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SEE ADV. PAGE 17 INSIDE.

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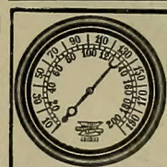

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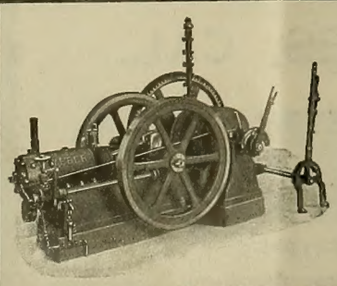

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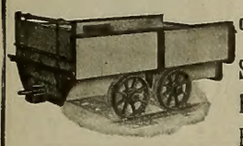
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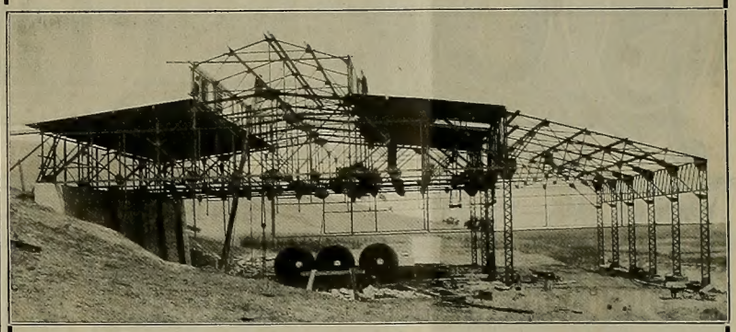
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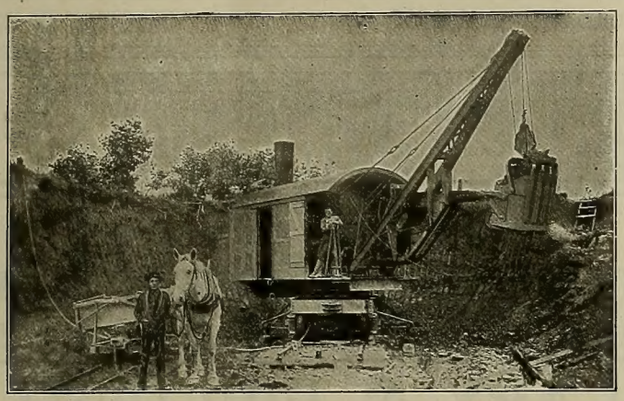
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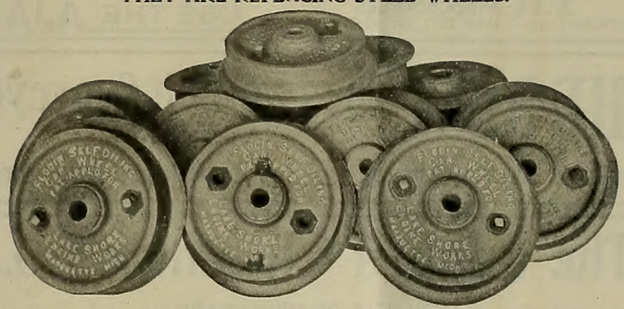
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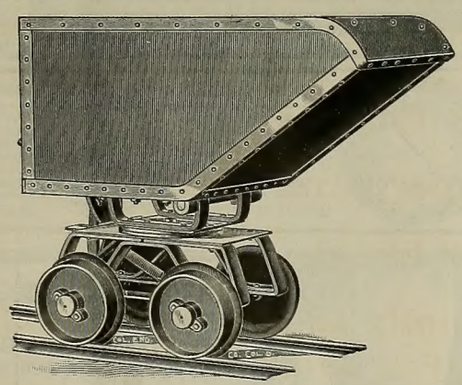

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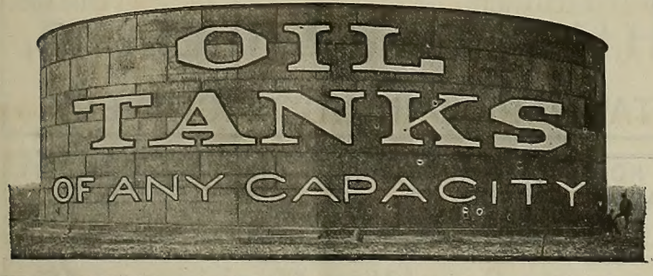

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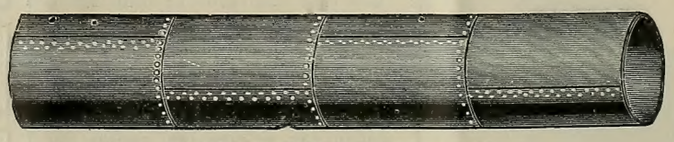
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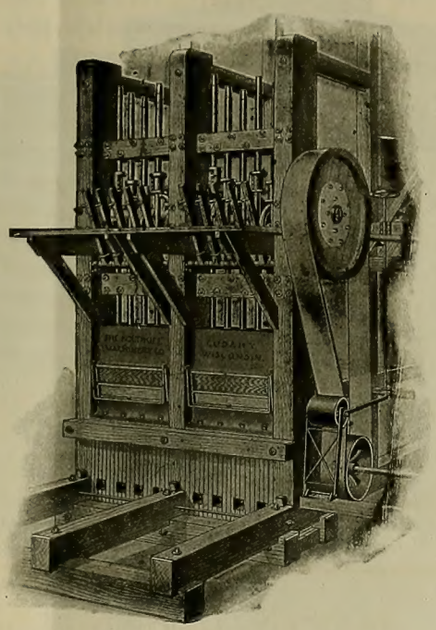

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ROCK BREAKER SHOES AND DIES AND LINERS do more work, last longer, wear better and give less trouble than any other Crusher Wearing Parts on the market.

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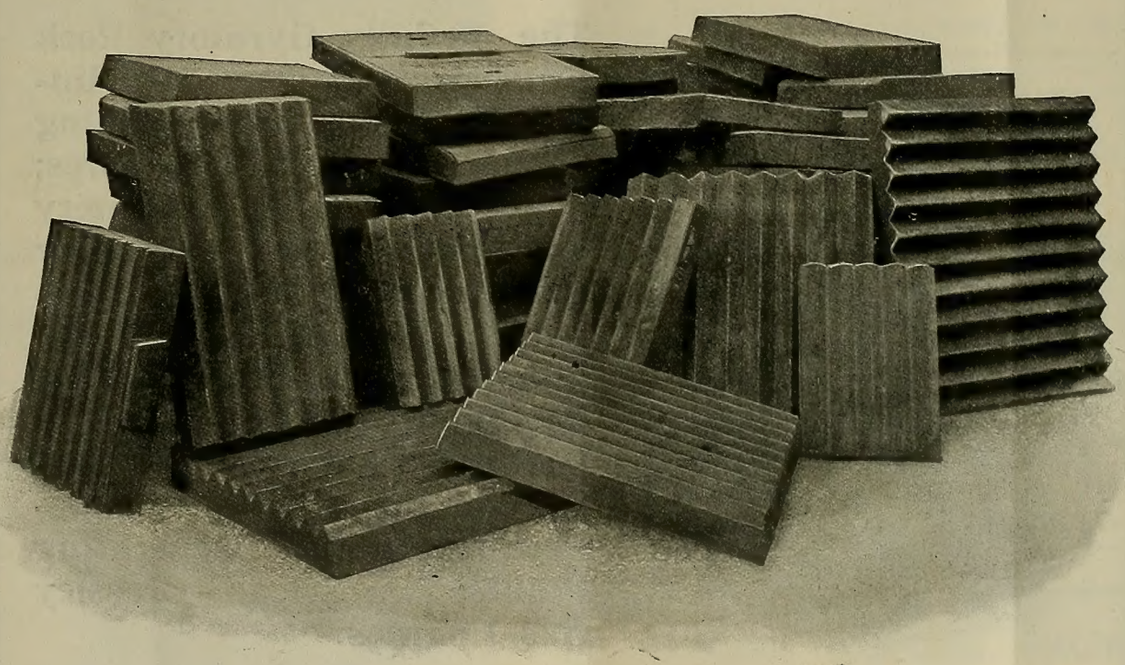

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After ten years of success, during which time the Wilfley Concentrating Table has been used in nearly every mining district of the world where the ore will concentrate and has established its reputation for reliability by actual performance, is it necessary to go back to the beginning and say that the

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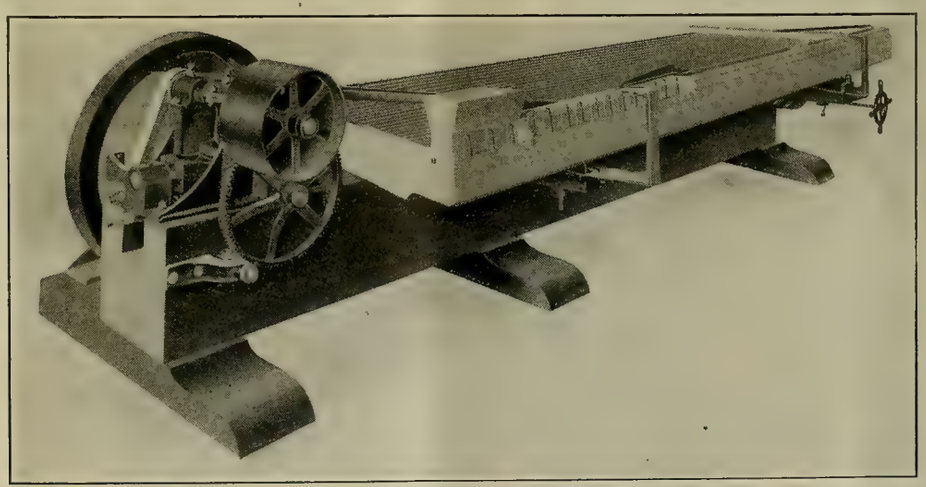
"SAVES EVERYTHING THAT A GOLD PAN CAN SAVE?"

It seems as though everybody must know it. But it is a fact, and we repeat it.

Do you think that one company would purchase over 500 of these tables if they did not consider them the best? They tested them thoroughly against all other known machines before placing their orders.



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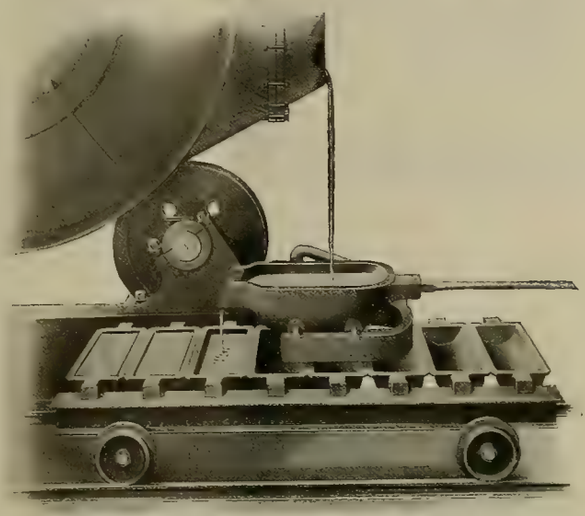

Effectively prevents splash in pouring

Swings out of way when pour is completed

Bowl drained by tipping at end of pour, and is then ready for next pour

No clay linings required

Simple, Strong, Durable and Effective

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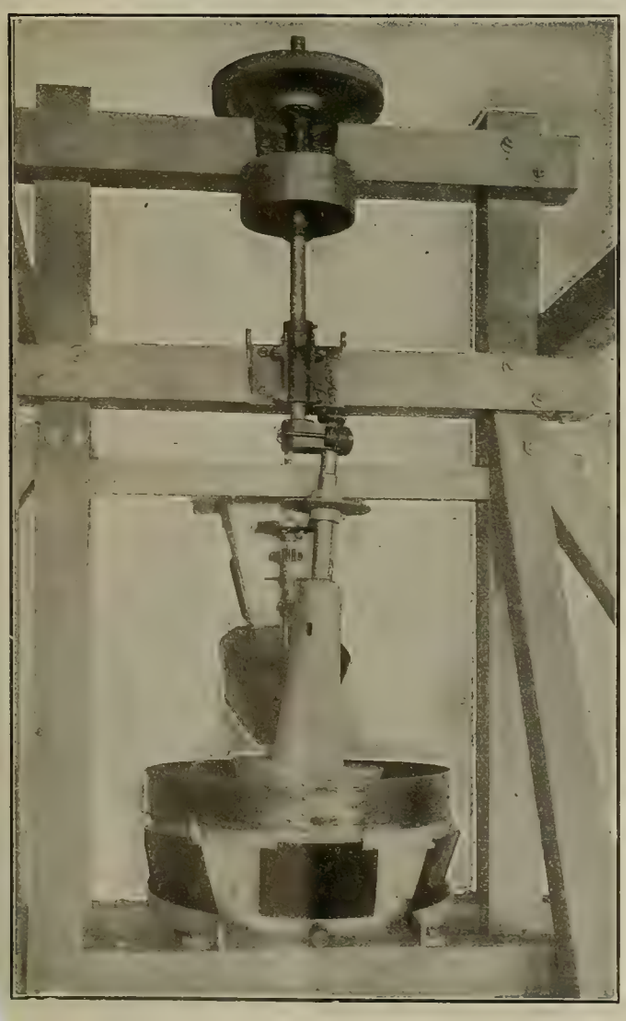

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DO YOU KNOW that tens of thousands of dollars have been taken out of the waste dumps of the Bonanza Mines of the Comstock with this Mill: rock so low in value that it was used to grade the streets with?

DO YOU KNOW that thousands of tons of hard quartz from the lower levels of the Comstock have been and are being successfully treated by the Kinkead Mill to-day?

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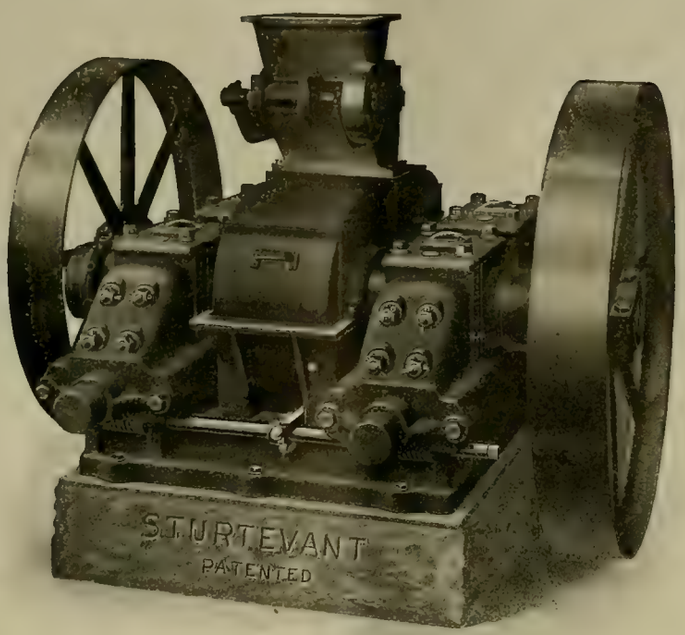

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Crushing Shocks ¼ that of other rolls.

Car-box bearings allow each shaft to get relief under excessive pressures.

Pedestals rigid.

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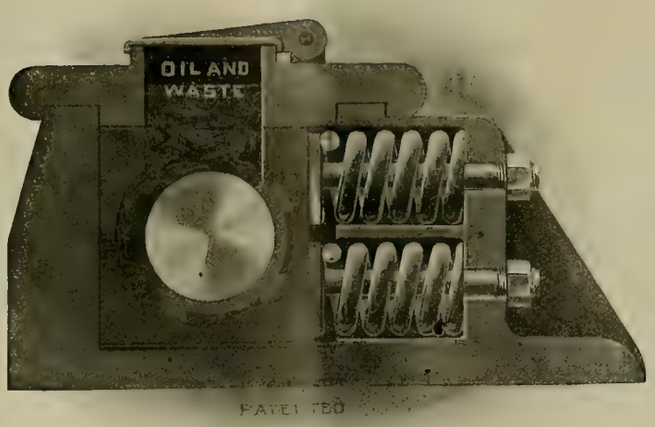

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Sturtevant Rolls are the only ones in which the shells may be kept true without removal for turning.

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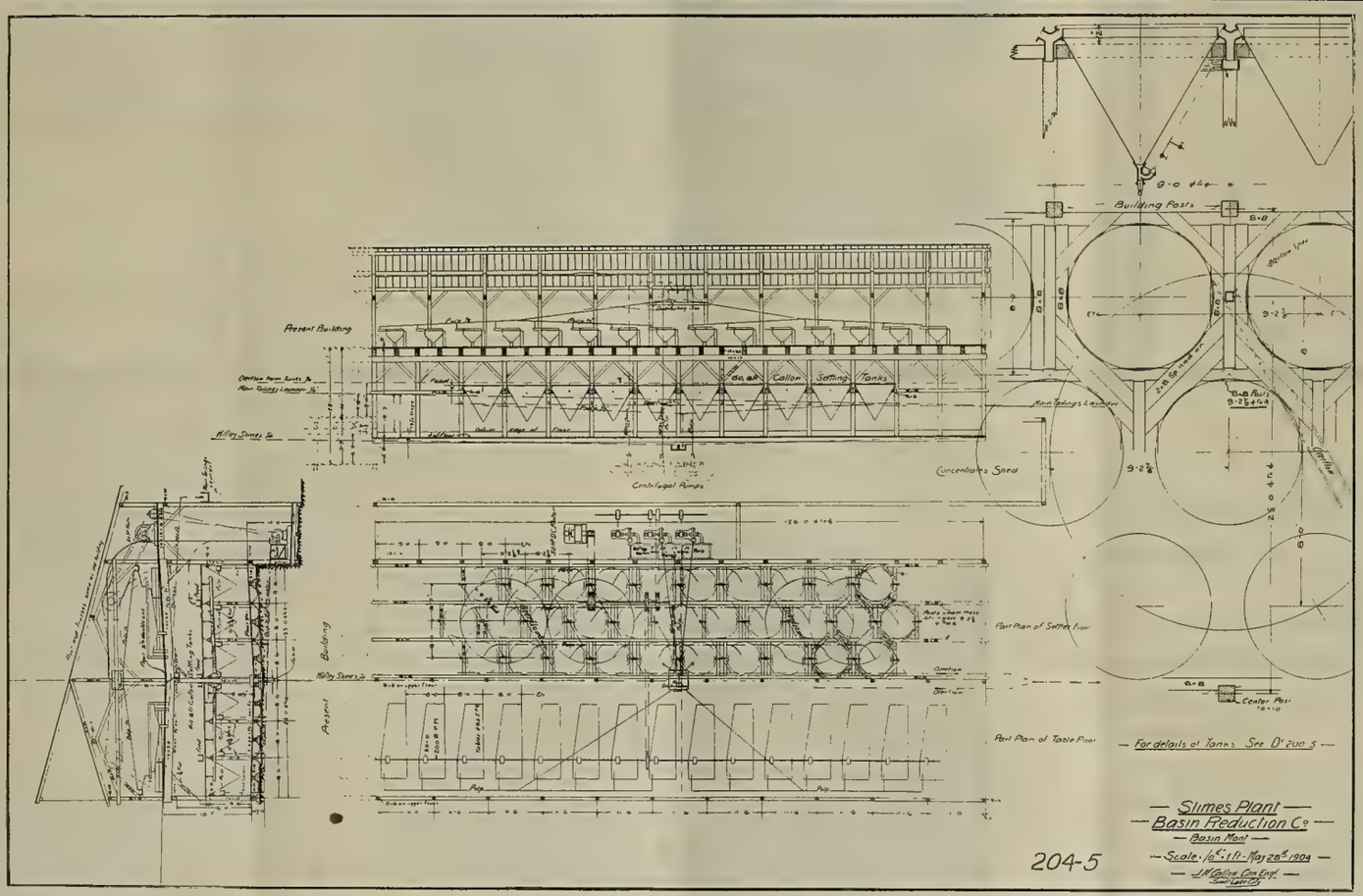

THIS PLANT is treating 1800 gallons per minute of slime overflow from the Wilfley feed tanks, and also the dirty water from the back ends of sixty-five Wilfley tables. This supply carries 41 grams of solid matter per gallon, and the overflow gives 16 grams. The recovery of solids is 62½%, of copper 78% and of silver 75%. The thickened pulp is treated on thirty Wilfley tables and yields from 250 to 300 tons of concentrates per month, representing from 3% to 3½% of the total copper output of the plant.

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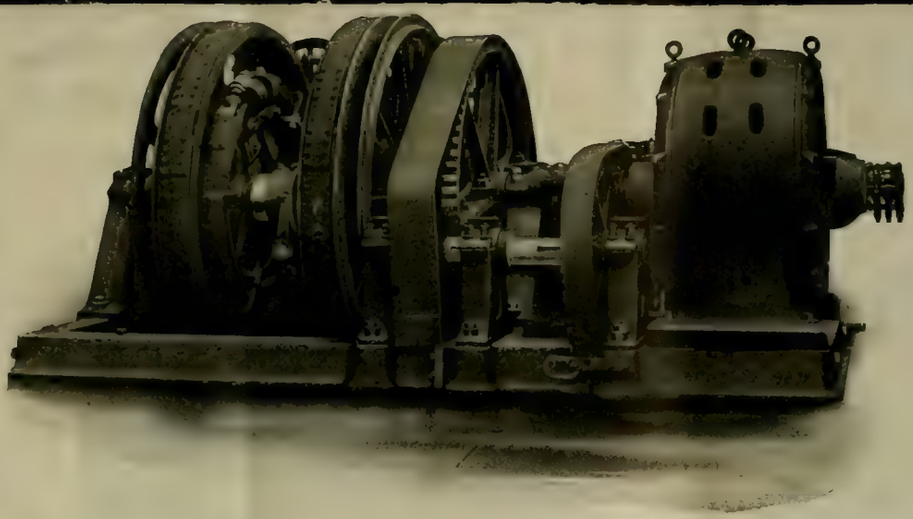

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WE BUILD them in a variety of types, equipped with either drums or reels, and for Alternating or Direct Current, as specified. The one shown is a

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We also build Steam-Operated Hoists and Haulages; Cages, Cars and Skips; Head Frames and Tipples; Reduction Machinery; Ore and Coal Handling Machinery; Cranes; Gas Engines; Water Power Equipment, etc., etc.

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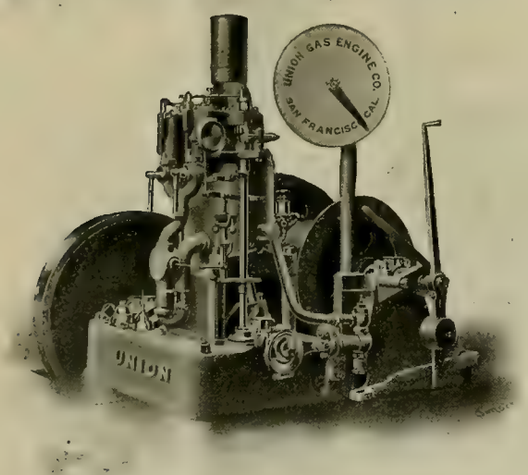

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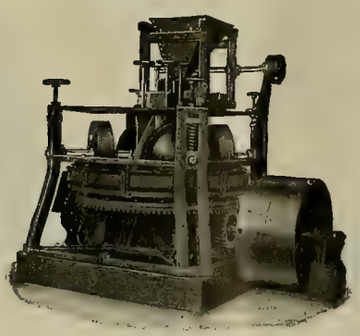
Perfect panning motion, die revolving and rollers remaining stationary.



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More lineal feet of screen surface than any other mill.

Less horse power to operate than any other mill of its size.

The Elspass Four-Roller Quartz Mill.

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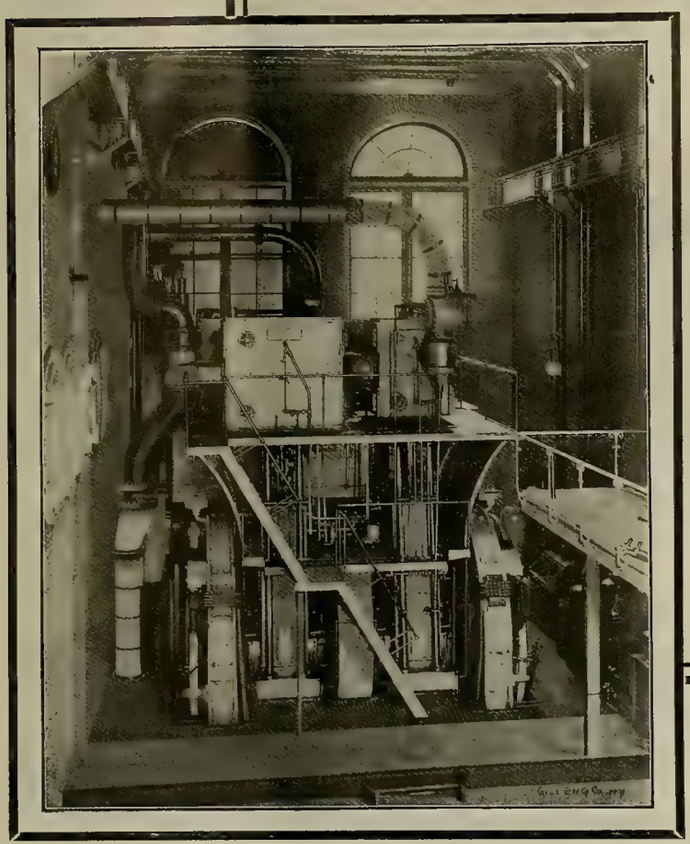

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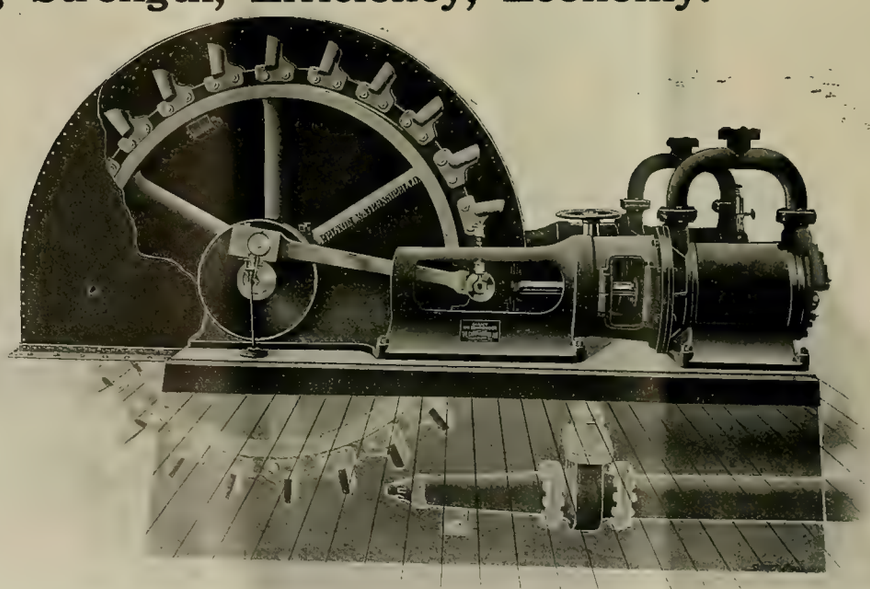
Combining Strength, Efficiency, Economy.

This cut illustrates a Standard Water-Power Duplex Compressor now in successful operation at the Draper Mine, California.



If we know the actual head of water, amount available in cu. ft. or miner's inches, size and length of pipe line, we can supply a direct driven compressor that will insure satisfactory operation.

The Compressed Air Machinery Co.

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THE HENDRIE & BOLTHOFF MFG. AND SUPPLY CO.

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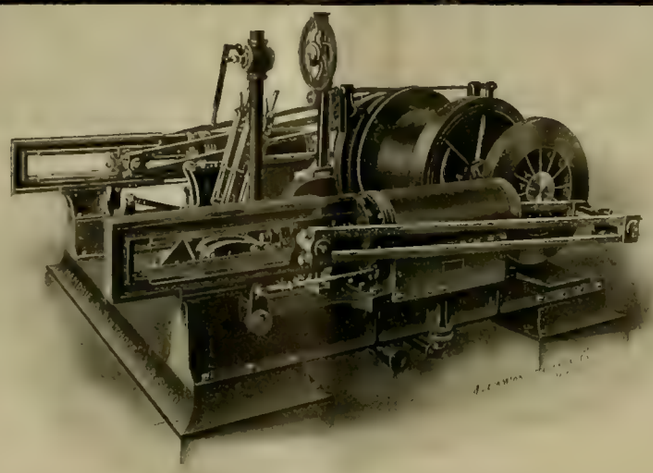
STEAM ELECTRICAL AND HYDRAULIC ENGINEERING — MINE AND SMELTER SUPPLIES.

BOLTHOFF'S SELF-CONTAINED HOIST

THIS HOIST

is manufactured in single and double drum, and occupies but one-half the space originally occupied by such machinery. Can be furnished in any desired size. Everything is mounted on one base, thereby keeping all working parts in perfect alignment, also reducing the cost for foundation and erection.



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AND THEN SEND FOR OUR
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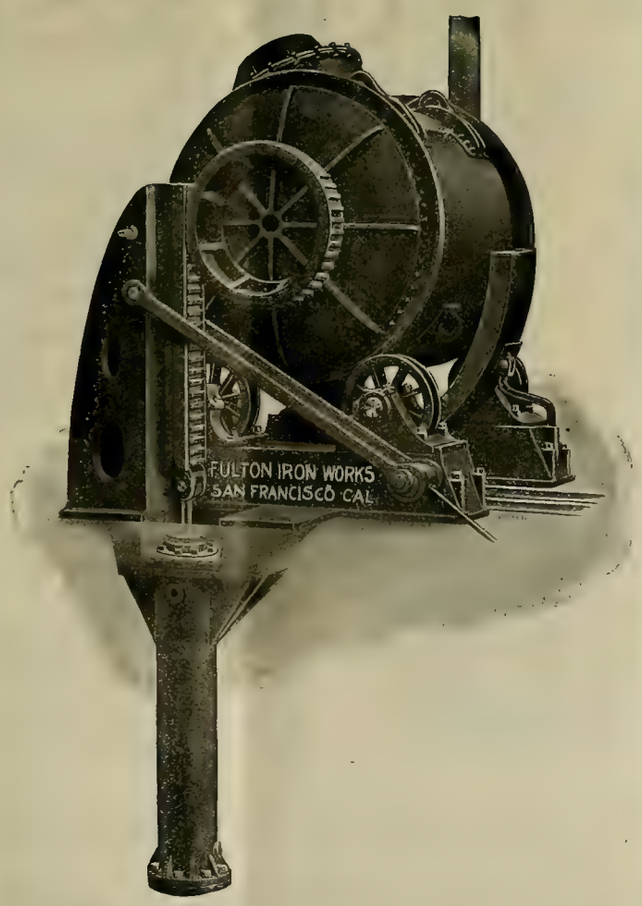
with the hoisting plant you are using? No? Then why not communicate your troubles to us? For thirty-five years hoisting machinery has been our specialty.

BOLTHOFF'S SELF-CONTAINED HOIST

BOLTHOFF'S SELF-CONTAINED HOIST



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CHROME STEEL Shoes and Dies

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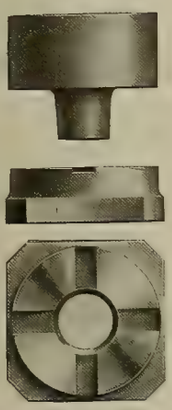

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Sectional dies are especially adapted for mills located in districts where the costs of freights are excessive. Also where milling conditions are such that ordinary dies have a tendency towards uneven wear.

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A full assortment of Shoes and Dies **ready for immediate delivery** from San Francisco.

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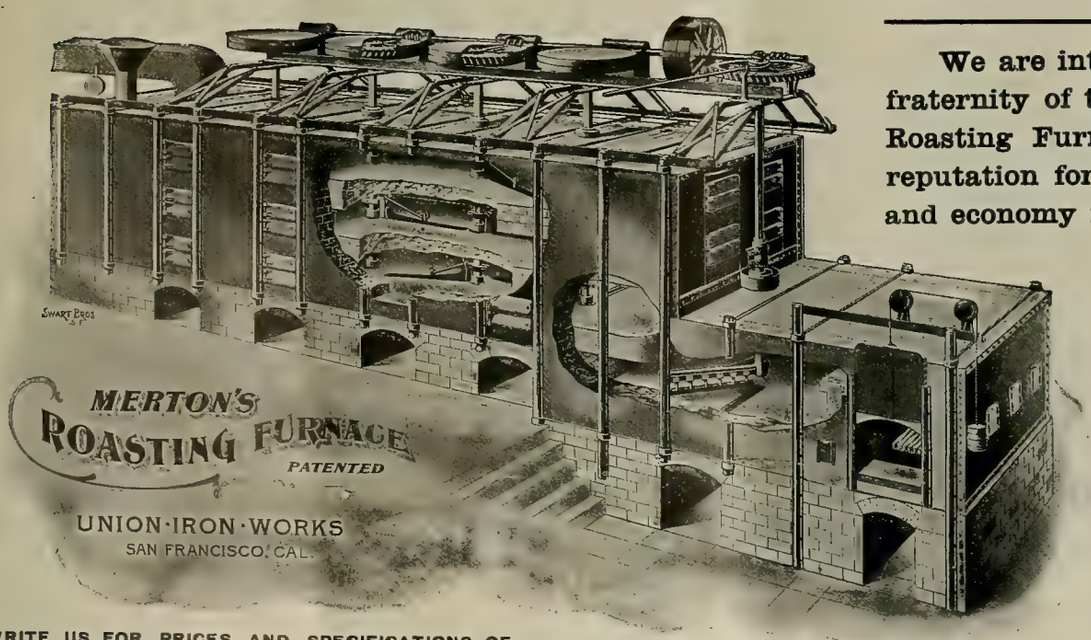

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It has points of superiority over all other types of mechanical Roasting Furnaces that we would like to explain to interested parties.

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SOMETHING ENTIRELY NEW IN ROCK DRILLS.

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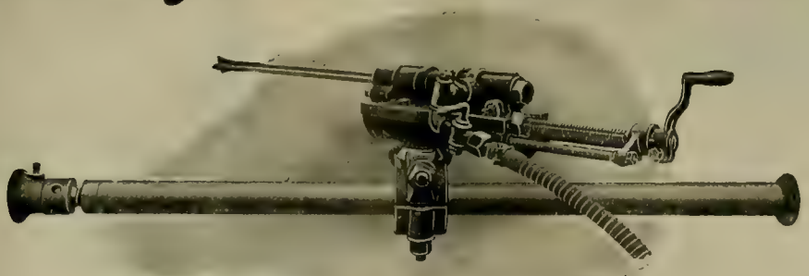

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Weight 54 pounds. Only one moving part. Total number of parts, 19. Air consumption about 25 cu. ft. Total length, 29¾ inches. Mounted on 2-inch column or bar. The steel is rotated by turning feed crank.

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For Stoping, Upraising and Lighter Work of all kinds, there is nothing like it or to be compared with it. It is in a class by itself.

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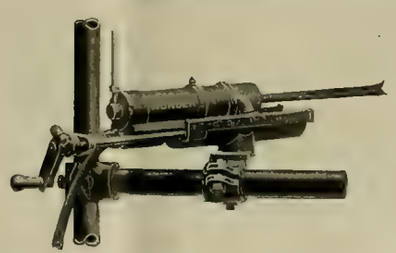
BIG WONDER AIR HAMMER ROCK DRILL

Is worthy to be classed among the labor savers and deserves the attention of all economical mine operators.

Our Little Wonder Air Hammer Rock Drill is a Practical Machine; so is the Big Wonder Mounted Drill.



The Following are Some of the Many Advantages of the Machine:

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Uses 17 cu. ft. air per minute.
Requires but one man to operate. Does the work of ten men.
Can be operated with or without tripod or column.
Is furnished with water attachment when desired.
Has no valves or springs to break or get out of order.
Cost of installation is much less than other drills.

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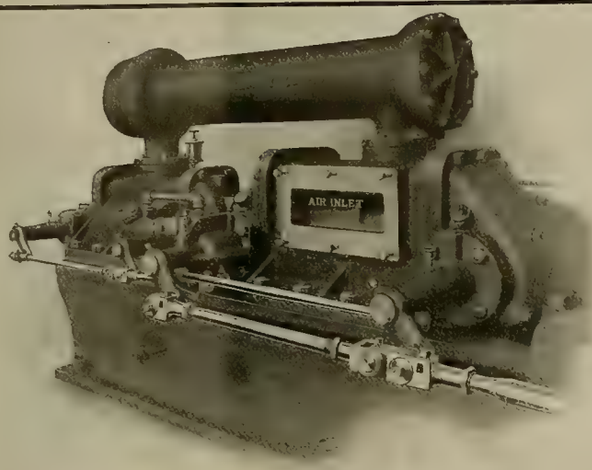
COMPRESSED AIR MACHINERY CO., 24-26 FIRST ST., SAN FRANCISCO, CAL., PACIFIC COAST AGT.



The Air End of a Sullivan Straight Line Mining Compressor deserves your attention because of its numerous features making for **High Efficiency.**

Air Supply comes from outdoors, not from engine-room, and enters the cylinder clean, dry and cool through large, short ports, absorbing no heat before compression.

CORLISS INLET valves, positively driven, fill **both low and high pressure** cylinders quickly and with minimum losses from clearance, leakage and friction. They last as long as the cylinders.

Intercooler and **discharge valves** of improved construction.

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TESTING A 3¼" EXCELSIOR DRILL with our celebrated "AIROMETER," showing 86.4 cubic feet free air used per minute at 80 pounds pressure. This drill has been sold after competitive tests at the Homestake and many other large mines in the U. S. during year 1904.

WE OFFER $100 to any standard drill that this drill cannot beat 25%. Send for particulars with official reports of drill tests. ☞Our drills are sold under absolute guarantee to cost less for repairs and to cut more ground than any rock drill so far made. Do you want more drilling than you are getting? Do you want an accurate Air Meter? If so, write

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RAND DRILL Co
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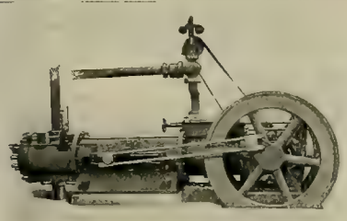
"Slugger" Drill

Length of stroke, 6¼" to 7⅞".
Length of feed, 18" to 30".

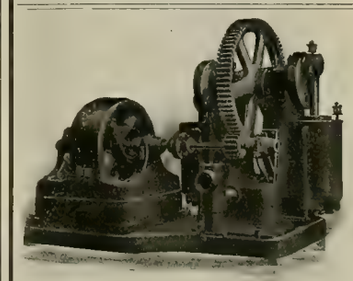
"Little Giant" Drill

Length of stroke, 3⅜" to 8½".
Length of feed, 10" to 30".



Rand, Straight-Line, Class C Compressors

Our Class C, Straight-Line, steam-driven compressor is particularly desirable where a machine must stand very hard usage, be moved from place to place, and receive but little attention. It is exceedingly compact, self-contained, simple in construction and easily transportable. For these reasons, it is especially suitable for prospecting work and for contractors' use.

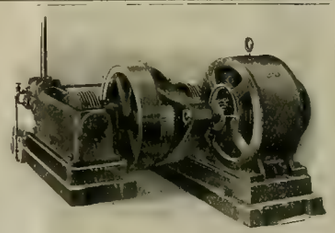


"Imperial" Type II Compressor

Geared to Electric Motor.

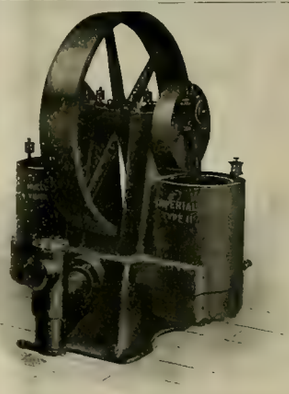
Rand, "Imperial," Type 10 Compressors, Steam Driven

The "Imperial," Type 10, steam-driven compressor is our latest model. It is of the duplex pattern, employing a heavy box bed with the steam and the air (or gas) cylinders at opposite ends, and the balance wheel located nearly in the center. It is self-contained, self-oiling and requires but little attention.



"Imperial" Type 10 Compressor

Noiseless Chain Drive, Electric Driven.



Rand, "Imperial," Type II Compressors

The "Imperial," Type 11 compressor is especially adapted for use in machine shops, foundries and other industrial establishments where but little attention can be given to a compressor.

Its principal features are compactness, simplicity and strength. It has two vertical, single-acting air cylinders, and very long trunk pistons that act as guides for the lower ends of the connecting-rods. By this design, stuffing-boxes and crossheads are eliminated, and a minimum number of bearings required. The cylinders are made both duplex and compound, are thoroughly water-jacketed and provided with hooded heads. They are cast in one piece with the frame, thus insuring the utmost rigidity. The valves, both inlet and outlet, are of the vertical, poppet type.

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Quarterly

A semi-technical journal devoted exclusively to compressed air.

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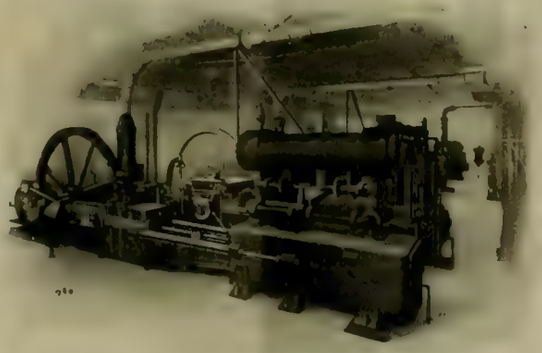

Air Compressor Plant of the Anaconda Copper Mng. Co., Anaconda Mont.

Another Recognition of Ingersoll-Sergeant Machinery as

STANDARD IN MINING SERVICE

THE ANACONDA COPPER MINING CO., Anaconda, Mont., Uses

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600 INGERSOLL-SERGEANT **ROCK DRILLS**

The air power equipment includes the TWO LARGEST High Pressure AIR COMPRESSORS in the WORLD.

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REDFIELD All-Steel

Electrically Driven

Rock Drill

Can be operated successfully in shafts, stopes or up-raises. It has 50 less pieces than any other electric drill. Motor is all-steel; waterproof; ball-bearing

Can be detached from drill in a few seconds. Weighs 100 lbs. Weight of drill 175 lbs.

FULL PARTICULARS CAN BE HAD FROM

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We also sell Redfield Hand Power Rock Drills

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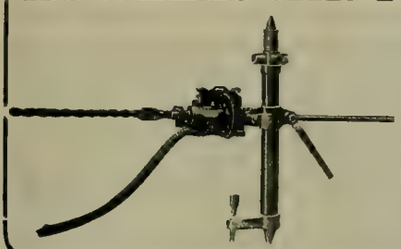

No. 2—For Medium Rock, Slate and Coal.

Just the thing to replace the hand drill wherever there is an air compressor. Entirely self-contained. Easily carried by one man. Any miner can operate it. It is simple, well built, and never gets out of order. In addition to our compressed air drills we make thirty-five types of hand machines. Our new catalog is full of information. May we mail you a copy?

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THE BABY TORPEDO

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Portable Adamantine Coring Machinery,

operated by Steam or Gasoline Power, for vertical borings. A core can be removed for examination with nearly the same despatch as with Diamond machinery. First cost of machinery is about one-half the cost of the diamonds. SIMPLE IN OPERATION.

Oil and Water Well Sinking Machinery and Deep Artesian Pumping Machinery.

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Victor Hand Power Rock Drill

Important Features—

All wearing parts run in oil.
No buffer head or side rods.
Roller bearing cam movement.
Has heavier working parts than many 250-lb. air drills.

Manufactured by

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WOOD DRILL WORKS,

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Drills built to be "cleaned up with a sledge hammer" and "wiped off with a scoop shovel" and yet "stay with you."

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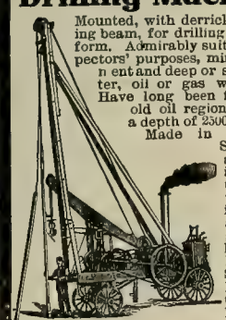

Mounted, with derrick and walking beam, for drilling from platform. Admirably suited to prospectors' purposes, mine development and deep or shallow water, oil or gas well boring. Have long been favorites in old oil regions. Bore to a depth of 2500 feet. Made in ten sizes. Strength and simplicity adapt them to service in mining camps and oil regions. Full line of Well Drillers' Supplies. Large illustrated catalogue free.

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If you want some good mining stock, call and let us explain to you something about the Tonopah Berkeley Mining Company.

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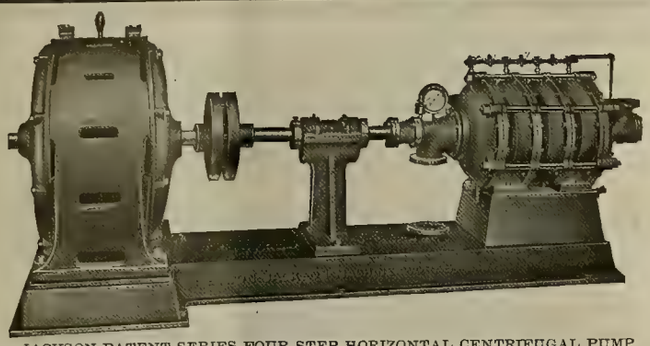
Our New Catalogue "R"

DESCRIBES OUR HYDRAULIC RAMS TELLS WHAT THEY CAN DO

The 48-inch Phillips Hydraulic Ram of our manufacture has 25 times more capacity than any other Ram known.

They make mines out of undeveloped gravel beds heretofore thought inaccessible.



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PUMPS

THIS CUT illustrates one of our high head centrifugal pumps direct connected to a Westinghouse induction motor and designed to operate against a head of 800 feet, discharging 650 gallons per minute. This pump under test gave an efficiency of 76% and is now operating in one of the largest mines in the West.

We have been building centrifugal pumps for the last twenty-five years and believe we have attained the highest state of the art. We guarantee to raise water to an elevation of 2000 feet or more with practically the same efficiency as a reciprocating pump. The first cost is much less and the expense of maintenance reduced to a minimum.

OUR HIGH HEAD MINE SINKING CENTRIFUGAL PUMPS are especially adapted for unwatering mines and sinking shafts.

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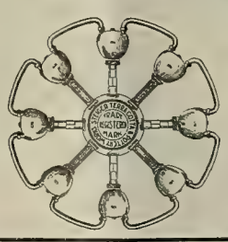

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CAMERON PUMPS. Often Imitated, Never Equaled. Imitation the Sincerest Flattery.

ANNOUNCEMENT! To Users of CAMERON Pumps and the Public Generally:

We have withdrawn our agency from the Mine & Smelter Supply Co., and they no longer represent us; nor are they authorized to sell, as our agents, any of our pumps or repair parts.

We take pleasure in stating that we have transferred our agencies to and are now represented by—

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228 South West Temple St., Salt Lake, Utah
INGERSOLL-SERGEANT DRILL CO.,
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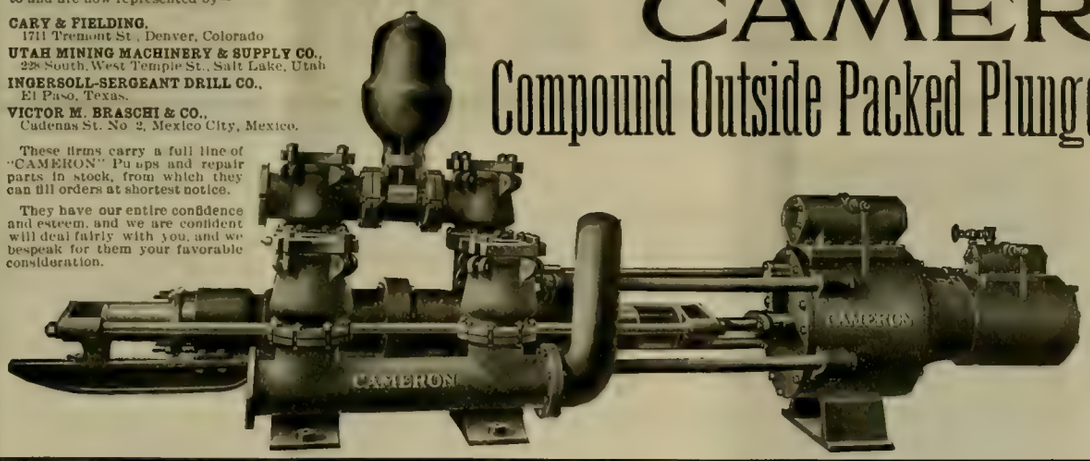
These firms carry a full line of "CAMERON" Pumps and repair parts in stock, from which they can fill orders at shortest notice.

They have our entire confidence and esteem, and we are confident will deal fairly with you, and we bespeak for them your favorable consideration.

CAMERON

Compound Outside Packed Plunger Pot Valve Pump



Designed and built especially for use in

MINES

having acid water and heavy lifts.

Water cylinders of hard, close-grained iron, wood-lined if desired or of bronze if necessary.

THE SLOGAN OF THE CAMERON—"CHARACTER THE GRANDEST THING."

To touch again on character—

The character of a CAMERON PUMP has made the CAMERON reputation, and to build up this character and establish this reputation we have had to be exceedingly particular in building our pumps.

To maintain both character and reputation we look to it that every ounce of metal used in a CAMERON PUMP is OF THE BEST. We see to it that every ounce of this "BEST" metal is placed where it will do the most good—to offset wear and tear.

Then again, a CAMERON PUMP is built so as to work along the line of least resistance—few working parts; because, the fewer the working parts and the less power to move them—the heavier we can make them—in order to stand the strain of long continued hard service.

NOWHERE—and CAMERON PUMPS are used EVERYWHERE—has a CAMERON PUMP failed in its duty, or in its ability to work up to full given capacity in situations or under conditions for which it was proportioned and guaranteed.

Truly we have found "Character the grandest thing."

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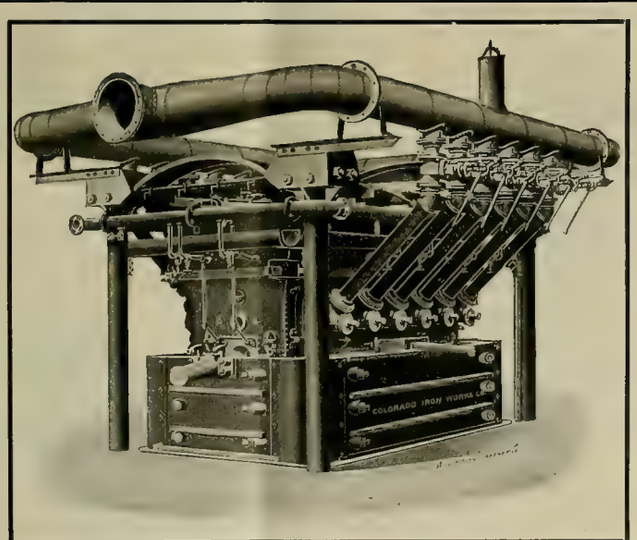
ORE SMELTING EQUIPMENTS ORE MILLING MACHINERY

DENVER, COLO., U. S. A.



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The main reason for the superiority of our smelting furnaces over those of other firms is that we DESIGN and BUILD each of our furnaces especially for each order as it is received. We have no "stock" furnaces, and each furnace has an INDIVIDUALITY and CHARACTER all its own that readily distinguishes it as a COLORADO IRON WORKS CO.'S product.

If contemplating smelting operations, write us; we will be glad to help you in any way we can. Send for descriptive literature.

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SALT LAKE CITY REPRESENTATIVES: CLEMENT & STRANGE, 307 DOOLY BLOCK.

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What Scale Does

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*Boilers are used about*_____ *hours out of 24*
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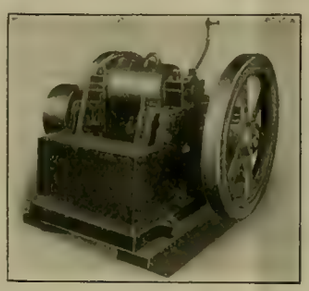

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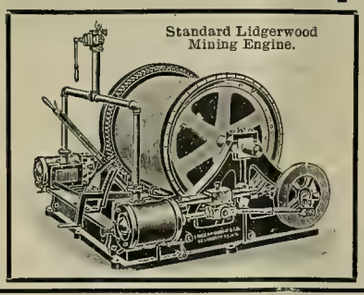
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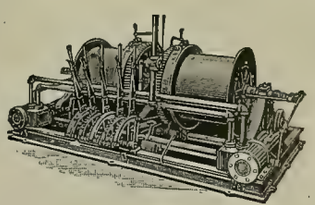

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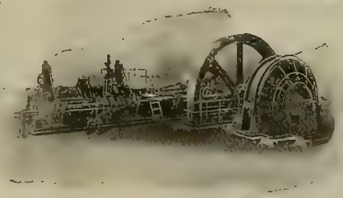

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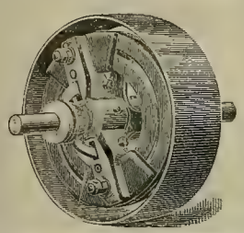

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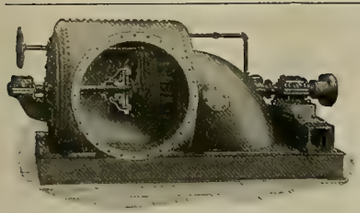

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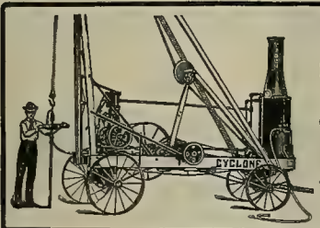

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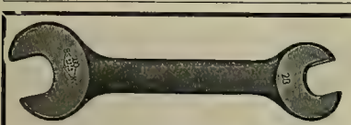

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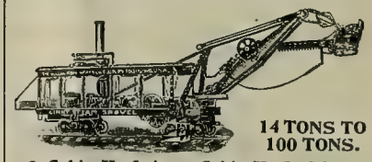

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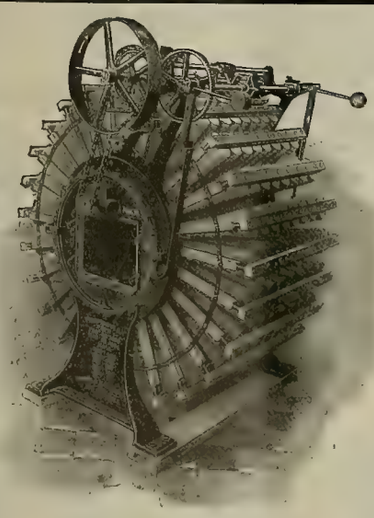

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Whole No. 2345.—VOLUME XCI Number 1. SAN FRANCISCO, CAL., SATURDAY, JULY 1, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Progress by Disaster.

At a dinner given recently by a technical society an engineer made the statement that one of the most potent factors in engineering progress had been disaster. His remarks referred more particularly to the progress in civil engineering, but the statement applies with considerable force to mining as well. The old-time methods of twenty-five years and more ago have to a great extent been changed and better methods devised and applied. There has been published herein the past two weeks a brief description of the methods in mining and milling practice on the Homestake belt in South Dakota during its early history, and showing how, by a process of evolution—suggested and necessitated by frequent disaster — the methods have been changed and adapted to existing conditions until methods of mining have been evolved which have no superior at present in the world. The same difficulties remain to be overcome at many other mines, where the old-time ideas still prevail. In many instances these methods are considered necessary, owing, perhaps, to the low grade of the ore, but any mining method which at first is easily applied and is for a time satisfactory, but which eventually results in disaster, is not the best method. Usually all that has been saved by short-sighted economy is swept away and lost by the disaster which cannot be averted, and which is directly attributable to the method. Caves in mines in many instances may be averted, if proper methods of mining be applied. If these methods be too expensive the management may have several working schemes from which to choose. He may decide that all the ore cannot be recovered by a certain method and that the loss of ore will be less than the increased cost of applying another method which would permit the removal of all the ore, but any method which renders the mine safe while extracting all the ore possible at the least cost is the best method, and is the one which should be adopted. While engineers profit by their own failures and those of others, there are those, unfortunately, who do not appreciate the lessons taught by disaster and who continue to undertake to outwit nature in the same old way and always with the same inevitable result.

Waikino Mills, Waihi Gold Mining Co., New Zealand. (See Page 12.)

THE proposition to reorganize the Horseshoe Mining Co. of South Dakota, if carried out along the lines suggested, as published locally, will do much toward placing that company on a more substantial basis. The Horseshoe is the second largest mining concern operating in the Black Hills of South Dakota. Since its organization the affairs of the company have been more or less involved, one of the drawbacks being excessive capitalization. That the property has merit no one acquainted with its resources doubts. To add to the other unfortunate combination of circumstances the mill at Terry, which cost about half a million dollars, burned the latter part of May.

Tonopah, Nevada, Showing Mill of the Tonopah Mining Co. (See Page 10.)

Tonopah as Seen from Mizpah Mine. (See Page 10.)

MINING AND SCIENTIFIC PRESS.

ESTABLISHED 1860.

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SAN FRANCISCO, JULY 1, 1905.

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THE explosion of a large amount of dynamite in a thawing house at the Findley mine in Cripple Creek district, Colo., a few days since, the cause of which is a mystery, has once more started a discussion on the vagaries of nitro powder. The building used for the purpose was a light frame structure and the only heat applied was said to be steam from the boilers, 50 feet or more distant from the thawing house. The building was said to have been locked at the time, and contained 300 pounds of powder. Steam has always been considered a fairly safe means of thawing powder, though there is danger in the use of steam of raising the temperature both too rapidly and too high. What is generally acknowledged to be the safest means of thawing nitro powder is warm water. If the powder be placed in a closed recep tacle, and gently heated by warm water, no explosion has ever been known to occur, but the direct application of steam to the warning device might induce a rapid rise in temperature. Just the character of the device used in the instance above mentioned is not known, therefore it is impossible to give more than a probable cause for the explosion. It is simply another illustration of the great care necessary in handling dynamite, and it will doubtless result in the exercise of even greater care in the employment of powder thawing devices in Cripple Creek district.

THE suit of the Federal Mining Co. v. the Bunker Hill & Sullivan Co., recently brought in the Cœur d'Alene district of Idaho, would seem to place F. W. Bradley, who was lately elected to take the management of the plaintiff company, in an embarrassing position, as Mr. Bradley is president and a large stockholder in the Bunker Hill & Sullivan. This is another of the already noted apex suits on the famous lead-silver vein of the Cœur d'Alenes. The Federal Co. sues for $1,000,000 claimed to be due it from the defendant company for the extraction of ore from a portion of the vein, claimed to belong to plaintiff company because it apexes in one of the latter's claims. The Bunker Hill & Sullivan vein is a broad lode, the foot wall of which is usually, if not always, well defined, but the hanging wall is determined wholly by commercial considerations, the ore occurring in the form of an impregnation of the country quartzite, and being mined as long as it is profitable to extract and concentrate it. At one point in one of the Federal Co 's claims it is understood that this indefinite and uncertain hanging wall cuts across one corner of the claim—therefore the suit. Mr. Bradley, upon being informed of this new litigation, promptly tendered his resignation as manager of the Federal Company, and also as director in the Tacoma and Selby smelters, as all of these enterprises are identified with the American Smelters Securities Co. It is presumable that he had no knowledge or intimation of impending new suits when agreeing to accept these responsible positions with the Federal and the Smelting Companies.

Mining in Mexico.

During the past ten years Mexico has come rapidly to the front as a possible field for profitable mining investment. For many years mining in that republic was not looked upon with as favorable an eye by American and British capital as at present. In fact, investments generally of foreign capital in Mexico were considered risky, to say the least. The broad and liberal policy of the Diaz government has changed this and opened the door of Mexico to foreign investment, and capital invested in Mexican enterprises is not only as safe as elsewhere, but these investments are often unusually attractive in some respects. Throughout Mexico there are old mines and undeveloped mineral resources. Many large as well as small mines are in actual and profitable operation, affording a wide variety of conditions, and great advances have been made in metallurgy in the treatment of Mexican ores. There are many who think that the most desirable mining property in Mexico is an old mine—"la mina antigua"—a mine worked so long ago that the oldest inhabitant knows nothing of it other than its whereabouts and the traditional stories of its fabulous wealth. The average modern miner feels himself so far superior to the "ancient" Mexican that he generally thinks that if he can only come into possession of one of these old mines he can quickly—by reason of his superior knowledge and experience—put it on a paying basis again. In many instances this is fallacious reasoning. The old mines were worked in the interest of men of large influence in their day, and the laborers were generally peons—slaves, in fact—to whom was paid, if anything, the merest pittance. Thousands of these poorly paid workers delved in the mines, building fires at the rock faces, groping through the suffocating smoke and dashing water upon the heated rock surfaces to disintegrate the hard ore, which, when recovered, was laboriously packed on their backs to the surface through long tunnels or up hundreds of feet of notched logs, called by the Americans "chicken ladders." The work of the metallurgist was laborious, crude and slow, but in most cases satisfactory. The efficiency of the labor was certainly not high, but it is equally certain that it was not expensive, even comparatively. For these reasons old Mexican mines yielded large net returns to their fortunate owners, and mines of very low grade could be profitably worked under the conditions existing at that time, particularly where the mine owners also owned a large rancho in the valleys, where all that was required for existence of man and beast was raised or manufactured and where the labor was also performed by peons.

With the ancient Mexican mining was a business which he brought to a high state of perfection in his day, and although not comparable with modern methods—even Mexican modern methods—he was enabled to perform a great work, as the wonderful extent of the development of some of the old mines testify.

Many of the old mines were phenomenally rich, such as some of those at Zacatecas, Guanajuato, Queretero and elsewhere throughout the republic.

Until the water line was reached the ancient Mexican could cope with almost any problem in mining, and in some cases long drainage tunnels were driven to facilitate mining, but when he passed below a possible drainage level in a wet mine his work came to an end, whether the mine were rich or comparatively poor.

The great low grade mines of Mexico can be again worked with profit, in many instances, by the introduction of modern machinery and mining methods, and the metallurgical practices of to-day will extract a far larger percentage of value than was obtained by the ancient miner except with the freest kind of ores, but it should be remembered that even these advantages scarcely offset the low costs under the old peonage system of the ancients.

There are mines in Mexico worked to the water line which were rich. Many of these can be and have been reopened and successfully worked by reason of the high efficiency of American pumping machinery and the superior management of American engineers. Other mines which were profitable above water level are found low grade, base and difficult of treatment in the sulphide zone. Unusual conditions and difficulties exist in many localities in Mexico due to climate and topography, and the truth should be recognized that mining in Mexico is not greatly unlike mining in the southwestern part of the United States, and that each mine must stand upon its individual merit and cannot borrow any real value from its rich neighbors, nor from the traditional tales of great wealth in the past. There are engineering and metallurgical problems—some of them novel—to be worked out, and these are being rapidly solved by American engineers. The difficulties of transportation are being remedied by the construction of railways, and nothing aids more materially than the liberal laws under which Mexican mines are at present operated.

In Mexico the extralateral right is unknown. All mining locations are in square units—the pertenencia, 100 meters square—and a mining property usually comprises a greater or less number of these units. There are many phases of Mexican mining law which could be adopted by the United States with advantage to the industry. No assessment work is required on claims in Mexico, but a tax is fixed and must be paid. There is no evasion of this tax—as in the case of the annual assessment, which is too often evaded in the United States for the good of the industry. As a consequence, those mining in Mexico actively develop the claims upon which they are paying taxes or, if considered not worth development, the claim is relinquished to the Government, and is again open to the next comer. There is no doubt that the Mexican mining laws are in many ways superior to those of the United States. The laws are favorable to development of the Republic's resources, but there are other conditions which tend to retard the extension of mining operations, as well as to make many enterprises commercial failures which should be profitable concerns. These are the overcapitalization of properties and the top-heavy management—an official staff at the mine large enough to operate a Government, with "Home Offices" which absorb a large share of what should be stockholders' profits, for it is needless to say that unincorporated companies, or close companies, and those owned and operated by individuals are not afflicted with the expensive home office attachment, nor is the official staff larger than is really necessary for the proper conduct of the business.

IT is now said that there is a reasonable probability of the construction of the deep Cripple Creek drainage tunnel, the estimated cost of which is placed at $750,000, of which about $500,000, it is reported, has been secured. The value of this tunnel to the mining industry in Cripple Creek district is almost incalculable. In fact, the past experience in this district has shown that very few mines can hope to operate at any considerable depth below the present drainage level of the El Paso tunnel, and even if it were possible to install pumping machinery sufficient to handle the vast volume of water found in this zone of saturation it is good business to drain the ground by means of the proposed tunnel for the reason that it can be more completely and far more economically done by the adit.

OF all the accidents occurring about mines, the collapse of head frames is one seldom or never heard of. In the building of these structures the factor for safety is usually so absurdly large that one has seldom or never been known to collapse.

CONCENTRATES.

SLIMY ORES treated by the cyanide process, where salt water is employed, usually give less trouble in settling the slimes than where fresh water is used.

THE Brandt drill is made in Europe. It is operated by water under a high head which forces the bit against the rock while it slowly turns, cutting away the rock.

MINING COMPANIES incorporated under the laws of one State, and operating their mines in another, are amenable to laws of the State in which they are operating.

THE price at present paid for Joplin, Mo., district zinc ore ranges from a basis of $39 to $41.50 for ore containing 60% zinc. Occasionally prices go as high as $43.50 to $45.

WHEN amalgamating in the battery it is generally advisable to use as little water as possible—enough to clear the pulp out and make an even and free flow over the plates.

WITH a proper arrangement of hydraulic classifiers and concentrating tables in gold mills, there is usually little use for a canvas plant to concentrate slimes from the tables.

MANGANESE occurs in a great variety of rocks, usually in small amount, but in some rocks, such as the cherts of the Coast range of California, is abundant, and in some instances forms veins of commercial value.

IT should be the duty of the superintendent or foreman of the mine to investigate carefully the cause for all missed holes. By ascertaining the cause, it may be possible to obviate their frequent occurrence.

A SULPHIDE is a combination of a metal with sulphur and a sulphate is a combination of a metal with both sulphur and oxygen. Sulphuric acid is merely the combination of sulphur one part and oxygen three parts with water H_2O, forming H_2SO_4.

IF it is necessary to unwater the old workings of the copper mine, it would perhaps pay to run the water through boxes containing iron and tin scraps. In this way considerable copper may be recovered, if the water in the mine contains much copper.

CHROMIUM, commonly called chrome iron, occurs almost exclusively in dark basic rocks, and notably in serpentine, also in dunite and peridotite. The ore is found in segregations of solid ore and in grains scattered through the matrix. It may be concentrated readily by water.

UNDER a head of 410 feet, each miner's inch of water (1.5 cubic foot per minute) will develop 0.99 H. P. Under a head of 650 feet, 1 cubic foot of water per minute will develop 1.04 H. P. Under a head of 410 feet, the discharge from a 1-inch diameter nozzle will be 5.31 cubic feet per minute.

IF the mineral is thought to be heavy spar (baryta), fuse a small quantity of the pulverized mineral with sodium carbonate and place the mass on a piece of clean silver and moisten with a drop of water. If the mineral is sulphate of barium (baryta) it will color the silver black—a black silver sulphide.

IN pyritic smelting if the height of a column of ore be too high the condensation of volatile sulphur in the upper part of the column will ultimately give trouble. If the fire works its way too far upward it has a tendency to slag the materials of the charge and the result usually is that the descent of the charge is retarded or prevented altogether.

IN roasting ores an oxidizing roast is one which leaves the gold present in metallic form and the silver either metallic or in the form of sulphate. A "dead" roast is accomplished by raising the heat, by means of which the oxidizing roast is continued until the sulphates of iron and copper are decomposed. Lead sulphate is not decomposed and usually the silver remains as sulphate.

ALMOST without exception the rich ore bodies of the Comstock lode at Virginia City occur as segregations in large masses of barren or comparatively barren quartz. These quartz masses have formed in the much altered andesites which lie on the footwall diorite of Mount Davidson. There are also ore bodies in the diorite, but these are mostly low grade and rather base, containing iron and copper and lead sulphides, etc., beside low values in gold and silver.

THE distance at which a mountain may be seen depends upon the point of observation and upon the clearness of the atmosphere. In dry countries it is usually possible to see great distances—150 to 200 miles, and even farther, when the air is particularly clear. Colorado, Wyoming, New Mexico, Arizona, southern California and the Great Basin region are noted for the purity of the atmosphere and the great distances through which objects may be distinguished.

IT is a mistaken idea that one may locate mining claims wherever gold is found. A few days since gold was reported found in the gravel brought up by the sand pump in drilling a well at Carson, Nevada, and a number of men at once began staking out claims. Mining claims may only be taken on the unoccupied public domain. Private property is not subjected to the laws under which mining claims are taken.

PRODUCER GAS is used as motive power to drive gas engines, and also for fuel for heating purposes and in furnace work. In the last its use is increasing. Producer gas is made in what are known as gas producers, by passing a mixture of steam and air through an incandescent bed of fuel in a closed producer. The admixture of steam and air must be in the hands of an experienced man or the fire may be extinguished or a poor quality of gas made.

THERE is no longer an arbitrary footage of ground excavated in the performance of assessment work. The work may be estimated by day's labor actually performed at the going wages in the camp where the claim is situated, the amount of work done in a day being equivalent to an ordinary shift's work. The cost of improvements in the way of buildings or other structures, ditches, necessary roads, machinery and pipe lines may also be counted as assessment work. Tools do not count.

ALTHOUGH carbon, manganese, chromium oxide, nickel and several other mineral substances give extreme hardness to steel, the percentage of the mineral used must be just right to accomplish the desired result. Too great an amount of any of these minerals in the alloy will usually produce an entirely different result from that resulting from the introduction of the proper proportion. When the carbon in steel—drill steel, for instance—is burned out by overheating, the steel becomes worthless as a tool, and the burned portion must be cut off.

IN copper mines, where the water is very corrosive and rapidly destroys the iron and steel with which it comes in contact, it seems that the damage to air and water pipes might be overcome by substituting copper pipes for those of iron commonly in use. At some of the mines of Butte, Mont., wooden pipes lined with lead have been put in, owing to the rapid corrosion of iron pipes by the acidulated water and the replacement of iron by the copper. Copper, which thus replaces the iron, has little or no cohesive strength, and the pipe in time will fall to pieces of its own weight.

WHERE ores containing arsenic and antimony are roasted, preparatory to treatment by the cyanide process, great care must be exercised in roasting, particularly in the early stages of the roasting. The temperature must be kept down to a low red heat, as if at first the heat be very high, certain stable compounds of arsenic and antimony are formed, which may make it impossible to extract the gold and silver values by cyanide solutions. On such ores, bromo-cyanide has usually a better effect than with simple cyanide solutions. An extraction of 6% to 7% greater is often possible where the bromine is used.

THE duty of a pound of nitro-powder depends entirely upon the manner in which it is used and upon the character of rock to be broken. An experienced miner who understands placing his holes will break more rock with a given amount of powder than he whose holes are pointed more for convenience in drilling than for the purpose of breaking rock. An expert will rarely overload his hole, while the inexperienced man almost invariably does. A hole that is overloaded will often blow off the collar and leave a large amount of the hole in solid rock. The inexperienced miner argues that he did not use enough powder and the next time uses more instead of less powder.

MAGNETISM is a property possessed by several minerals. The most important are iron, josephinite (a natural alloy of nickel and platinum), some platinum (slightly magnetic), magnetite, pyrrhotite, and in far less degree a number of other minerals. A German scientist—Plœcker—determined the relative magnetic attraction of a number of minerals, taking iron as 100,000. He found that magnetite was 40,227; hematite, crystallized, 533; massive, 134; limonite, 71; pyrite, 150. Many minerals only slightly magnetic become noticeably so on being subjected to high heat. On this property is based the success attending the use of the electro-magnetic separator in concentration of zinc and other ores.

WHERE rock is much decomposed—so much so that it cannot be drilled without much trouble from caving of loose ground into the hole—the ground may sometimes be successfully drilled by means of a bit auger. The bit is made like what is sometimes called a "swallow tail," one point being turned slightly to the right, the other to the left. The bit can be placed in an improvised brace similar to that used by carpenters, but more simple in design, being merely a rod of steel bent at right angles so as to form a crank. It is well to place a wooden handle on the crank before making the bends, as this will greatly facilitate the operation of the auger. When rock is so soft it cannot be bored by a device of this kind, it can be removed by picking and shoveling. Low nitro powder or black powder is strong enough for ground that requires to be bored with augers.

FLUX is material added to an ore charge to cause it to smelt readily, freeing the metal present. Quartz alone is practically infusible at a temperature which will melt all of the minerals with which it is associated. The quartz is acid, and a basic flux is required. In assay charges the addition of the basic flux sodium carbonate forms a suitable combination and the two substances fuse, forming silicate of soda, and gold will separate and unite with the particles of molten lead derived from the reduction of the litharge, which has also been added to the charge for this purpose.

AT copper smelters 20 pounds of copper in ore or matte is called a unit or 1% of the ore or matte by weight. The gross value of a unit is 20 pounds times the market price 1 pound of the metal. Thus, a 20% ore contains 20 units or 400 pounds of copper in 1 ton of 2000 pounds. With copper at 15 cents per pound, a unit is worth $3 and the ore is worth $60 per ton. This is gross or assay value, from which the smelters deduct the costs of shipment of the metal to New York, and also refining charges. In Arizona these charges generally amount to 3½ to 4 cents per pound in addition to smelting charges and deductions for moisture in the ore, and a small percentage sometimes deducted for mechanical losses in the slag.

AIR COMPRESSORS should be so arranged that the air taken into the compressing cylinders should have as low a temperature as possible, and a liberal supply of cold water should be run through the jackets. When air is compressed its temperature rises. If it were not for that fact the efficiency of compressors would be nearly 100%, but the air becomes heated, expands and exerts a certain amount of back pressure. As soon as the air leaves the compressor, passing to the receiver and pipe line, the temperature is lowered and a corresponding decrease in pressure takes place. If the air can conveniently be reheated near the point of use it will be again expanded with increase of pressure and corresponding increased efficiency.

THE "Stark process" is in successful operation in South Africa, on the Rand. The process, if it can be called such, consists in simply pumping water onto old dumps of cyanided tailings. These dumps are theoretically considered to contain all the essential elements to successful treatment. At first the amount of gold recovered was small, but the amount increased in time until now it constitutes a very substantial sum. The solutions as they come from the dump are run onto old mine cables and other scrap iron, when precipitation results. The entire process is apparently suggested by the leaching of dumps of copper ore. So successful have these attempts in this direction been that a floor is now prepared for the tailings by running a quantity of slimes into the tailings pond, as an impervious floor is an essential feature of the successful operation of the process. A similar scheme was adopted at a Mexican mine several months ago.

IN West Australian milling practice it has been found that the limit of economy in breaking rock for stamping in the various types of breakers has been reached when the pieces will pass a 2½-inch ring. In the batteries a 15-mesh screen is found to give the maximum economic result. The subsequent grinding in pans completes the communition of the ore, and this is arranged so as to produce an almost uniform product by regulating speed of the muller. At the upper rim of the pan is an outlet overflow. When run at a high speed—sixty revolutions per minute—the pan will produce several grades or sizes, but at slow speed—twelve or fifteen revolutions per minute—a stated size only is produced, which being comparatively fine rises, being forced to the surface by the sinking toward the bottom of the coarser material, the fine overflowing, the coarser in time being ground and rising to flow away. By this arrangement few slimes are produced and the desired size of particles can be obtained. The tube mill is employed when slimes are desired.

THE cost of putting down deep holes (15 to 20 feet) with churn drill must depend somewhat on the character of rock drilled, upon the drill itself and upon the industry of the men employed in the work. Three men should drill a 15 to 18-foot hole in one shift of ten hours. Their wages would be probably $2.50 to $3 each, or $7.50 to $9 for an 18-foot hole. In hard rock the progress would not be so fast, and in very hard rock proportionally less. If three holes can be drilled 18 feet deep on a suitable bench or in the side of an open cut, the holes 20 feet apart, and with a "burden" of 12 to 15 feet on the holes, after "springing" or chambering, these holes should break 800 to 1000 tons of rock, and under favorable conditions more. The cost for drilling alone under average conditions would be from 3 to 5 cents per ton of rock broken. A good drill for this kind of work is made by welding 1¼-inch drill steel onto each end of a 1½-inch pipe. The bit at one end should be a little smaller than at the other in order that the drill when reversed may "follow" readily in the hole already drilled. Novices at the work cannot be expected to operate a "jumper" or churn drill as well as those who are experienced, but it is easily learned.

Discovery and Development of the Homestake Mines of South Dakota.

NUMBER III.

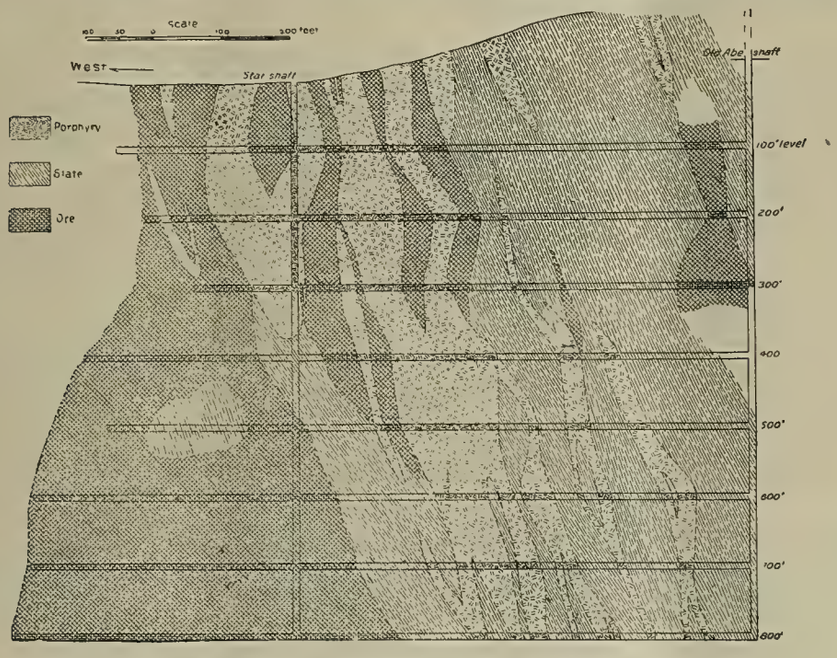
Written for the MINING AND SCIENTIFIC PRESS.

The methods of carrying on the work of mining in former days left many blocks of ore in the backs of stopes, which became too dangerous to work farther, and in some instances considerable amounts of ore were involved in caves which occurred. The management has introduced new systems of mining throughout in new ground, each method being particularly adapted to the physical conditions obtaining at that place. Robbing these old workings and recovering ore lost in caves has also become a feature of mining operations in these mines. Often under the old system mining was discontinued in a stope where the conditions became in any way disadvantageous. In each of these several cases the ore is now being recovered—not because there is a shortage of ore, but because it is not considered good business to leave ore in the mine which is accessible and which may still be extracted at a profit.

Where it is determined to recover ore from a cave or the back of an old stope which it was found unsafe to further attempt to mine, the ore is approached from a level below, a raise of two compartments being put up, timbered by square sets. At the top a substantial bulkhead is built to protect the workmen. A grizzly is put in on the floor of the set next below the top, consisting of several pieces of timber 12x12 inches and spaced 12 inches apart. These timbers are faced with old boiler plate to render them durable. The ore which it is desired to secure has usually settled on a filling of waste. A run is started by working into the broken mass with bars, or blasting with moderate amounts of powder. Often the run once started, as in the case of some of the open cuts, the broken ore continues to come as fast as it is drawn off into the cars from the chute at the foot of the raise, until it has either all been drawn out or the slope angle will not permit it to run farther. Occasionally after a brief run a large excavation is discovered, in the roof and walls of which the ore is still solid. This ore is then stoped in the usual manner, the precaution being first taken to fill the open stope with waste. Sometimes a run of ore is followed by a run of waste. This latter is sent below to fill a stope on some lower level. Later waste may be again followed by ore for a time where the ore, which is in most cases readily distinguished by its appearance from waste, is sent to the mill. Many thousands of tons of ore have been recovered in the manner above described.

In the Terra mine stoping without timbers was carried on for a long time. The method is applicable to veins of clean ore having hard walls and standing at an angle above 40°. A crosscut was run from the nearest shaft across the formation to the ore body and entirely across it. The method of attack is variable. In some instances a drift was run in the foot wall parallel with the ore body and about 50 feet from it, and the stope opened from the crosscut. At intervals of about 30 feet the drift was connected with the stope by short crosscuts All the rock broken on the first floor, about 7 to 8 feet high, was shoveled into cars and removed. Mining upward continued and only sufficient ore was drawn off through the crosscuts run from the main drift to give the miners room to reach the back. As the work progressed upward raises were carried up to allow access to the stope. Stoping was carried up as close to the next level above as was considered safe, and the excavation already made was now practically filled with broken ore, only enough having been drawn off as work proceeded to make room. As 13 cubic feet of ore in place fills 20 cubic feet when broken, about 40% of the ore broken had been removed, the remaining 60% being ready for removal to the mills. By this method a large tonnage of broken ore was always on hand in the event of a temporary suspension of mining operations. The stopes thus worked were from 30 to 50 feet in width. The ore remaining between the back of the stope and the level above was recovered later by caving.

The most interesting feature of modern mining methods at the Homestake is the extraction of large ore bodies, no matter at what angle they may lie, with a minimum amount of timber and contemporaneous filling. There are several methods in vogue, which vary somewhat with the existing conditions. In the early days of underground mining on this belt the square set was introduced, but the mistake was made of trusting the timber supports to keep up the tremendous weight of the ground. Outside of some massive limestones and tuffs in dry regions, there is, perhaps, no better standing ground for large masses of rock than that at the Homestake; but even this has its limits of self-support, and when stopes are carried with such great dimensions as were attempted there, collapse is eventually inevitable, and such proved to be the case in these mines. Stopes more than 100 feet in width, 150 to 200 feet long and 80 to 100 feet high, with no support to the roof and hanging wall other than the timbers of the square set, caved in several of the mines. In some, if not all, of these cases the disaster might have been averted by running down into the stopes the waste rock of the porphyry cap which was in most instances available. At the Deadwood mine, north of the Terra, thousands of tons of this rock were removed and trammed to one side, to strip the ore body beneath, in order that it might be mined by the open cut method.



Cross Section of Homestake Ore Bodies Through Old Abe Shaft.

The accompanying sketch, taken from "Contributions to the Geology of the Northern Black Hills of South Dakota," United States Geological Survey, shows the immense size of some of the ore bodies in the Homestake mine. On the 800 level the main ore body is over 400 feet wide and below that level is in places over 500 feet in width. Mining men acquainted with large veins, where the square-set method of timbering is followed, realize what an enormous amount of timber is required to support these great stopes. Where sets are placed with the posts in the form of a square, with 6 feet from center to center and 7½ feet high, and 12x12 timbers are used, the average amount of timber in each set, exclusive of the sills, sprags and blocking (which are always as necessary as the main members of the set), is about 275 feet board measure, or about 14 feet for each ton of ore extracted from the space which this set fills. With timbers at $20 per thousand, this means a first cost of 14 cents per ton of ore for the timber as it arrives at the mine. To this must be added the expense of framing, handling, and setting up in the mine, which increases the expense to 25 or 30 cents per ton of ore. A stope 100 feet square and 100 feet high would require, if timbered by square set system, after the manner above suggested, about 1,000,000 feet of timber which, to place in the mine, would cost, at 25 cents per ton of ore removed, about $20,000. If timbers of larger dimensions are used the cost increases rapidly.

It was this tremendous expense for timbers which stimulated the Homestake management and engineers to devise a method by means of which these large ore bodies could be safely extracted without loss and with a minimum expense for timbers. The result of the efforts in this direction was the introduction of an entirely new method of ore extraction and support to the stopes.

In one new system the main crosscut is driven from the nearest shaft to and entirely across the lode to the foot wall. A heading is then run along the foot wall, about 25 feet in width, and from this heading stopes are opened, 60 feet wide, with blocks of ore 60 feet wide intervening. Sills are laid in these stopes from foot toward the hanging wall, being advanced as fast as the work proceeds. On the sills the square sets are placed in the usual manner, and when stoping and timbering have advanced far enough, waste is run into the stope from some point above and the stope filled. As the work of ore extraction and timbering proceeds toward the hanging wall the filling is introduced into that portion of the stope adjoining the foot wall, following the stoping toward the hanging, the gangways being protected by heavy lagging. When a stope is completed from foot to hanging the pillar left on either side may be removed in like manner, the waste in the stope previously extracted being prevented from running into the new stope by lagging placed in the sides of the old stope timbers.

This system, although a marked improvement on former methods, and one which gave increased safety in mining, and also permitted the recovery of all the ore without undue risk, still required a vast amount of timber in its operation, and the management decided that further experimenting in the direction of economy was advisable. Accordingly various expedients were suggested and tried, resulting in the adoption of methods which are quite as safe as that above described while requiring only a small amount of timber as compared with the former methods. This new method was named the Homestake system, and is applicable to large stopes where the ground is fairly good, everywhere.

(TO BE CONTINUED.)

The Rational Design of Head Frames.

TO THE EDITOR:—Referring to Mr. Binckley's reply to my own communication published by you on June 17th, I desire to add a few words to elucidate two points raised in his letter.

Mr. Binckley states that, in the head frame designed by me for the Wildman mine, the dimensions of steel in the front column is apparently the same as in the main brace, an impression presumably caused by the small scale of the drawing. The main braces are made of two 15-inch I beams, and the counter-braces of two 12-inch channels, their object being solely to steady the former, as explained further on, and to act as anchors in case of overwinding.

It is true that the sheave bearings are bolted on to one side of uprights resting on a cross piece directly supported by the main braces, at their center, the bolts being figured out to stand in shearing the resulting strain of the cable tensions. The consequence of this arrangement was the possibility of laying a cap across the top of the main braces and above the sheaves, which was considered desirable in order to rig up an overhead traveler for handling them. There is no question, moreover, but that, when the center of the sheaves can be set as Mr. Binckley recommends it, in the middle plane of the braces, they are in a geometrically correct position for making up the strain diagrams; but in the Wildman frame the resultant of rope tensions is actually, if not singly, taken up by the main braces, just as in a Cornish pump, the thrust on the plungers is taken up by the main rod, or like the weight of a line shaft, is transmitted to a post by means of the supporting bracket; there is only, besides the longitudinal thrust on the main braces, a transverse strain which does not exist in the geometrical arrangement, and which is taken care of by the counter-braces.

I fully agree to the fact that Mr. Binckley's former article of 1899, like the subsequent one, made the principle involved so plain that any one could have made up such a design without difficulty. It was in the early summer of 1898 that John Ross, Jr., the manager of the Wildman Co., took up with the writer the question of the projected installations at their Emerson shaft, including not only the head frame, but also the annexed crushing plant and mill buildings. There was no intention of rushing the completion of definite plans, and the main lines subsequently followed up for the head gear had been agreed upon with a number of other points months before the final drawings were made.

I would say, in concluding what is not a controversy, that at no time did I have any desire of depriving Mr. Binckley of the deserved credit attached to his able treatment of this subject; no question is raised as to who first called the attention of your readers to that type of head frame. Mr. Binckley did it on two occasions at least, whereas I never con-

tributed a line to the matter, the cut of the Wildman frame appearing in an article from the pen of John Ross. I simply happened to submit a design involving a distribution of strains which I did not at that time consider a personal conception, but which I knew to be rational, and it is to be hoped for the sake of sound engineering that the present tendency towards deep mining, and consequently substantial head gears, will lead to the general adoption of frames designed upon the lines rightly advocated in Mr. Binckley's articles. A. E. CHODZKO.

The Treatment of Refractory Auriferous Sulphides at the Cassilis Mine, Victoria, Australia.*

NUMBER II.—CONCLUDED.

Written by FRANCIS B. STEPHENS.

With the adoption of classifiers no occasion was found for use of Raff wheels, which were thrown out. At the end of the tables an inner sliding box was arranged in the usual concentrates box for the purpose of catching the galena concentrates. These concentrates contained a quantity of arsenical pyrites, and were daily reconcentrated on a separate table reserved for this purpose, and three products were made.

Of these the heads, containing 40% of lead, went to the grinding pans; the middlings, containing 15% to 20% of lead, 15% to 20% of arsenic, and eight ounces of gold per ton, were shipped direct to the smelter; and the thirds went back to the ordinary concentrates for chlorination. Smelters, by the way, paid for gold, silver, and lead, but deducted 1s per unit for arsenic. The galena headings were ground in a Berdan pan with mercury and a little cyanide for a period of twelve hours or less, and the ground pulp when removed from the pans was stirred in a tub and allowed to settle, when the top sludge was removed, put into jute bags to drain, and shipped to smelters.

Settlings at the bottom of the tub, after removal of the bulk of the mercury and amalgam, were returned to the next charge, and in this way the mercury loss was kept at a minimum, averaging for all operations at the mill from .75 to 1.05 ounce per ton crushed. The lead sludge from the grinding carried about 15 ounces gold, 40% lead and 10% arsenic when shipped, the gold value before grinding being sometimes as high as 60 ounces. The stamps were run at 96–100 drops per minute with a 6–7-inch drop.

Any more elaborate system of concentration would not, under the peculiar circumstances, have proved commercially advantageous. When the plant was run without hydraulic classifiers great losses of concentrates took place, to test which a trial of ore running 28 dwts. was made.

The stream of pulp was divided, one-half being concentrated without previous classification and the remainder being run through classifiers first, with the result that tailings in the former case went 7 dwts. and in the latter case 3 dwts. The capacity of the tables was increased fully 25% by the use of classifiers.

The sands freed from concentrates by magnetic concentration proved barren, so that this was an ideal ore for a complete system of classification.

In due course the canvas slime tables were abandoned, as the values saved did not pay for the labor, and the slimes were settled in a series of terraced dams which assayed as follows:

Top dam	4.5	dwts.	of gold	per ton
Middle dam	4.5	"	"	"
Bottom dam	5.0	"	"	"
Overflow	12.0	"	"	"

The amount of solids overflowing amounted to only 1% of the amount crushed. No attempt was made to treat the slimes separately, as the quantity accumulated was not sufficient to warrant the addition to plant.

CHLORINATION TREATMENT.—As it was usual to make from 15% to 20% of concentrates running from three to four ounces of gold and containing over 50% of the total gold value of the ore crushed, the chlorination work had to be run as cheaply as possible. The following is the analysis of a sample of concentrates, including galena, and representing the average over a week, although the variation was very great for all the constituents:

	Per Cent.
Lead	4.48
Zinc	5.26
Iron	31.56
Arsenic	15.16
Sulphur	31.53
Unestimated	11.91
Total	100.00

The writer in taking charge found that the short hand-rabbled reverberatories were quite unsuited for the work, on account of the concentrates fusing too easily. As the galena could not all be separated, some form of mechanical furnace was absolutely necessary. Chlorine solutions generated from bleaching powder and sulphuric acid were used in 10-ton open wooden vats, and after comparative trials against gas this method was retained as offering many advantages, being actually cheaper for this ore, while the extractions were the same for both.

Two Edwards' mechanical furnaces with 60-foot hearths were installed with excellent results. One man per shift of eight hours attended to all the work of two furnaces with a weekly capacity of 30 to 35 tons each. The furnace man charged the hoppers from the battery hoppers, stoked his two furnaces and looked after the engine and dynamo for lighting the works. The fumes were led into a brick flue 300 feet long and 5 feet by 4 feet inside, with a 40-foot iron stack 2½ feet in diameter.

The height of the top of the stack above the hearths of the furnaces was 70 feet, and small dust chambers were built between the ends of the furnaces and the flue. The iron stack did not suffer at all, and it acted as an excellent arsenic condenser. It was necessary to clean the whole length of the flue every three months, about thirty tons of deposit being obtained.

The flue dust for the first 100 feet consisted of partially roasted concentrates and arsenic soot assaying about three ounces of gold per ton, or about the same value as the concentrates roasted. The last 200 feet of flue contained arsenic soot comparatively free from concentrates, and assayed at the rate of 7½ dwts. The arsenic at the base of the iron stack had to be cleared out weekly, and it was a matter of serious consideration what to do with this material in a mountainous rocky district.

Finally it was buried with the residues of the chlorination works. All attempts to rework the rich flue dust with the raw concentrates for reroasting failed, as the extractions fell off so greatly, so this material was placed in heaps to weather and afterwards roasted and treated by itself.

Just before the finish of the roast 1% to 1½% of salt was added to the ordinary concentrates in order to obtain a sweet roast. No evidence of loss of gold by volatilization could be obtained, although on one occasion, when roasting some concentrates containing a heavy amount of orpiment, the teeth of the last rabble were coated $\frac{1}{16}$ inch deep with crystalline gold. Similar occurrences have been noted at Kalgoorlie, I believe, but I have heard of no explanation why white-hot cast iron should have gold deposited on it, nor can I suggest one.

The roasted ore was discharged into a push conveyor carrying the ore to a steel bucket elevator, which took it to a cooling bin over the treatment vats. Dry wood was used as fuel; any green sticks getting in generally had the effect of throwing back the charge to magnetic oxide. Badly roasted ore set hard in the vats, while well roasted ore did not. The ore in the hand-rabbled furnaces always roasted black, while in the mechanical furnaces it roasted cocoa color, but never bright red. The brighter the color obtained on roasting the better the roast, although a magnet failed to show any difference. Practically no zinc was sent into the flue, the heat not being high enough, being mostly in the roasted ore as sulphate or basic sulphate.

During treatment the zinc was almost all leached out of the vats by the sulphuric acid, but the amount of zinc seemed to have no influence on the extractions other than to prolong the extraction period, owing to the sand in the vats packing as the zinc leached out. Vats holding ten tons and made of 3-inch Kauri pine staves were used.

An ordinary graded pebble and sand bottom was used, and was replaced when it showed signs of clogging. Strange as it may seem, the filter bottom and the lead solution pipes used to get clogged with magnesium sulphate, but a little hot water free from sulphuric acid soon cleared this out. The chlorine solutions run on had a strength of .09% to 1.2% of chlorine and from 0.5% to 1% of sulphuric acid over and above the quantity required to combine with the bleaching powder. In this way many deleterious compounds were leached out or rendered harmless, most of the copper present being leached out in the first solution, leaving the ore in a good condition for the next solution.

The first solution usually had all its chlorine used up, but on well-roasted ore the solution ran off showing chlorine freely. The solutions were not allowed to remain long in contact with the ore, as otherwise the chlorine became used up and the gold already dissolved was precipitated in the vat. Solutions were run on for six days, or till the off-flowing solutions failed to react well for gold. The solutions were allowed to settle in an intermediate vat before precipitation.

This vat was fitted with plugs every 6 inches for drawing off small portions for assay, and an extra check on the amount of gold due at the cleanup was obtained. Ferrous sulphate was used as a precipitant, and was made from old battery screens. A considerable amount of basic iron sulphate, etc., settled in the precipitating vats and at cleanup time was taken into solution with the sulphuric acid. Copper gave very little trouble, but it seldom went over 1% or 2% in the concentrates. Owing to the use of such weak solutions, not much chlorine passed into the atmosphere. Less chlorine was consumed than if dry gas had been used on this ore.

An extraction of about 85% was obtained on well-roasted ore, the loss amounting to 1 to 2 dwts. per ton crushed. Shipping to the smelters and treatment charges amounted to £6 per ton, while our costs, plus the value of gold left in, did not amount to half that. The drawback to the use of 10-ton vats was the fact that a little carelessness on the part of a furnaceman spoilt the extraction of a whole vat. The ore at the furnace discharge was tested every five or ten minutes, and none but very reliable men could be employed on this work.

Numerous experiments were carried out to try and better the extractions, but with no success, although they led to a steady decrease in the cost of chemicals. Fine grinding after roasting gave no better results. Dry gas gave the same extractions as chlorine solutions, but the method was more expensive and decidedly more troublesome to work. The cream-colored mud which settled in the intermediate solution vats before precipitation was of a very complex nature, consisting largely of basic sulphate of iron and up to 20% of manganese and arsenic.

On treating this mud with sulphuric acid it all went into solution and left a small amount of black residue behind. This residue turned out to be gold, but was quite insoluble in chlorine water or cyanide, even on long standing. Doubtless this was due to the chemical condition of the gold precipitated in the treatment vat if solutions were allowed to stand long in contact with the roasted ores, as no lengthening of the time of treatment on a vat of this description would give a good extraction.

To test this a solution of gold chloride was poured on a sample of well-roasted ore and allowed to stand all night. In the morning all the gold was precipitated, and could not be redissolved by chlorine water, and yet this same ore gave good extractions if the first solutions were run off quickly. At one time solutions were only run on on two shifts, but after the above facts were proved three shifts were started with very beneficial results. What the chemical condition of this precipitated gold was the writer is unable to state, as sufficient was never collected to determine this.

TREATMENT OF TAILINGS.—Cyanide works were erected for the treatment of accumulated tailings; but these leached very badly, owing to the large percentage of talc and mica scales and the nature of the slimes. The slimes running high in concentrates settled in large quantities with the coarse sands in spite of the dams being kept narrow—most of the tailings were made before the introduction of classifiers—and these slimes percolated very badly and gave a poor extraction even with agitation.

The sands could be separated in layers like leather and had exactly the appearance of mica slates. A trial was made of direct filling from the mill, using a Butters' distributor, but with very unsatisfactory results, owing to the amount of high-value slimes that had to be run away to get a leachable product. The following analysis of a vat settled in this manner shows how unsuited these tailings were for a direct leaching process:

Retained by 40-mesh, 14.4% at 4.00 dwts. per ton.
" " 60-mesh, 20.7% at 2.75 dwts. per ton.
" " 80-mesh, 9.1% at 2.00 dwts. per ton.
" " 100-mesh, 20.7% at 2.25 dwts. per ton.
Passed 100-mesh, 35.1% at 6.25 dwts. per ton.

Consequently a great amount of preparatory work in the way of drying and mixing had to be done in the dams to get a product that would leach. An ordinary agricultural scorifier and an earth scoop were used for this work, which could only be carried on in dry weather.

The sands, after filling, were water-washed for eight to twelve hours to remove magnesium sulphate, which was present in large quantities. The wash water coming off showed no free sulphuric acid and not a trace of iron salts. Considering the large quantity of iron and arsenical pyrites in the tailings, this was at least remarkable, and that the pyrites had oxidized was shown by the large amount of magnesium sulphate. About seventy pounds of caustic soda was used on a 90-ton vat and the cyanide solutions were made up to .25% of KCy.

Caustic soda, unfortunately, dissolved arsenic compounds readily, especially orpiment and hydrated arseniate of iron, which were present in considerable amount, and the solutions entering the zinc boxes carried .5% of arsenic, causing a heavy consumption of zinc.

To obviate this difficulty, solutions were not allowed to remain in contact with the sands and matters improved very much.

Solutions which ran off quite clear on standing became quite milky with magnesia hydrate, and this precipitate settled thickly on the zinc and spoiled its efficiency. Extractions ranged between 60% and 65% and the consumption of cyanide kept at the moderate amount of seventy-five pounds. A treatment of seventy-two hours was given, but a longer treatment gave no better extractions. The use of an oxidizing agent in experiments increased the extractions 10%. The water supply destroyed permanganate readily; organic matter in the water may have accounted for this, as the water came from peat bogs. If the ore were leached with distilled water, a heavy consumption of permanganate followed on the magnesium sulphate, which seems rather strange.

ASSAYING CYANIDE SOLUTIONS.—The following method of assaying cyanide solutions was worked out by our assayer, A. M. Henderson, and used with success: The solutions to be assayed are electrolyzed for a period of four hours, the gold being precipitated on a cathode of lead foil, the anode consisting of a wrought iron rod. The formation of Prussian blue on the anode is prevented by the addition of an excess of ammonia, and the necessary circulation of

*Trans. Inst. Min. and Met.

the solution is caused by the liberated gas bubbles and the peculiar shape of the cathode.

The precipitation of gold is very complete. On solutions assaying 10 to 15 dwts. of gold per ton and containing .03% to .25% of cyanide the value is reduced to below 3 grs. in four hours with the necessary current density. As compared with evaporation, the results are more consistent. In practice 10 assay tons—212 c.c.—of solution are taken in a tall beaker and 12 to 15 c.c. of strong ammonia added.

The lead cathode consists of a cylinder of lead foil 2½ inches high and 1 inch in diameter, with three V-shaped notches cut in the lower rim, a lead strip being attached at the top with which to make connection. The lead foil cylinder should be covered to a depth of about ½ inch, and a 6-inch nail is used as an anode. The disengaged gas bubbles cause an upward current in the solution inside the cylinder and down round the outside and through the V notches in the bottom.

It is usual to make from fourteen to twenty assays at one time, all joined in series between the terminals of 110-volt lighting mains. With twenty assays in series no extra resistance is necessary, but with a lesser number than fourteen incandescent lamps are inserted.

The current used is from .06 to 1.2 ampere, the fouler the solution the higher the current density that can be safely used. The gold comes down as a bright yellow deposit, and when precipitation is complete the cathode is washed in water, dried, rolled up, scorified with the addition of some test lead, and cupelled.

COSTS.—The following table shows the mining, milling, chlorinating, cyaniding and smelting costs, on a weekly output of 270 tons milled and mined, 54 tons of concentrates chlorinated, 300 tons of tailings cyanided from the dams, and 4 tons of galena shipped for smelting:

Mining—Average cost of mining, developing, and transporting 1 ton of ore, 15s. 3d.

Milling—Tons crushed 270, wages 2s. 2.2d., fuel 11.2d., stores 6.6d., general charges 1s. 1.8d., cost per ton crushed 4s. 10.8d.

Roasting—Tons roasted 54, wages 3s. 11.3d., fuel 4s. 5.3d., repairs 2d., general charges 1s. 10.3d—cost per ton roasted 10s. 4.9d.

Chlorinating—Tons treated 54, wages 2s. 9.5d., chemicals 4s. 10.2d., general charges 1s. 7.3d—cost per ton treated 9s. 3d.

Cyaniding—Tons treated 300, wages 1s. 9.8d., chemicals, etc. 10d., fuel 4.2d.—cost per ton treated 3s.

SUMMARY.

	Per Ton Crushed. £.	s.	d.
Mining, developing and transporting	0	15	3.0
Milling and concentrating	0	4	10.8
Chlorinating and roasting	0	3	11.2
Cyaniding	0	3	0.0
Shipment and smelting charges	0	1	9.0
Total costs	£1	8	10.0

These costs do not include directors' fees and Melbourne office expenses. Owing to heavy freight charges the following costs are high:

Bleaching powder (27% to 30% available chlorine) cost £18 per ton.

Chamber sulphuric acid cost £11 per ton.

Engine wood cost 14s. per cord of 125 cubic feet.

Furnace wood cost 16s. per cord of 125 cubic feet.

Explosives cost as follows:

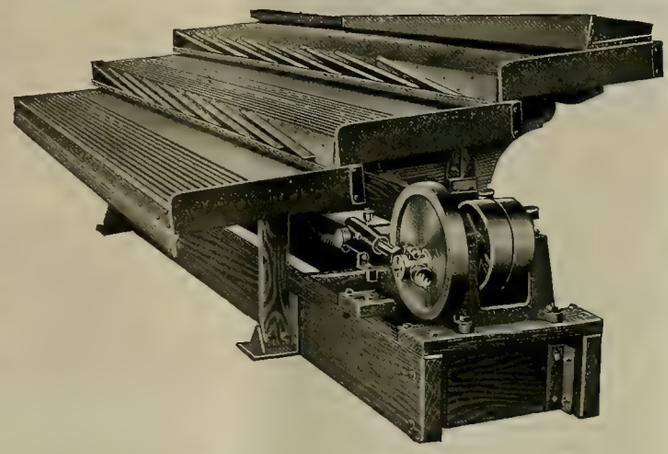
	Per Case on Mine. £.	s.	d.
Gelignite	3	2	6
Gelatine dynamite	3	12	6
Blasting gelatine	4	2	6

The cost of erecting this plant, including office buildings, housings, etc., but exclusive of cost of air compressor, was about £20,000, and was all paid for out of the profits as the work proceeded, showing that excellent profits could be made by ordinary milling methods, from what had been considered by many to be only a smelting proposition.

NOTE.—The chlorination process, as practiced at the Cassilis Company's works, and which is referred to by the writer above, is as follows: "The chlorination plant consists of seven circular treatment tanks, 12 feet in diameter and 3 feet 6 inches deep, above the filter floor; four precipitating tanks, each 8 feet diameter and 4 feet depth; two storage tanks, each 5x4 feet. The chlorine is generated by the action of sulphuric acid on bleaching powder. At these works 220 pounds of chloride of lime (bleaching powder) are dissolved in 8 tons of water, and a solution of 1% sulphuric acid is prepared. These two solutions are run upon the ore simultaneously through a V-pipe, which is connected with the solution tanks. The strength of the chlorine solution thus formed is about 0.15%. The time of leaching is about seven days, generally. The chlorine solution, after passing through the charge of ore, is run to two settling tanks, from which the solution, after being allowed to settle, is drawn off into precipitating tanks, in which the gold is precipitated by means of an acid solution of ferrous sulphate. This is made at the works by treating iron in a boiler with sulphuric acid. The ferrous sulphate solution is poured into the precipitating vat by the bucketful, until it is found to be in excess by testing with gold chloride. After thoroughly stirring, the precipitate is allowed to settle for 48 hours, when the clear liquor is drawn off by means of a rubber hose connected at one end with a pipe, which passes into the tank 3 inches above its bottom, and at the other end to a dish which floats on the surface of the liquid. By this ingenious means all of the liquor can be drawn off without disturbing the precipitate on the bottom of the tank. When it has run down to the level of the pipe, the vat is tilted slightly and the remaining liquor with the gold removed by means of buckets into small tubs. Here it is again allowed to settle and the clear liquid drawn off. The precipitate is then digested in sulphuric acid, washed, removed to a filter and allowed to drain, and is finally washed into an iron pot. When dry, the precipitate is heated to redness and niter added, after which it is smelted with borax. The precipitate contains generally from 70% to 80% gold, and the gold runs 980 to 990 fine. It is said the extraction of the gold values from the concentrates is from 85% to 87% of their assay value. This process is a modification of the Muncktell process.

The Bartlett Simplex Concentrator.

Herewith is illustrated the new Bartlett simplex concentrating table now being manufactured by the Colorado Iron Works Co. of Denver, Colo. The building of the old Bartlett table has been discontinued. The simplex is less than one-half the weight, has one-third more capacity and is one-third less in price,



Bartlett Simplex Concentrating Table.

and one-half less power is required than on the old-style Bartlett table. It is set up and vibrates on four broad hickory strips, to give the table resiliency and quick action. Each deck is designed to be an independent concentrator and each can be removed in five minutes by taking out three hinge bolts. Its construction is of the armored wood pattern, containing no mortises or tenons. It is put together with bolts and can be taken apart into pieces which weigh 100 pounds or less.

Each deck is covered with a single piece of solid rubber, riffled, the riffles being molded on when the plate is made at the rubber factory. This special molded rubber top is covered by United States patents, issued Jan. 27, 1903, and others now pending. Each top or deck is provided with thirteen riffles, 1 inch apart, ½ inch high at the feed end, tapering to the extreme discharge end. These riffles are banked on the lower edge of the deck, having a smooth blank space 9 inches wide where the ore discharges. This blank space is intended to allow fine ore and slimes opportunity to settle and stratify. The manufacturers point out that the ore travels faster on the first deck than on the second, and slower on the third than on the second, and claim that, as the concentrates are largely removed on the first deck, less movement is required for the second and third, thus giving the material more time to settle and stratify. The wash water pipes are independent of the table. They discharge into open launders, hence are not easily clogged by dirt in the wash water.

The simplex weighs 900 pounds. Its builders state that it requires only ½ actual H. P. to operate. They also claim that three separate classes of concentrates can be made on the table and that the capacity is very large. It is claimed that this table saves slimes so closely that no after treatment is required. Complete information and literature may be had by addressing the manufacturers.

The First Ingot of Mexican Tin.

Some 200 or 300 years ago the Spaniards worked deposits of float or placer tin at a point about 40 miles from Aguas Calientes, Mexico, says the Engineering News. Last year W. A. Pratt, who has been an assayer at Aguas Calientes for several years, and his associates discovered a tin vein from which the float tin had evidently come. On Feb. 23 of this year an ingot of tin weighing fifty pounds was smelted from the ore of this vein. This ingot is believed to be the first ever cast in Mexico. The vein is said to be about 5 feet wide, containing stringers of tin, and can be traced for a mile. The vein is said to run from 2½% to 4% tin, which compares well with Cornwall ore, most of which runs less than 1%. There is so small an amount of iron (1%) in this vein that the ore can be economically concentrated and smelted. Mr. Pratt has organized the Consolidated Tin Mining & Smelting Co. of Mexico, and he writes us that shaft sinking and tunneling on the vein are now under way. The address of the company is Aguas Calientes, Mexico.

Vertical Shaft Sinking on the Rand.*

In the discussion of the paper by H. F. Roche, on "Vertical Shaft Sinking on the Witwatersrand," in the Journal of the Chemical, Metallurgical and Mining Society of South Africa, an abstract of which appeared herein in the issue of May 6, E. M. Weston said:

There are one or two matters in Mr. Roche's interesting paper I should like to have made clearer. He considers that any advantage buckets or kibbles may have over skips for sinking are far outweighed by the three advantages of greater safety, quicker hauling and better baling facilities claimed for skips. In his opinion they outweigh the time lost in cleaning down 50 or 60 feet of extra shaft timbering after each firing, and of fixing and adjusting the false sets and guides necessary to carry the skips to the bottom of shaft (an operation taking time and care), in lowering and fixing and afterwards taking out and hoisting before fixing again. Nor does he consider that the possibility of swinging the bucket about the shaft to favorable positions for loading, nor the greater immunity of the timbers to damage, does anything like balance the advantages he claims for skips. Would Mr. Roche be kind enough to supplement his paper by giving figures showing actual time of loading, hauling and tipping skip from a given depth and their capacity, as against corresponding figures for buckets at other shafts like the Cinderella Deep and Western shaft of Village Deep. Twenty feet a month is such a serious difference between the two methods, that the question as to whether this would hold true in all shafts and under all conditions cannot be too thoroughly inquired into. Clay may not always be the most suitable material for surrounding the shaft near the surface, as the nature of the ground may call for the more solid support afforded by concrete, masonry, brickwork, or iron tubing. Mr. Roche's reason for preferring 3-inch or 3½-inch machines to smaller machines in shaft sinking is not convincing. In the first place he ignores the fact that the ground to be sunk through may not be hard, and that the long holes may not be suitable owing to the way the ground breaks. I hold, however, that it is a fallacy to believe that small machines, say 2¾-inch diameter, will not bore as quickly in hard ground as big ones will. They will always do so if they are not expected to drive jumpers with bits not suitable to their size. Much trouble has been caused, and small machines often given a poor chance of competing with the larger sizes, by either giving them jumpers too nearly resembling hand steel and capable of boring only short holes, or giving them identical steel to that of big machines to bore a 7-foot hole. With jumpers fitted with bits of a suitable size a 2¾-inch machine should drill 6 to 7 feet deep in the same time as a large machine. Taking the difference of size of bits at ½ inch, though it can often be made ⅝ inch, a set of steel for a big machine to bore about a 7-foot hole would have the following sizes: Short starter, say about 18 inches long, bit 3¼ inch; starter 30 inches long, 3-inch bit; second, 4 feet 6 inches long, 2½-inch bit; long second, a short chisel, 6 feet 6 inches long, 2-inch diameter; chisel of 1¼-inch diameter, octagon steel, 8 feet long, bit 1½ inch to 1¾ inch. The big machine having a "run out" of feed screw of about 2 feet. If a 2¾-inch machine were to be used for sinking it should be provided with a set of jumpers of, say, short starter about 18 inches long, bit 2⅜-inch diameter; long starter 3 feet long, bit 2⅜-inch diameter; second, 4 feet 6 inches long, 2-inch bit; short chisel of 1½ inch, octagon steel, 6 feet long, 1⅝-inch bit; long chisel, 7 feet 6 inches of 1-inch diameter, octagon steel, with 1¼-inch bit. These 2¾-inch machines have only 18 inches run out of feed screw, and so the bits are required to do less boring before being taken out, and can be made of closer gauge than the big machine jumpers which have to bore 24 inches.

It will be seen that the 2¾-inch machine is all the time boring with a bit a size smaller than that of a big machine, and can thus bore as fast in even hard rock. By finishing up with longer chisels of ¼-inch steel, an even longer hole can be bored. I have used them successfully in stoping. The advantage that these machines would have over big machines in sinking would be as follows: A 2¾-inch Ingersoll weighs 180 pounds, as against 280 to 290 pounds of a big machine, and takes up about half as much room in skip or bucket. They are thus very much more quickly handled, lowered, raised, set up and taken down. Nor do they cause so much stress on the bar, arm or clamp. They are more easily and quickly moved for holes and take up so much less room in shaft that, as is often the case, twelve big machines would be objected to at the bottom of a shaft as taking up too much room when lowered; twelve of these machines

*Trans. Jour. Chem. Met. & Min. Soc., S. A.

would cause no trouble at all. They should certainly be able to compete with the usual eight big machines. Their jumpers are much lighter and the weight to be lowered would be about the same in both cases, and being so much more easily handled, should be set up in the same time and bore out the shaft much quicker to a depth of 6 or 7 feet.

This brings us to the question, What is the most economical depth of hole for use in sinking? This must, of course, depend on the hardness of the ground, the way it breaks, whether it sets and cracks much after breaking, and the class of machines available. Other things being equal, long holes are always economical to bore, because it is the pitching and starting of the hole and the boring of the first 2 feet that takes up the greatest proportion of time, so the greater the ratio, the part of the hole that is bored with smaller bits bears to the first 2 feet, the quicker and the more economical the work. I am, however, surprised at the method Mr. Roche says was successful at the Village Deep. To bore 10-foot cut holes, to charge them fully, and yet to be able to break the first 4 feet must be extravagant in explosives, but what, as having had some experience in rock drilling, I cannot understand is that the plan of cleaning out and firing the stumps of the holes was at all successful. I have always found such holes most difficult to clean out and in some ground absolutely impossible. The fine rock will pack and set solid in them and larger pieces wedge themselves in the holes and their radiating cracks, so that it is impossible to blow them out or scrape them out. When cleaned out, such holes are too big to fire with economy, as there is no proper contact between the explosive and the solid ground. In any case, I should think the task of looking for twenty-four old holes and cleaning them out was, apart from the danger, one taking too much time and trouble to be successful. If, however, such long holes can be effectively fired, big machines should have the advantage over smaller ones. I should have thought that the plan of drilling a relieving cut with holes 5 feet long, and then either firing everything together (when the cut should come out clean), or half filling up the long holes, when bored, with clay or sand, and firing the relieving cut and the top halves of the other holes first, and the bottom cut holes and the rest of the other holes after cleaning, would have been much more economical in explosives, and much quicker and easier. I should think, however, that the speediest plan of sinking in any given shaft would be determined by first finding the maximum number of large or small machines that could be worked conveniently in it and decide which to use, when by the experiment the maximum depth of hole was found, that would, while keeping the shaft to its proper dimensions, come, bringing a clean cut with one charging and firing. The trouble of cleaning and firing twice should render a longer hole less effective, while a shorter one would be uneconomical for the reasons already given.

(TO BE CONTINUED.)

Drainage of a Rapid Transit Railroad Under a River.

One important engineering problem in the building of the New York rapid transit subway was the construction of the two tunnels, or tubes, under the Harlem river. These two tubes, through which the subway trains are to run regularly, were constructed on a new engineering principle, having been built of concrete above the ground, and then sunk to the bottom of the river, instead of having been forced through the mud under the river bottom, as had been done in such work heretofore. These twin tubes are 641 feet in length and are 16 feet in diameter, the top of the tunnel being 20 feet below the low water mark. Before the tubes were put in place, the engineering department of the subway contractors devised a system for the drainage of the seepage, or the water percolating through the walls of the tubes, and also in case of emergency arising from the sudden inrush of water in the event of the breaking of a water main. The drainage and pumping system adopted, and the precautions taken to meet the possible conditions, are portrayed herewith.

Fig. 1 shows a sectional view of the tunnel looking southwest, and showing the arrangement of the pumps which are in position in both of the tubes at the junction of the subway and the mouth of the tunnel at Harlem river. The pumps adopted for this service were specially designed and built by the

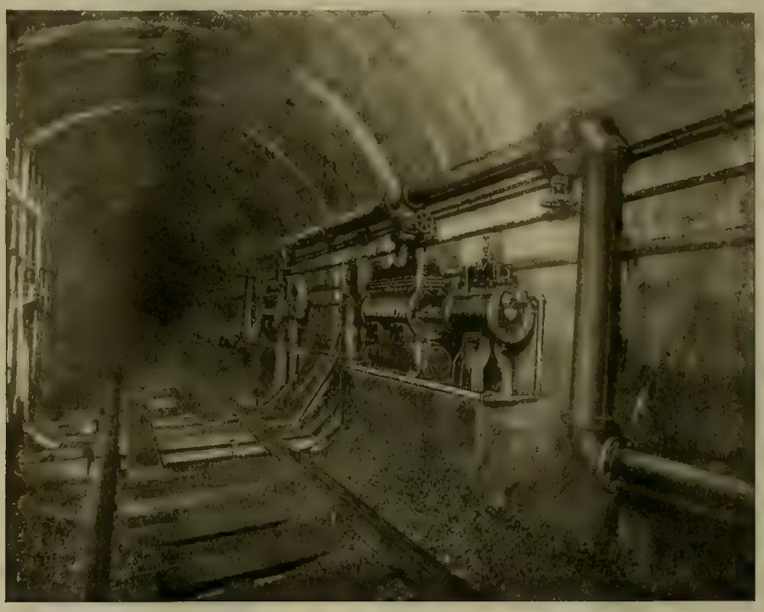


Fig. 2.

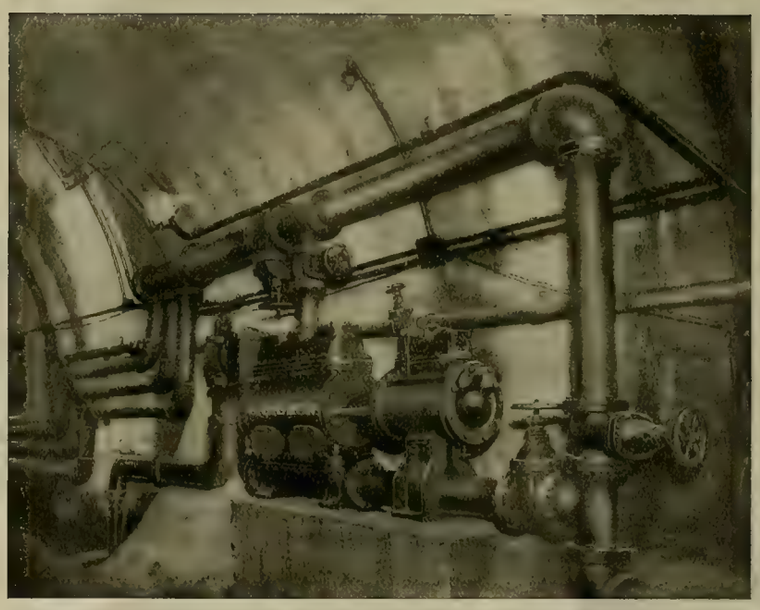


Fig. 3.

A. S. Cameron Steam Pump Works, whose general offices and works are at the foot of East Twenty-third street, New York. A longitudinal arrangement of the piping and connections for the pumps is shown on the right hand side of this illustration.

Fig. 2 shows two of the pumps in position on concrete foundations, with the arrangement of piping and connections. Four of these 12x12x18 pumps were installed, each having separate air lines to the compressor plant, ¾ of a mile away and above ground. The pumps are controlled automatically by separate floats located in the tunnel. The automatic float for one of the pumps is shown in the illustration along the wall on the left hand side. The other pump, in the distance, has its automatic float nearer the floor and attached to the pump. An air reservoir 16 inches in diameter by 36 inches long is arranged in the air pipe line at the throttle of each pump. The suction piping is also shown extending into the sump, the top of which is protected by iron gratings.

Fig. 3 depicts the outside construction of the pumps. The water valves are set in removable valve decks, allowing them to be easily removed with minimum time cost. The suction valves are placed under the water cylinder, and the discharge valves are shown above the water cylinder.

Each of the pumps are separately and independently connected and are also designed with the suction and delivery flanges looking fore and aft, permitting the arrangement of the suction pipes as shown, with the pipes running under the "air end," and the foot under the air end made in two parts, straddling the 6-inch suction pipe, permitting the piping to be readily removed.

Each of these pumps is capable of delivering 600 gallons of water per minute while running at a normal speed, with an air pressure at the throttle of about seventy pounds per square inch, and a total lift of 70 feet.

These pumps have already been severely tested owing to the discovery

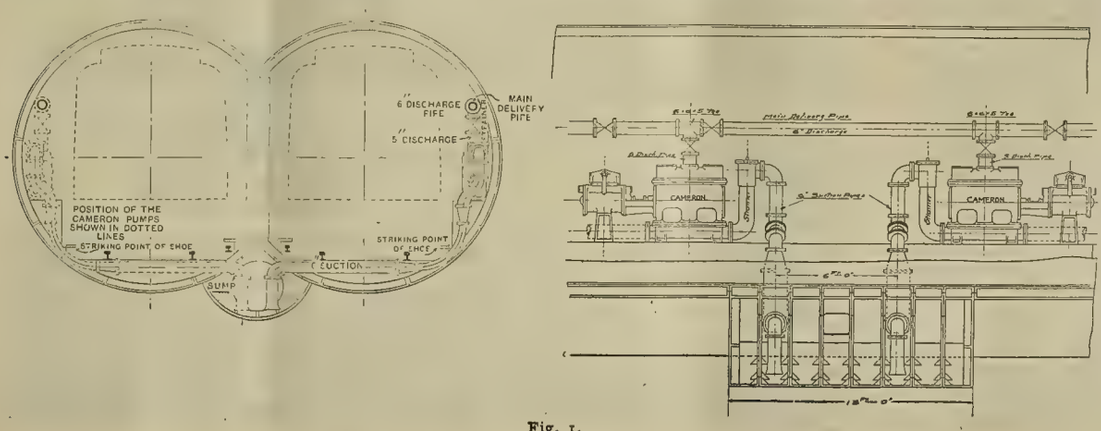


Fig. 1.

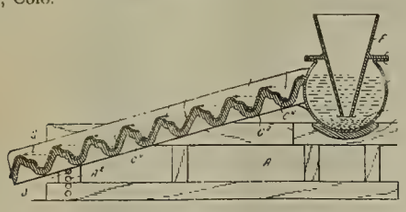
of water in the tunnel some time ago, when temporary piping and connections were hurriedly made and the pumps were pressed into use at short notice, being in operation day and night, and performing good service, the inflow of water being entirely taken care of and causing but a slight interruption in the completion of the work.

Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 20, 1905.

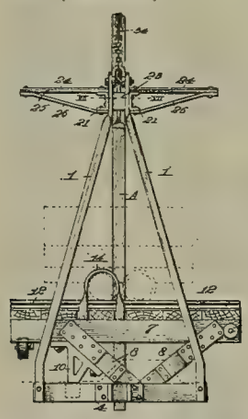
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PLACER MACHINE.—No. 792,111; D. T. Barry, Denver, Colo.



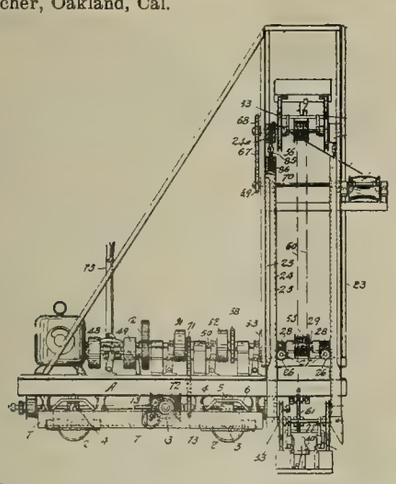
In machine of class described, combination of suitable support having curved seat, receptacle engaging seat, engaging portion being curved to conform to curve of seat, sluice rigidly connected with receptacle at suitable point above bottom, sluice being suitably inclined and having series of valleys and removable amalgamating plates mounted on bottom of sluice and made to conform to shape of bottom, bottom of each valley being comparatively narrow and shaped to form eddy as pulp falls thereinto, each plate being provided with ledge located between top and bottom of valley, and suitable means for supporting sluice whereby inclination may be regulated at will.

MINE CAGE.—No. 792,330; J. Herzler, H. Henninger and W. Fenner, Belleville, Ill.



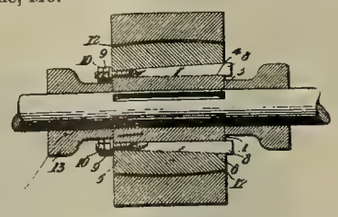
In mine cage, combination of bottom frame, shaft journaled in frame, platform, rockers mounted on shaft, inclined legs secured to rockers and tiltingly supporting platform, chairs secured to platform and to rear of rearmost platform legs and normally resting with lower end on bottom frame, and means for tilting forward end of platform.

EXCAVATING APPARATUS.—No. 792,699; W. H. Fulcher, Oakland, Cal.



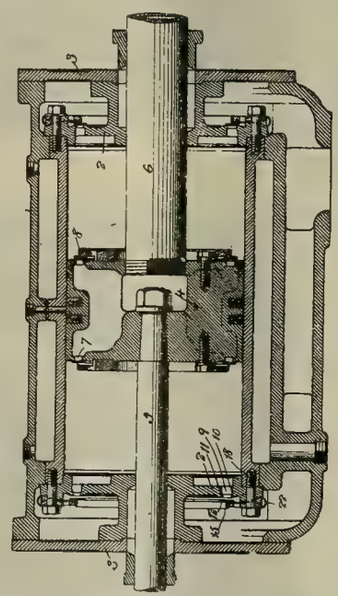
Excavator comprising wheeled or table frame, superposed frame or table mounted thereon, pair of vertical spaced guides at each side one end portion of superposed frame, vertical spuds mounted to slide in guides, means for moving spuds vertically, pulleys journaled near top and bottom of spuds, and endless chain of excavators passing around pulleys in direction at right angles to line of travel of wheeled bearing frame.

CRUSHING ROLL.—No. 792,733; O. H. Schoenherr, Carterville, Mo.



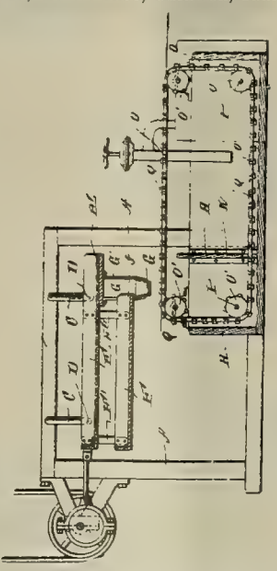
Crushing roll comprising polygonal hub, shell surrounding hub and having its inner face concaved longitudinally, segmental core sections interposed between hub and shell and extending at opposite sides of middle of hub, core sections having flat inner faces fitting respective flat faces of hub and longitudinal convexed outer faces corresponding to longitudinal concaved inner face of shell, each core section capable of radial movement independently of hub and shell, adjacent faces of hub and core sections having open-ended registering keyways, tapered keys driven into keyways and having smaller ends threaded and projected externally of hub, and nuts fitted to threaded ends of keys.

COMPRESSOR.—No. 792,788; W. Prellwitz, Easton, Pa.



Cylinder head having annular passage therethrough, annular valve therefor comprising ring portion and flange, and annular plate secured to head and spaced therefrom, inner wall of plate engaging outer wall of flange, forming guide for valve and limiting outward movement.

APPARATUS FOR SAVING PRECIOUS VALUES IN SOILS.—No. 792,617; B. W. Rice, Caldwell, Idaho.

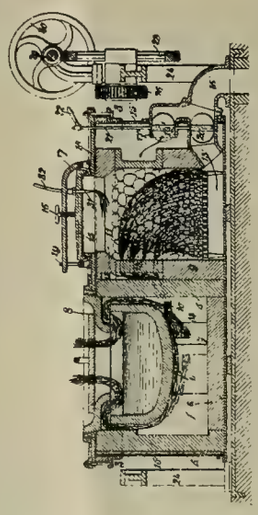


Apparatus for saving metallic values from sand, gravel, etc., comprising shaking screen, trough supported by arms secured to screen, screen box, bars supported by screen and positioned underneath exit end of trough, tank adapted to contain water and oil and positioned underneath screen box, sprocket wheels mounted within and upon upper edge of tank, sprocket chain traveling about wheels, cross pieces secured at intervals to links of chain and projecting laterally from sides of chain and adapted to travel adjacent to bottom of tank its entire length, and gate positioned within tank and underneath which cross pieces upon chain are adapted to travel.

PROCESS OF HARDENING AND TEMPERING COPPER.—No. 792,070; C. R. Plumer, Seattle, Wash.

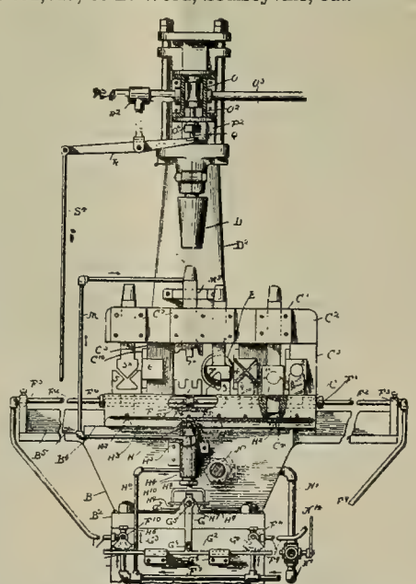
The herein described process of hardening copper or alloys of copper, comprising subjecting copper or alloys of copper to high temperature and while in heated condition subjecting same to action of sulphate of copper (blue vitriol) and pouring metal into molds and forming same into desired shapes and allowing metal to partially cool, and finally subjecting it to the action of sulphur until it is coated with sulphur oil and then allowing metal to harden.

PORTABLE FURNACE FOR MELTING STEEL OR OTHER METALS.—No. 792,619; L. Rousseau, Argenteuil, France.



In portable furnace for melting steel and other metals, combination with combustion chamber of juxtaposed circular chamber, conduits or flues connecting two chambers, supports fixed in second chamber, crucible resting on supports, conduit divided into two branches leading respectively under combustion chamber and into space around chamber, vertical rod crossing two branches, valve in each branch mounted upon vertical rod, two valves being located at right angles to each other, removable cover upon combustion chamber, tube projecting through cover and means for tilting furnace.

MACHINE FOR MAKING AND SHARPENING DRILLS.—No. 792,643; J. B. Word, Soulsbyville, Cal.



Machine of character described comprising base movable anvil on base provided with plurality of tools, means for operating any of tools, motor for shifting anvil, lever for starting and stopping motor, catch on base arranged to normally engage anvil and hold same in stationary position, and connections between lever and catch whereby when lever is moved to start motor catch will be disengaged from anvil, and when lever is moved to stop motor catch will be caused to again engage anvil and lock same in position.

The Commercial Development of Electro-Metallurgy.

Written for the MINING AND SCIENTIFIC PRESS by GEORGE E. WALSH.

The production of metallic carbides in the electric furnace has added greatly to the commercial development of a number of industries. Owing to the very high temperature required to fuse most of the carbides, the electric furnace is practically monopolizing the industry. A good many of the comparatively rare metals are now being utilized in different ways which make them of increasing importance, although before the electric furnace was developed it was impossible to produce such metals as tungsten, ferro-tungsten, molybdenum and vanadium at a cost that would make them commercially profitable. As alloys in manufacturing high-grade self-hardening and high-speed tool steel, tungsten, ferro-tungsten and molybdenum are important factors, and as they come out of the electric furnace in a compact fused mass, they are most advantageously used in the process of adding to the steel.

Calcium carbide can be produced at a temperature of 1500° C., and consequently it can be manufactured in the ordinary regenerative furnace, which produces a temperature ranging from 1500° to 1800° C. The oxy-hydrogen regenerating furnace yields another 200° C., and the possible range of temperature in this furnace is from 1700° to 2000° C. In the ordinary blast furnace, charged with coke and lime, with oxygen instead of air used, calcium carbide has also been produced.

But all the other carbides require the higher temperature of the electric furnace for their manufacture. With its additional temperature of some 1500° C., the electric furnace becomes a most important factor in fusing the carbides. The commercial development of carbides is thus due entirely to the practical adaptation of the electric furnace to industrial purposes. Most of the rare metals, and nearly all of the common ones, form carbides in the electric furnace when sufficient temperature is given.

The most important carbides formed of industrial metals are aluminum, tungsten, boron, molybdenum, silicon, thorium, uranium, calcium, strontium, sodium, barium and potassium. In nearly a dozen or two different industries these carbides have entered, and their employment is gradually revolutionizing manufacturing conditions to a remarkable degree. The carbide of silicon, which is now generally called carborundum, has completely changed our methods of grinding, scouring and polishing in many lines. The extreme hardness and abrasive qualities of this carbide makes its value world-wide, and its manufacture to-day is on such a large scale at Niagara that every industry can afford to use it. Even harder than carborundum is boron carbide, and if it were not for the fact that it costs more to manufacture it than carborundum it might in time displace the latter in many industries just as carborundum has displaced emery.

Calcium carbide, in its employment for the production of acetylene, is known the world over, but both barium and strontium would do equally well as the former for this work, but the more general occurrence of lime and its cheapness gives the calcium carbide the preference. Acetylene has extended its field rapidly, and to-day there are upward of 8000 acetylene installations of all capacities in active operation. More recently it has been utilized for power purposes, especially for driving gas engines. According to the tests made, 5.65 cubic feet of acetylene gas will develop one horse power, while 21.19 cubic feet of coal gas of ordinary quality are required for the same purpose. The small weight of calcium carbide makes it more useful in places where transportation is an item. In a good many mines a portable acetylene generator is used for lighting miners' lamps. Both for illumination and power purposes, the use of acetylene is thus extending, and the manufacture of calcium carbide is assuming proportions that make it of world-wide interest.

In the manufacture of carborundum on a large scale the use of ferro-silicon in the steel industry has been to a considerable extent displaced. Ferro-silicon has been an important factor in the steel trade as an alloy to prevent oxidation. In the casting of iron and steel ferro-silicon acts as a deoxidizer and thus relieves the process of the need of blowholes. Owing to the high heat of combustion, the metal is rendered more fluid for casting. The manufacture of ferro-silicon has extended a good deal in recent years, and several calcium carbide factories that did not prove profitable, owing to the competition, have turned to the production of ferro-silicon. The grade of metal thus produced varies greatly, all the way from 15% to 85%.

Copper silicon is also a good deoxidizer, and it has been used a good deal in copper and brass castings. It also increases the tensile strength of these metals. This is obtained from the electric furnace at a cost so low that it is likely to displace nearly all other alloys in the copper and brass casting factories.

In the manufacture of aluminum in the electric furnace a great impulse has been given to the electrical trade. The substitution of aluminum for copper conductors is one of the most important developments in modern long-distance transmission of electricity. Previous to 1898 aluminum was comparatively little known in the industrial world, but when it was manufactured in solid drawn conductors its use rapidly extended. There are three plants in this country producing aluminum, and six in Europe. The total water power employed for making the aluminum is nearly 40,000 H. P. As an electrical conductor aluminum is in some instances considered cheaper than copper, although not quite so efficient. The first use of aluminum conductors was for railway feeders, but its employment for telegraph and telephone lines is doubtful. For long-distance power transmission it is supplanting copper in many parts of the country. The long-distance lines of the Telluride Power Transmission Co. in Utah, Colorado and Montana use nearly 2000 miles of aluminum conductors, involving transmission distances of over 130 miles. Aluminum is not readily oxidizable, and for this reason its employment as conductors in mines and acid factories is considered important. While mineral acids affect copper conductors, they appear to have no chemical effect upon the aluminum conductors. In one particular there is an exception. Chlorine is detrimental to it, and where conductors are exposed to strong sea air or in the vicinity of chlorine works the disintegration of the metal is very marked.

The chief properties of the carbides which make them of particular industrial importance are their power to decompose water or to withstand oxidation. These properties are proving of great value in manufacturing as new methods are discovered for utilizing them. There are five of the carbides produced by the electrical furnace which are nearly inert or normal so far as the oxidizing action of water or atmosphere on them is concerned. These are boron, silicon, titanium and zirconium. On the other hand, barium, thorium, calcium, lanthanum, uranium and cæsium are strongly acted upon by water. Between these two extremes all the other carbides experimented with lie. In the decomposition of water similar differences are noticed. In the reactions, carbides of calcium, barium and strontium produce acetylene, manganese carbides evolve a mixture of methane and hydrogen; the cerium group produces methane and acetylene, and thorium and uranium yield in addition to the latter a certain amount of hydrogen.

A few of the rarer metals have only very recently been tested in the electric furnace, but their application to a number of industries is indicated. Quite recently ferro-titanium and ferro-vanadium have been manufactured in the electric furnace, and they proved of considerable value in the steel industry. The demand for higher grade steel is one of the phases of manufacture that is stimulating chemists to greater effort in the industrial application of their art. With the employment of electricity for driving steel tools the need for harder and more resisting steel is apparent, while the manufacture of armor plate to resist modern projectiles requires chemical composition of steels that will make it better than heretofore. Nearly every metal known to the world is being experimented with in the modern laboratory to evolve some harder variety of steel.

According to some of these modern tests, it has been found that the addition of titanium to pig iron greatly increases its tensile and transverse strength, while a similar but less marked effect is obtained with steel. Other of the rarer metals have been used in a similar way with varying success. In dealing with all of these metals the electric furnace is essential, for the high temperatures needed cannot be obtained in any other way, and the blast or regenerative furnace cannot be kept under such perfect control as the electric furnace. Owing to the development of the electric furnace, the waste of material is greatly minimized in these experiments. At Essen, Germany, where some of the most successful tests with rare metals have been made, the metallic oxides are reduced by finely divided aluminum

In this connection a word regarding the smelting of ores by the electric furnace should be added. Recent improvements have indicated some great developments in this direction. While the electric smelting of iron ores and the manufacture of steel by the electric process have limitations, especially in the relative cost of the operations, it is quite evident that there is a field for successful work in smelting certain titaniferous ores which are frequently very low in phosphorus, sulphur and silica, but high in titanic acid. Such ores cannot be treated in the ordinary blast furnace process, and heretofore they have been rejected. In the electric process such ores can be treated successfully, and considerable advance has been made in the manufacture of steel in Newfoundland by using this method. Large deposits of titaniferous ores are found on the island of Newfoundland, and they have not heretofore proved profitable to treat. There is also an abundance of available water power near the mines, while coal is scarce. By utilizing the electric current generated by water power, it is indicated that these huge deposits of titaniferous ores can be made of great commercial value.

In the treatment of copper-nickel matte obtained from the Canadian ores, the electrolytic refining plant at Sault Ste. Marie has been very successful. Nickel-steel is becoming more useful in a variety of ways every year. The railways have taken it up for a number of purposes, and the increased consumption thereby demands a larger adoption of electrolytic processes for refining the crude nickel. By the ordinary metallurgical processes raw nickel has been refined to test 99.2, and as a result of this improvement it is not likely that the electrolytic process will be adopted to remove the last traces of impurity except for special purposes. Where pure nickel is required the cost must be of secondary consideration, and in this connection the electrolytic process is the only one that can produce the desired results. If the impurities left in the nickel were silver and gold, it might pay for the extra expense of the electrolytic process simply to recover these metals. But the impurities are not of this character

The development of water power for electro-chemical and electro-metallurgical purposes has increased in the past few years remarkably, both in this country and Europe Heretofore the water power developed has had little reference to the location of the metal mines. Niagara and Messina have attracted the attention of the engineers and the great plants established there are in many cases far removed from the mines from which the different ores are extracted.

A change in this policy is now apparent. A better study of the available water power among the mountains has shown that it is possible to secure large electric current close to the mines, and with the two brought close together in one plant the process of refining the metals is greatly cheapened. In the mining regions of Montana, California, Colorado and Utah large electrical currents have been developed by private companies for operating mine hoists, pumps and general machinery, and it is now only one step farther to use the same current for electrolytic refining plants. Electro-metallurgy will thus take another step in advance and become of more practical value to the mine owner and operator than ever before.

THE PROSPECTOR.

The rock samples from Mercur, Utah, are as follows: No. 1, a much decomposed quartz porphyry, in which the quartz grains are almost microscopic. No. 2 is undoubtedly a portion of the same rock mass as No. 1, but is impregnated with carbonaceous matter, which on ignition turns white, like the original porphyry. No. 3 is the same, but has been rendered shaly by pressure. It also is heavily impregnated with carbon. This black material in appearance resembles pyrolusite, but no reaction for manganese was obtained. No. 4 is a decomposed porphyry, apparently somewhat different from No. 1. Its finer grain may be due to its occurring in thinner sheets. No. 5 is a fossiliferous clay rock, and No. 6 the same, but stained with iron oxide. It also is fossiliferous. No. 7 is a coarse-grained hornblende granite, in which occurs molybdenite and a little chalcopyrite.

The samples from Caribou Crossing, Y. T., are as follows: No. 1, diorite-aphanite. No. 2, quartz, with what is probably a decomposing gray copper, probably rich in silver. No. 3, quartz, with decomposing arsenical sulphide. No. 4, quartz, containing a decomposing iron-copper ore, stains of green copper carbonate—malachite. No. 5, jasper, carrying a little pyrite. No. 6, an altered intrusive rock, probaby diorite. The hornblende has been entirely removed, leaving only spots of iron oxide. No. 7, felsite. No. 8, crystallized vein quartz, in which are seen galena, zincblende, bornite (copper sulphide) and pyrite. The silver-bearing metals in this ore which can be identified are pyrargyrite (antimonial ruby silver) and argentite (black silver sulphide). There are probably other silver minerals present, but in too small quantities to be identified. No. 9, quartz, containing copper sulphide, altering to azurite. No. 10, quartz, with ruby silver and argentite. There is also, probably, some silver chloride present on one side of the specimen, but it is too small to be detected.

The rock samples from Sweetwater, Shasta county, Cal., are: 1. Limestone. 2. Chlorite schist, altered from a massive greenstone, probably diorite. No. 3 is also chlorite schist and contains iron sulphide and some chalcopyrite (copper-iron sulphide). No. 4 is novaculite; probably a silicified limestone. No. 5 is garnet. 6. Amphibole (hornblende). 7. Silicified dike rock containing cuprite (red oxide of copper). 8. Bornite. 9. Magnetite. 10. Pyrrhotite, a magnetic mono-sulphide of iron; the latter is too low in sulphur to make acid making profitable in this country, although it is used to some extent for that purpose in Europe. 11. Zincblende; it probably contains considerable iron.

The rock from Franklin Camp, B. C., is diabase. It contains finely disseminated chalcopyrite and bornite—sulphides of copper.

The rocks from Calico, Cal., are: 1. Hornblende andesite. 2. Liparite, a variety of rhyolite. 3. Sandstone, the material being from the disintegration of volcanic rocks, probably rhyolite. 4. Shale. 5. Jasper. 6. Rhyolite; the dark specks are silver chloride.

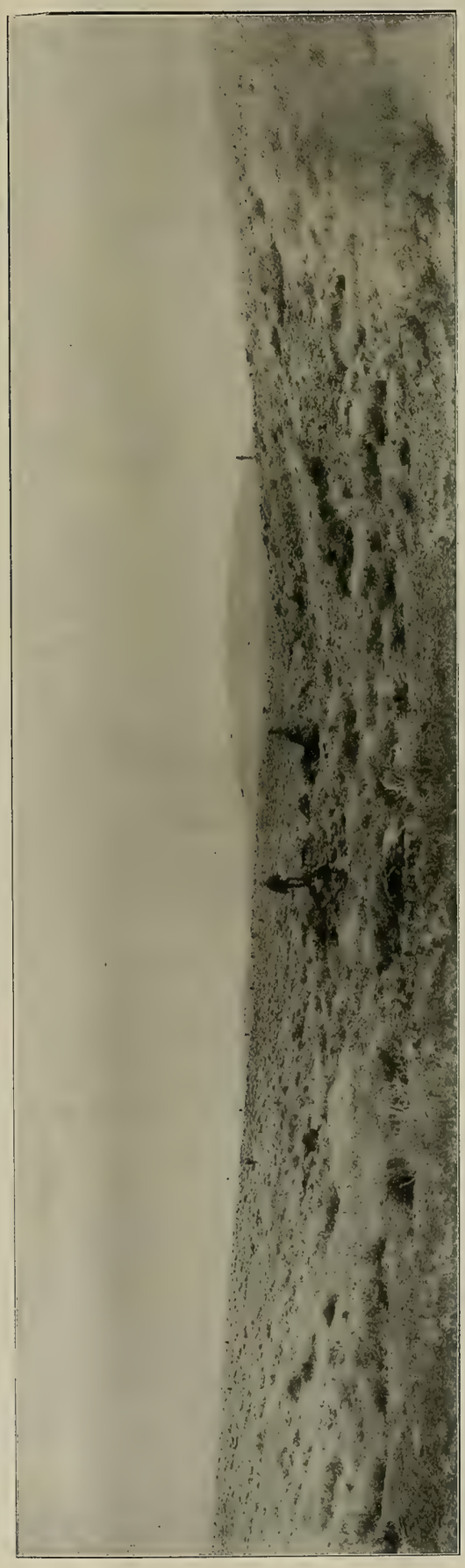
Tonopah, Nevada, and Its Development.*

There are few instances in the brief history of Nevada, which teems with the story of discovery, development and herculean achievement, more interesting than that of Tonopah. Prior to the discovery by Jas. L. Butler of the rather unpromising ore on the mountain side at the foot of the hill now known as Mount Oddie, Nevada's mining industry had declined almost to the point of stagnation. Outside of the operations on the Comstock, at De Lamar, and in the southeastern end of the State about Searchlight, desultory operations only were being carried on, in a listless sort of way, at the numerous camps throughout the State. The famous old camps of Pioche, Eureka, Austin, and some others were doing little or nothing, while the great desert stretching across the southern end of the State offered little of immediate promise. It was known that mineral existed in some of these southern hills and mountains, for in former years energetic men had explored and developed more or less extensively the districts of Reveille, Logan, Hiko, Good Springs, and some other camps, but these mines had either ceased to pay, or did not possess the elements of success, and were therefore unattractive to the average fortune hunter. Still through this period of depression there were venturesome prospectors who annually made pilgrimages into this southern desert, lured by the possibilities of the discovery of a "Gunsight," a "Breyfogle," or some other mythical bonanza.

James L. Butler was one of these. He made his headquarters temporarily at Belmont, the most southerly of the several outfitting points for the desert to the southward. He was going to the region south of the present town of Tonopah, where some discoveries had been made in a camp called Southern Klondike. He arrived late one afternoon at the foot of Mount Oddie, where he made a dry camp. From force of habit he looked about the vicinity, and noticing some quartz croppings, like an experienced prospector took several pieces of the

*See illustration front page.

The Tonopah Mining Company's Property, Tonopah, Nevada



Croppings on the Desert King, Twenty Feet Wide, in Alaskite District, Eight Miles Southeast of Goldfield, on the Road to Bullfrog, Nevada.

rock with him for test. He carried them southward with him and handed them to an assayer at one of the southern mines, who did not consider them promising enough in appearance to assay them. Butler himself did not feel particularly elated over the find. After a time he returned northward toward Belmont. It is the habit of desert travelers when on these trips to camp in the same places if the previous visits had shown the place to be satisfactory, therefore it was not strange that he found himself under the shadows of Mount Oddie once more as evening came on at the end of a cheerless day on the desert. Once again following his natural impulse to pick up anything that looked like ore, he gathered a quantity of samples, took them with him to Belmont, showed them to T. L. Oddie of that town, who agreed to have them assayed for an interest in the claims. The samples were sent to an assayer by Mr. Oddie, who promised one-half of his interest in the claims if he made the assays. The rock, unpromising as it appeared, proved to be astonishingly rich.

This all occurred in 1900. Mr. Butler, immediately upon receipt of the assays, went to Mount Oddie and located several claims. In doing the assessment work two tons of sorted ore were sacked and shipped to Selby's. This shipment netted $600, and from that time on the development of the new camp was rapid. A number of leases were given miners on the Mizpah and Valley View claims, and the desert slope quickly became dotted with the tents of miners, prospectors, merchants and adventurers of every description. The accompanying engravings, for which we are indebted to John D. Hoff of San Francisco, Cal., show clearly the results of the tremendous activity which has been the most marked feature of the development of Tonopah, the superfluous energy extending its influence out over the surrounding desert regions in all directions and resulting directly in the discovery of the several camps of the Goldfield district, Bullfrog, Lone Mountain, Gold Mountain, Kawich, as well as a revival of mining in the old camps of Lida, Reveille and half a dozen other localities where for many years it has been known that mineral existed, but which, owing to their isolation, could not be profitably worked. Tonopah has changed all this.

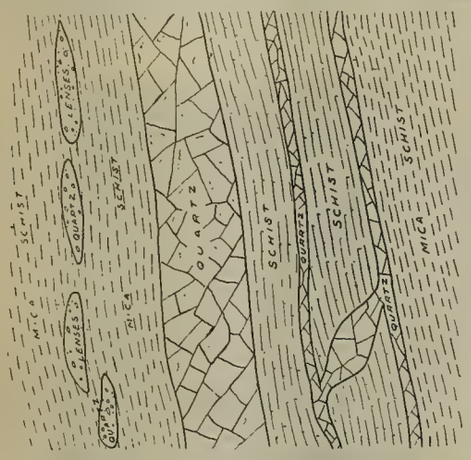
A Development Camp Between Goldfield and Tonopah, Nevada; Archer Mountain in the Center.

Tonopah Mining Company's Property; Dump of Ore in Front of Picture From Valley View Mine; Montana Tonopah Company at Foot of Mount Oddie.

Street Scene, Tonopah, Nevada.

Gold Mines in Schistose Rocks.

While many gold mines in schistose rocks are of a somewhat erratic character — lenses of quartz without continuity — but succeeding each other along a general course, nearly coincident with the schistosity of the rocks, there are other types of veins approaching fissures in their structure in schistose rocks. When the vein cuts across either strike or dip, or both of the country rock, there can be no doubt of its character, but sometimes the stress which has produced the vein has been such that the rocks are crushed, flexed and even faulted to a greater or less

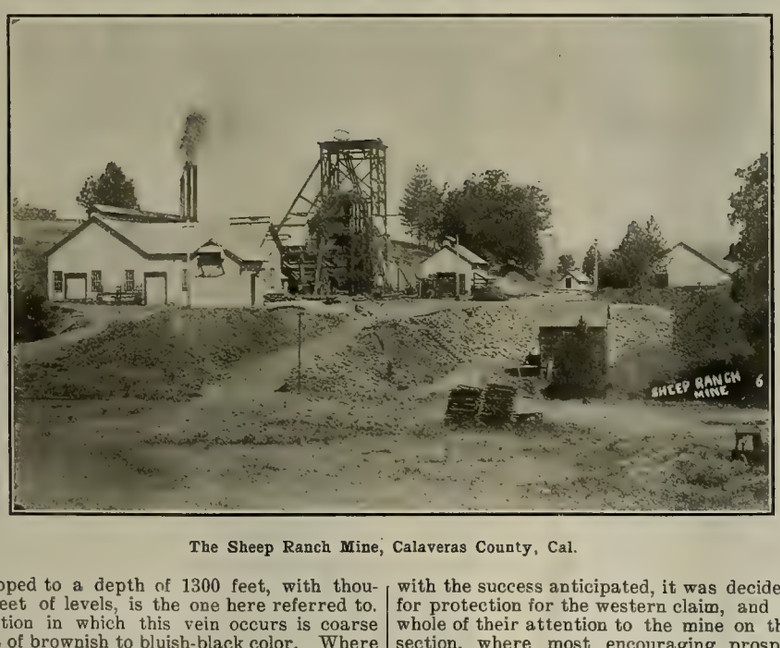


Cross Section Vein 1200 Level Sheep Ranch Mine, Calaveras County, Cal.

extent, thus forming a series of lenses of fracture, with occasional actual displacement of the rock masses adjacent to the line of disturbance and on either side of it. When these movements take place there are certain blocks which suffer displacement, and other blocks which are only subjected to stress, as indicated by the crumpling of the rocks. This results in one portion of the vein having the appearance of a fissure with walls, while in another portion the ore is "frozen" to the walls, or there is only a crumpling and crushing of the fragments of schist with little or no deposition of quartz. In some instances the latter are undoubtedly the result of movement which has taken place after the deposition of quartz in the vein had ceased.

The Sheep Ranch mine in Calaveras county, Cal., is of this type. There are five or more veins in the property, but the main Sheep Ranch vein, which has been developed to a depth of 1300 feet, with thousands of feet of levels, is the one here referred to. The formation in which this vein occurs is coarse mica schist of brownish to bluish-black color. Where this rock has been subjected to pressure and sheaving near the vein the schist has the appearance of foliated black slate, which has led some who have previously described it into the error of stating that the walls were slate. The schist is cut by dikes of diorite and pegmatite granite. This vein is, so far as known, the hanging wall vein of the series. It is from an inch or two to 3 feet in width, having an average of 18 inches. Much of the quartz from this vein was high grade, and gold could readily be seen in much of it, particularly in a dark-bluish, almost black, vitreous quartz, occurring in rolls and lenses where the formation was much crumpled. Ordinarily the vein quartz occurs as a continuous waving vein, or, as previously mentioned, as a succession of disconnected lenses. The accompanying sketch shows a characteristic cross-section of the Sheep Ranch vein and was sketched on the 1200 level. At times the several stringers and independent accompanying lenses disappear, there being but one vein, and again only the lenses, or a series of stringers can be observed. The mine paid from its earliest history and is credited with having produced over $3,000,000 in gold.

The accompanying engraving shows the hoist and mill built a few years ago. The mine is equipped with both steam and electricity.



The Sheep Ranch Mine, Calaveras County, Cal.

Mining in Waihi District, New Zealand.*

One of the most important gold mining districts of New Zealand is that of Waihi. In this district the property of the Waihi Gold Mining Co. is extensively equipped and developed. Concerning it the report of the Minister of Mines has the following:

This company's works are increasing to considerable dimensions, and up-to-date machinery is being obtained to replace that which formerly was sufficient for the requirements. A large winding plant is in the course of erection at No. 1 shaft, which will be capable of hauling up two trucks at a time instead of one, thus enabling the company to increase the output from the mine should it be required, or in the event of any stoppage in the other winding shafts through accidents or otherwise, a sufficient supply of quartz could be hauled up this shaft to keep the batteries running. A powerful pumping plant is in the course of erection at No. 5 shaft. This, together with the present engine now doing most of the pumping on the same shaft, will, it is supposed, be capable of unwatering the mine to a depth of 3000 feet.

The work of development in the mine is being vigorously proceeded with, and, as the lode system is opened up from day to day, new discoveries are being made and the value of the mine becomes more apparent, proof of which is shown by the handsome returns obtained from the ore as it is broken out.

At Waikino mill, (see illustration front page), great improvements and additions are being made. The most important in hand is the erection of a plant to treat the concentrates, which have for some time past been transmitted to New South Wales for treatment. From tests already made, this new plant will put through a large tonnage, and the extraction will be as good as that at the works in New South Wales.

WAIHI-GRAND JUNCTION GOLD MINING CO., LTD.—This company has two claims. One is situated on the western side of the Waihi Company's mine and the other on the eastern side, and they comprise 90 and 190 acres, respectively. As the claims do not adjoin each other, they have to be worked as two separate mines. At the beginning of the year the company was carrying on prospecting work in both mines, but after a few months' work, not meeting with the success anticipated, it was decided to apply for protection for the western claim, and direct the whole of their attention to the mine on the eastern section, where most encouraging prospects were being obtained. While working on the western mine a large amount of sinking, driving and raising was done to effect communication between B and C shafts for ventilation, and when this was accomplished, a crosscut drive was put in a distance of 56 feet, where the reef was intersected, and driven through and found to be 14 feet wide. The quartz consisted chiefly of large blocks of oxidized ore and, on tests being made, it was found to be very low grade. In the eastern section communication had been made between Nos. 1 and 2 shafts, which has given excellent ventilation to this portion of the mine, but to complete this work, 243 feet of raising and driving had to be done at a considerable cost. At No. 2 level the drive on the lode was extended for a distance of 26 feet, for the purpose of reaching the Waihi Company's boundary. In the northeastern drive on the lode at the same level, the drive has been extended a distance of 304 feet and four winzes opened out and sunk for a short distance below the level. The lode here, I am informed, at each place gave satisfactory results, and the company has every confidence that this portion of their mine will prove to be highly payable at greater depth. At the bottom of No. 1 shaft the No. 3 level crosscut has been driven a distance of 167 feet. In the month of May the directors decided to test the lode at a depth of 1000 feet by means of boring, and let a contract to the Goldfields Diamond Drilling Co., Ltd., to put down a bore from the 500-foot level at an angle of 68½°. At a depth of 458 feet the first quartz was met with, and the bore was to all appearance in lode formation, until the supposed foot wall of the lode was reached at a depth of 784 feet. The company intends shortly to commence sinking the No. 1 (main) shaft to a distance of 750 feet, where a crosscut drive will be put in to intersect the lode. An average of twenty-nine men have been employed.

WAIHI EXTENDED MINE.—This company's operations have been directed to crosscutting north, south and westward at the 500-foot level, with the object of discovering the Waihi Company's lodes. In several places quartz and silica veins running through the country were met with, and what appeared to be the hanging wall of a lode was followed for some distance, but as the Grand Junction or Waihi Company's lodes have not been met with (although striking direct into this company's ground) the manager is of opinion that the lode will not be found until a greater depth is reached, on account of the broken nature of the country. A total of 830 feet of driving has been done during the year. An average of ten men have been employed.

WAIHI GLADSTONE.—Operations in this mine (which is worked by a syndicate) have not turned out as successfully as was anticipated. The small 5-stamp battery which the owners erected on the property was completed about the middle of the year, when crushing operations commenced for the purpose of testing in bulk the value of the ore won from the different prospecting and development workings of the mine. The reefs vary from 1 foot to 6 feet in width at different points of the property. The method of treatment adopted was wet crushing and plate amalgamation. Up to the present, however, the results obtained have not proved of a payable nature. The total quantity put through the mill was 400 tons of quartz, from which 47 ounces 10 pennyweights of gold was obtained; value, £115 3s. 9d. An average of six men were employed.

WAIHI SOUTH.—All work in this mine is stopped for the present, pending negotiations with the Goldfields Diamond Drilling Co., Ltd., for a series of bore holes to be put down on the property to locate any ore body that may be traversing the ground at a depth, previous to incurring a large expenditure in machinery, etc., to enable deep sinking to be undertaken. In the early part of the year work was carried on in the Waihi-Grand Junction West mine by this company, but when the aforesaid company stopped operations here, the Waihi South Company could not carry on the work they had on hand at the time on account of the large amount of water to contend with.

WAIHI CONSOLS.—This company is directing attention to boring, with the object of discovering any lodes that may run through their property at a depth, and a contract was let in October last to the Goldfields Diamond Drilling Co., Ltd., to put a hole down 1200 feet. At the end of the year the hole had reached a depth of 262 feet.

WAIHI CONSOLIDATED.—There has been very little work done on this ground during the year. A contract was let for boring, and a start was made with the old machine that was on the ground, but this not being good enough for the work, operations were temporarily suspended until one of the Goldfields Diamond Drilling Company's machines arrived.

OHINEMURI RIVER SYNDICATE CLAIM.—The syndicate has gone to considerable expense in the erection of houses and machinery, and although temporary trials of the machinery have been made, and also experiments to find out the best mode of treating the tailings, the work is practically at a standstill until a grinding machine is installed. It is confidently assumed that the sands will then be treated efficiently and economically, and thereby a payable concern made of the venture. An average of ten men have been employed.

* See illustration front page.

PROBABLY the best and simplest test of the road making value of an oil is to evaporate a weighed sample in an open metal dish, down to the hardness of commercial 'D' asphalt, and weigh the residue. We thus get at once both the original asphalt and that formed during evaporation, and while it is not likely that the percentage of asphalt thus obtained is the same as would be gotten by allowing the oil to dry in the sun, yet it is highly probable that the comparison between different oils thus made is accurate. This test requires no apparatus except an iron or copper pan, a scale, and a plumber's fire pot, though it must be admitted that the even grading of the asphalt requires care and a little skill.

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MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

During 1904 the production of mica in the United States was confined to the following States, given in the order of the importance of production: North Carolina, New Hampshire, Colorado, New Mexico, California, Georgia, South Dakota, Connecticut and Idaho. The total quantity of sheet or plate mica produced in the United States during 1904 as reported to the United States Geological Survey was 668,358 pounds, valued at $109,462, an increase of 48,758 pounds in quantity, but a decrease of $8626 in value, as compared with a production of 619,600 pounds, valued at $118,088, in 1903. The reports of sheet or plate mica for 1900, 1901 and 1902 were 456,283, 360,060 and 373,266 pounds, respectively. It appears that in 1903 and 1904 the production was nearly 300,000 pounds greater than in 1901 and 1902. This large increase in the production of sheet mica during the last two years is due to the very large quantity of the small sized disks and rectan ular sheets of mica that have been prepared for electrical purposes. The production of scrap mica during 1904 amounted to 1096 short tons, valued at $10,854, as against 695 short tons, valued at $6460, in 1903. During 1903, however, there were also reported 964 short tons, valued at $18,580, which were sold in the rough blocks as produced. This probably made at least 800 tons of scrap mica, so that the actual production of scrap mica in 1903 was greater than that in 1904. Of the 1904 production 610,121 pounds of sheet mica, valued at $100,724, and 200 short tons of scrap mica, valued at $2000, were produced in North Carolina. This was over nine-tenths of the total production of the United States in 1904.

ALASKA.

Gravel washing has been commenced at the Jualpa mine, near Juneau, under the direction of W. H. Hile. ——Superintendent G. Otterson, of the Mansfield Co., has leased the Nowell placers in Silver Bow basin, near Juneau, and will open the camp on July 1.

ARIZONA.

Cochise County.

The Cochise Con. M. Co. is contemplating putting in a 50-ton reduction plant at the Davis group, 5 miles northeast of Paradise. The ore occurs in limestone and carries values in lead, copper, zinc, gold and silver. H. Alexander is manager. ——The Manhattan Development Co., working near Paradise, is considering putting in machinery for development. F. W. Hoar of Paradise is superintendent.——J. A. Lewandowski of Douglas, president of the Savage Con. G. & C. Co., is building a small matting furnace at the company's mines, near Paradise.——The Planet shaft of the Chiricahua Development Co., near Paradise, is down 450 feet and is to be continued to the 1000-foot level. F. W. Hoar is superintendent.——The main two-compartment shaft of the Shattuck Arizona C. Co., near Bisbee, is down 675 feet. A station is to be cut and drifting started, as a 15-foot lens of ore was cut at 525 feet. B. M. Pattison is superintendent.

Gila County.

(Special Correspondence).—The Arizona Commercial Copper Co., W. S. Sultan, superintendent, have put in a new hoist and other machinery in the mine, near Globe, and are developing the mine.——The Black Hawk shaft is down 115 feet. The crosscut at the 100-foot has opened an ore body which assays high in copper and silver.——At the Old Dominion plant the automatic conveyors and crushers have been tested and found to work satisfactorily and all the ore from the mine is hoisted through the new shaft and handled by the conveyor system. Rapid progress is being made in sinking the shaft below the twelfth level, having reached a depth of 80 feet below that station. The smelter is maintaining its average output of 100,000 pounds daily.

Globe, June 26.

The Inspiration M. Co., 10 miles west of Globe, J. D. Coplen manager, has run three crosscut tunnels, the Clipper, the Woodson, the Mercer, and the Martin. A small concentrating plant is to be built.

Mohave County.

The German-American 10-stamp mill and cyanide plant, near Acme, has been started. The mill has 950-pound stamps, 7-inch drop, 100 per minute, and is run by a gasoline engine. O. F. Kuencer is superintendent. ——The Fay shaft, south of Kingman, is being sunk deeper and it is reported that machinery for deep sinking is to be placed on the property.

Pima County.

It is reported that the Arizona mines, south of Tucson, are being worked by the Mineral Hill Con. M. Co., who will build reduction works this fall.

The double-compartment shaft of the Weeden mine at Pittsburg will be sunk 600 feet. The smelter is turning out ten tons of copper matte daily. D. Dryer is superintendent.

Pinal County.

The Saddle Mountain M. Co. has 100 men employed on the San Carlos strip erecting a 180-ton smelter and in the development of their copper property. Supplies for this property are now being unloaded at Winkleman and are freighted from that point to the mines, at Dudleyville, a distance of 14 miles.

Work is to be resumed on the Aboriginal mines, at Cochrane station, on the P. & E. Railroad, 10 miles from Kelvin. The property is owned by J. S. Cochrane of Cochrane, A. L. Jones of Phœnix and F. Harvey of Kelvin.

Santa Cruz County.

(Special Correspondence).—The Mowry mines at Patagonia, operated by the Mowry M. Co., have been developed to a depth of 600 feet. The several shafts have been unwatered and development is again under way. Larger hoisting and pumping plants are being put in and better reduction works have been ordered. The ores, which are sulphides of lead and copper associated with gold and silver values, occur in lime gangue inclosed in granite walls.

Patogania, June 25.

Yavapai County.

The working shaft of the Swiss Girl mine of the Baumann Copper Co., at Dewey, is down nearly 200 feet.—— H. Bowdre of Turkey creek reports that new camps are starting up in Pine Flat, Crook canyon and in the Palace station neighborhood. M. Ryan of the Wisconsin-Arizona Co. is working on the company's properties.

The United Verde Copper Co. at Jerome is regrading the old 300 roast grade and placing trolley wires thereon, preparatory to again using it.——At the Black Hills Co.'s property, south of Jerome, two shifts are at work unwatering the mine.

L. C. Haynes of New York City has bonded the Harryhousen claims near Jerome. He has started drilling in the Verde Chief. D. L. Bartholdi is superintendent.

CALIFORNIA.

Calaveras County.

E. C. Wood, consulting engineer for the Essex Consolidated Mines Co. of Angels Camp, says that the property has been opened up by three long tunnels and one shaft 660 feet deep. A 40-stamp mill on the property has been in continuous operation since April.

El Dorado County.

The Good Luck M. Co. has been formed to work the Good Luck mine, near D amond Springs.

Fresno County.

A big flow of oil has been struck in the Coalinga district by the California Monarch Oil Co. After a great waste of the petroleum the flow was placed under control, and it is now rising through a 6-inch pipe at the rate of 3000 barrels daily. —— H. J. Greva of Coalinga has made a location on the headwaters of the San Benito, near Hollister, for a water right to take water into the Coalinga oil district by means of a tunnel through the mountains.

Kern County.

The experimental deep well of the Santa Fe in the Kern River oil fields is down more than 2000 feet and the drill has penetrated a stratum of light oil of 30° gravity. This is the most important discovery in the Kern fields since the first find of oil, as the oil is so much lighter than that now being pumped. The shallower wells now being developed give a much heavier oil, and during the last few years the output has been gradually decreasing. The work of deepening the old wells will be begun at once.——The Standard Borax Co. of Bakersfield is working near the boundary line between Kern and Ventura counties. J. Werrington and J. A. Flood are interested. J. B. Berges has charge of the work.

Mono County.

R. Mitchell of Bridgeport, superintendent of the Dunderberg M. Co., has bought one-half of the Castle Grande mine, owned by J. C. Douglas and Osborne, for $2500.

Nevada County.

Gold discoveries are reported at Deadman's Flat, west of Grass Valley.

Placer County.

It is reported that H. Bernard has bonded the Evening Star mine, on Rock creek, to O'Neal & Scribner of Oakland, who will put in new machinery.——The Dunlap property, below Auburn, has been bonded by M. Repose.

San Bernardino County.

(Special Correspondence).—Beck & Body are developing the Sunrise group, 8 miles from Sandy, Lincoln county, Nev. A winze is being sunk in high-grade ore, with values in gold, silver and lead. C. H. Beck has charge.

Sandy, Nev., June 28.

Santa Barbara County.

The New Pennsylvania Oil Co. has reached the oil sand in its first well in the Santa Maria field at a depth of 1350 feet. Santa Maria wells have struck oil at a depth of over 2000 feet. The well is 3 miles from Orcutt, and one of the branch pipe lines of the Standard Oil Co. will be extended to it.

Shasta County.

The Dobrowsky mine, near Shasta, is being worked by W. H. Nofsinger and W. H. Johnson who have a lease in which H. O. Cummins, manager of the Middle Creek G. M. Co., has become interested. They have 21 men employed grading the site for the new mill. The new steam hoist has been started. Crude oil is used for fuel.

Sierra County.

O. Owens and E. Jones report the Columbia tunnel near American hill, near Downieville, is in nearly 1700 feet, and after being run 100 feet farther an upraise will be made to strike the channel. J. M. Harper is manager.——J. Hayes and F. Somerville of Sierra City, who, together with L. D. Flint and R. Parker, own the King Quartz mine near Sierra City, intend building a 20-stamp mill on their property.

Siskiyou County.

The management of the Headwaters group of mines at Humbug, 18 miles from Montague, intend pumping out and will run a tunnel into the mountain for drainage, tapping the ledge 150 feet below present workings. G. W. Cooper of Yreka has signed a contract for the construction of a $3000 mill building at the Headwaters mine, which does not include the machinery for same. The present stamp mill and machinery will be used, with additions, including a cyanide plant.——F. W. Mahler of Cherry Creek has sold his Drummer Boy quartz ledges to E. W. Emmons of New York City.——McFerrin, Zimmer & Dingman of Fort Wayne, Ind., have leased the Freshour property, on Klamath river, in Virginia Bar district, and are sinking a shaft to bedrock, with the intention of running four drifts from the shaft to find the pay channel. A. Thrash of Humbug is superintendent.

John M. Tetherow, superintendent of the Highland mine, near Etna, states he will put in a new mill at once.

Yuba County.

The Peerless Gold & Silver M. Co. has been formed by J. Byrne and J. Peardon, Sr., of Smartsville and R. P. McKay, C. Metteer and M. L. McKay of Marysville to purchase and develop the Peerless gold and silver claim, west of Smartsville.

COLORADO.

Boulder County.

The first cyanide mill to prove a success in Boulder county has been opened up in Magnolia, 10 miles from Boulder. It is owned and operated by F. Leonard of Magnolia and is treating ore from the Cash mine. Straight cyanide and an oxidizing roast are the principal factors of his method. He is still somewhat uncertain about the cost of treatment, but estimates that it will not exceed $2.50 per ton, at the highest.

Clear Creek County.

The Independent M. Co. is working the East Griffith, near Georgetown, with J. Larsen of Idaho Springs as resident superintendent.

Work has been resumed on the St. Paul & Colorado M. Co.'s claims on Lincoln mountain, near Georgetown, with W. M. Lewis as manager. It is stated that a power plant will be built at which time power drills will be used in driving the bore.

A test in the cyanide section of the Ward mill, near Idaho Springs, on 104 tons of raw iron and lead concentrates containing gold and silver values of $16.80 per ton, after nine days of leaching, during which the cyanide consumption was 2.4 pounds per ton, showed an extraction of 74.3% of the contents. The tailings, which have been running to waste into Chicago creek, are being placed in the cyanide tanks for treatment. The tailings carry values of from 96 cents to $1.82 per ton, and commercial tests have shown that nearly a complete saving can be made at a cost not exceeding 38 cents per ton. ——S. Anderson of Idaho Springs and W. Lamb are sinking the main shaft on the Griffith vein, near Georgetown, owned by Maxwell & Hood.

At the Hazelton-Santiago mines at Argentine and Brown mountain the proposed mill and tramway are to be constructed, says W. Rogers, the president and general manager. He plans to build a tramway 8000 feet in length to connect the Santiago with Baltimore tunnel, on the Hazelton group, near Silver Plume, and the Colorado & Southern Railway, for convenience and economy in conveying ore to the mill which is to be erected there. Stamps, jigs and concentrating tables, supplemented by cyaniding, will be employed.

Chaffee County.

The Black Hawk mine at St. Elmo, in the Chalk Creek district, expects to put in an electric separator to concentrate the zinc ores. The mill is to be put up at the foot of Baalbec gulch, 2300 feet from the mine. An aerial tramway, with a capacity of 100 tons a day, will be built from the mill to the mine. The Black Hawk has been operated for several years by the Mary H. M. Co., of which T. B. Crawford is president.

Custer County.

M. Moore and Abbott have charge of work on the California claim, on Game ridge, near Silver Cliff. They intend to put in a hoist. Moore has also been cleaning out the India tunnel for the owners.——Work has been started on the Bridgeman's Hope claims in Junkins park.——It is reported that C. Haskell, manager of the Hector mine, near Silver Cliff, is making arrangements for working the mine and for putting in a cyanide mill.

Gilpin County.

The following is the new schedule of smelting rates for the Clear Creek valley mines, adopted by the smelter trust, which went into effect on June 20, the prices governing the settlement of all ores purchased by the Chamberlain-Dillingham Ore Co., at Black Hawk: $19 per ounce for gold when the ore contains $\frac{5}{10}$ to 2 ounces, $19.50 per ounce when over 2 ounces, 95% of the value of silver, when 2 ounces or over. On copper, $1.25 per unit, up to 5%; $1.50 per unit up to 10%, and $1.75 per unit over 10%.

ORES CARRYING OVER 65% SILICA.

Gross value and under—	Treatment.
$14	$ 4 00
Gross value—	
$14 to $20	5 00
$20 to $25	5 50
$25 to $30	6 00
$30 to $35	6 50
$35 to $40	7 00
$40 to $45	7 50
$45 to $50	8 00
$50 to $75	9 00
$75 to $100	10 00
$100 and over gross value	11 00

ORES CARRYING LESS THAN 65% SILICA.

Gross value and under—	Treatment.
$20	$ 5 00
Gross value—	
$20 to $25	5 50
$25 to $30	6 00
$30 to $35	6 50
$35 to $40	7 00
$40 to $45	7 50
$45 to $50	8 00
$50 and over gross value	9 00

TAILINGS AND CONCENTRATES

Minimum price, $6 per ton; excess of silica over 10% deducted from $6.

	Treatment.
$35 per ton and under	$ 3 50
$35 to $80 inclusive	4 00
$80 and over	4 50

To these different prices should be added the freight and sampling charges.

G. C. Easton of Denver has started work on the Lakeside tunnel, near Apex.

Mollow & Co. of Russell Gulch, operating the Gem mine on Bellevue mountain, are preparing to put in a hoisting plant.——Sinking operations have been finished at the Chicago-Carr mine on Bobtail hill, near Central City, this lift making the shaft a total depth of 600 feet. Manager B. Meyers says that as soon as the drifts are in a safe distance from the shaft sinking operations will

again be resumed with the intention of going down another lift of 80 feet.——The Castleton mine, at the head of Virginia canyon, and operating under the management of W. Kirk, is shipping daily to the concentrating mills at Idaho Springs.

Owing to a strike at the stamp mills on North Clear creek at Black Hawk, the owners have adopted an eight-hour day. At the Bobtail an eight-hour day has been adopted at $2.50, where it was $3 for twelve hours, and will be worked with special shifts, a temporary agreement to that effect having been made. The Buell mill is working on the eight-hour scale awaiting advices of the manager in Denver, and at the concentrator it is believed that an eight-hour agreement will be reached. The Gilpin, Polar Star and Randolph mills did not start work to-day.

Gunnison County.

At Camp Sherrod the Sunlight G. M. Co., working the Bacon tunnel, has found good ore after running 200 feet.——The N. B. C. Co. has let a contract for 500 feet of tunnel into Brittle Silver mountain, near Gunnison. ——The Glen Park Placer M. Co., operating on the north side of Cross mountain, 8 miles west of Tin Cup, is preparing to resume work on its gravel beds. The Glen Park people have constructed 900 feet of flumes and have two dams and a reservoir. S. G. Bradford of Denver is superintendent.——The West Gold Hill M. & M. Co., operating in Tin Cup district, has contracted for an aerial tramway of one span, 2250 feet long, without a tower, to convey ore from the mine to the company's mill. A special 1½-inch cable is being made that will put the entire line on the gravity system. It will carry ten tons an hour.——Geo. Williams, manager of the Congress G. M. & M. Co., operating at White Pine, reports that the tunnel has been driven 150 feet and that an electric light and cyanide plant has been ordered.

G. Kellogg, operating the Chloride, at Pitkin, will unwater the lower levels of the mine in July and resume work at that point.

The A. R. C. M. & M. Co. at Sherrod, L. J. Ross president, has decided to drive a crosscut tunnel 350 feet deep, which will cut the main vein at depth of 267 feet.

The Raymond ore bodies at Pitkin have been gone over by experts, reserves of ore measured, ores tested in carload lots, and the management has decided to build a 30-stamp mill at once. K. Neitzel, late superintendent of the Portland mill at Colorado City, will have charge of the erection and afterwards of the mill. The ground is being surveyed and plans drawn. The Raymond tunnel has four veins to draw from, outside of the Raymond proper, which has not yet been cut. The tunnel to this point will be started soon.——The Leona claims, west of Bowerman, at the head of Grant gulch, is owned by the Bessemer M. Co., composed of Pueblo parties, with A. H. Baxter in charge of the work. A shaft has been sunk 72 feet.——The drainage tunnel being run by I. L. Johnson into Gold hill from Middle Willow creek, near Pitkin, is in 200 feet. A pipe line has been laid from the compressor, 3000 feet distant, and air drills are being used. The tunnel is to be driven under the Gold Cup workings at a depth of 400 feet by following the dip of the vein.

Ten feet of high-grade zinc ore is said to be showing in the Napoleon and Edna Draine properties on Gold hill, east of Pitkin. The Napoleon and Edna Draine were recently purchased by the Lanyon Zinc Co. The shaft on the Napoleon is down 200 feet.

Hinsdale County.

The Hanna M. & M. Co. expect to have their new 100-ton mill near Capitol City ready by Oct. 1. It is to be equipped with rolls, trommels, jigs, Wilfley tables and slimers, hydraulic classifiers and static electrical separators and is designed to turn out lead concentrates carrying gold and silver, copper concentrates carrying gold and silver values and a clean zinc product. The mine is developed by tunnels, the ore from the lower 850-foot tunnel being carried by a 5000-foot aerial tramway to the receiving house. From here it is to be carried to the crushers by a belt conveyor, the ore being hand-sorted to remove both high grade and waste. G. H. Martin is directing the work. J. W. Moffet is mill superintendent.

It is reported that the Max M. Co. intends putting in a mill near Capitol City. B. Geanneau is manager.——It is said that the Hinsdale T. & R. Co., which has succeeded the Henson Creek Lead M. Co., will resume work at its property, 13 miles above Lake City, with H. F. Wells of Boston, Mass., as manager.——The Pittsburg M. Co. have taken over the Wyoming, on Henson creek, 15 miles above Lake City, and, it is reported, will build a mill. The property has been worked by J. Schaffer.

Lake County.

At Twin Lakes work has been commenced on the Bull Hill properties belonging to the Fidelity Co. of Pennsylvania.——Work has been resumed by the Mt. Storm Co. on the Summit claim, on Red mountain, near Twin Lakes.

The bottom of the Penrose shaft atLeadville has been reached and a large station will be cut to accommodate two compound pumps that will have a combined capacity of 3000 gallons per minute, and this will more than suffice to keep the water under control. When the pumps are in, drifting toward the Coronado will commence, and when some distance has been gained the pressure of water at the Coronado will be lessened. The draining of this property means a great deal to the district, as it is now possible to sink any shaft in the downtown section without having to pump.——The Nil Desperandum shaft on Rock hill is down 740 feet, and after passing through the blue lime for 150 feet, the last shift in the shaft of 14 feet was sunk through a disintegrated mass of heavy mineralized matter.

Pueblo County.

It is reported that F. J. Hearne, president of the Colorado Fuel & Iron Co., plans to bring G. P. Harault from Paris, France, to show his process of smelting iron by electricity. It is said that by Harault's method iron ore containing any quantity of sulphur or phosphorus may be used for making steel, and that magnetic iron can be handled as easily as hematite.

San Miguel County.

Manager E. A. Taft of the Doctor Franklin syndicate operating in the Mount Wilson district, near Telluride, reports that he has eight men opening the road to the Silver Pick mill, so that the mill may be started after being repaired. The mine is still buried under the snow.

Summit County.

The Pennsylvania-Ohio mines at Argentine have put on a large force. The mill is running to its full capacity.——Manager E. McConnell of the Braganza mines has started work in their Warden gulch property, near Argentine.——Work is to be resumed at the Rothschilds tunnel, near Argentine. The bore is in over 3000 feet.

The Rose of Breckenridge is producing good zinc and lead ores from the main tunnel workings. The leasers will start shipments soon.——Boyce Bros. and G. C. Forsythe, operating the Waupeta property on Farncomb hill, near Breckenridge, have struck high-grade lead and zinc ore.——The mill at the Old Union Co.'s property near Breckenridge has received the necessary adjustment and alterations and has been started.——The Morning Star mine, on Baldy, near Breckenridge, is being developed by W. P. Condon and E. W. Shrock. ——Air drills have been put in at the King Solomon tunnel, near Frisco. The tunnel is in 250 feet.——Near Summit gulch, near Breckenridge, the Evergreen group is being worked under the direction of Theo. Knorr.

It is reported that after working for ten months on the Fountain lode on Farncomb hill, near Breckenridge, Boyce Bros. & Forsythe have found the vein.

E. Loring of the Hoosier Gulch G. M. Co. is directing lode and placer work at the Hoosier property at the Summit county base of Hoosier pass, near Breckenridge. Stouffer, Huntington & Bernatchie, with a pumping and hoisting plant, are sinking a shaft on a vein that runs through the placer.——H. T. Keltie of Joliet, Ill., president of the Washington-Joliet M. & M. Co., has been at Breckenridge inspecting the progress and development of the property. There is talk of building a new mill at the mine.——J. P. Howe, president of the Senator G. M. Co. and the Wonderful & London Placer Co., has been at Breckenridge from Boston, Mass., to examine the mines under the management of M. M. Howe.

Teller County.

Lessee Gillpatrick has opened up high-grade ore in the Accident mine of Gold Hill, Cripple Creek.——Superintendent L. Mac Cummings, of the New York group on South Straub mountain, Cripple Creek, contemplates putting in a 50-ton experimental cyanide plant preparatory to a 200-ton plant, if it proves successful in treating the new body of low-grade ore.——Airheart & Shepherd, lessees, on the Rocky Mountain, near the El Paso Con., on Beacon hill, Cripple Creek, after sinking 250 feet. have started a prospecting crosscut at the 85-foot point in the shaft.

Sinking has been suspended in the C. K. & N. on Beacon hill on account of the flow of water. The pumps have been closed and placed on the surface. Two weeks of hard pumping showed that the water was stationary. The C. K. & N. is the deepest shaft on Beacon hill from a point of elevation above sea level. The vein carries the water course and dips into the shaft 300 feet below the present drainage tunnel level. The El Paso adjoining will take care not to cut the C. K. & N. vein in its lower workings, and by remaining away from it will be able to continue sinking.

It is reported that $500,000 of the $750,000 needed has been subscribed toward driving the tunnel to drain the Cripple Creek district gold camp, by the mine owners of Colorado Springs and Cripple Creek district, including I. Howbert, president of the Portland G. M. Co.; W. Bainbridge, superintendent of the El Paso; A. E. Carlton, C. C. Hamlin, A. Holman of the Golden Cycle; J. W. Graham and E. M. De La Vergne. It is expected that work will be begun within ninety days. The new tunnel will have a total length of 27,140 feet and will drain the camp to a depth of 1500 feet. The tunnel will start at a point in the bed of Cripple Creek, 3 miles below the El Paso shaft. From the portal it will be driven to the El Paso shaft, a distance of 14,000 feet, thence north of east to the Vindicator property, a distance of 12,640 feet. This bore will cut the El Paso workings at depth of 1325 feet, the Elkton at 1680 feet, the Portland at over 2000 feet, and the Vindicator at over 2125 feet. The bore will be pushed from four working faces, including the main southern portal. The El Paso shaft will be sunk to the tunnel level and the bore started north from that point. An intermediate shaft will be sunk to the tunnel level midway between the El Paso and the main portal, from which point the tunnel will be driven both north and south. The plan now under consideration will carry the big bore across all of the known underground water courses, and it is believed will drain the entire section north of the tunnel.

Operations have been resumed on the Fluorine property on Copper mountain, Cripple Creek. The company recently secured assets of the Sioux Falls M. & M. Co. A cyanide mill has been started and is treating from fifty to seventy-five tons of ore a day.——The construction work on the cyanide mill of the Little Giant Co. in Pony gulch, near Cripple Creek, is nearly completed and it is believed that everything will be in working order by July 15.

Phillip Argall has been examining the Globe and Ironclad hill properties belonging to the Stratton-Cripple Creek M. & D. Co., to make a report of the feasibility of cyaniding the low-grade ore.——H. R. Richmond and associates, operating the Aileen property, on Guyot hill, Cripple Creek, under lease, are retimbering the main shaft from the surface down to a depth of 380 feet. When this work is completed they will commence to hoist ore.——Lessee Fogelman, who is operating the Reno Co.'s property on Womack hill, Cripple Creek, has opened several ore shoots between the surface and the 100-foot point.——Experiments have been made on ore from the San Juan, on Mineral hill, Cripple Creek, regarding cyanide treatment.——J. F. Hadley & Co., lessees on the Beacon Hill-Ajax property, Cripple Creek, have started sinking.

At Cripple Creek work has been resumed at the South Burns shaft of the Acacia Co. by the Exposition Mines & Leasing Co., lessee.——Interruption was caused by the appearance of water. Now that the water has seeped away sinking will be resumed, the intention being to add 200 or 300 feet to the depth of the shaft. The present depth is 265 feet.——It is reported that rich ore has been opened up by lessees between the third and fourth levels of the Doctor-Jack Pot mine at Cripple Creek. C. Vetter and associates are the lessees. —— D. Bernard, working the El Paso dump, Cripple Creek, has increased the force to eighteen.

IDAHO.

Blaine County.

The force at the Minnie Moore mine, near Hailey, has been reduced and the mill is being cleaned up preparatory to shutting down in accordance with new plans for the operation of the mine, which, from now on, is going to be worked partly by leasers and partly by day's work. The engineers, the sinking crew and the managing staff are to be retained, but in the stopes and where ore is expected to be found leasers will be given an opportunity to work.

Lemhi County.

The Gold Flint M. Co., whose properties adjoin the Gold Dust mines of Leesburg, announces the beginning of work for the installation of a 40-ton mill, which is to be in commission by October 1.

Nez Perces County.

B. B. Hans of New Orleans, La.; W. Harris of Alexander, La.; E. Enderle of New Orleans, La.; and C. F. Knoll of Bunkie, La., the four stockholders of the Idaho Placer & Quartz G. M. Co., have been in Lewiston arranging to start mining their placer claims on the Salmon river, near Forrest. Since October they have been working from 18 to 20 men on the flume, which is to be 4½ miles long. Hydraulic mining will be started with one stream.

Shoshone County.

It is reported that an independent smelter is to be built near Mullan.——The Sister M. Co. of Wallace proposes to sink a shaft 150 feet east of the main tunnel. A hoisting plant will be put in.

Hill Bros. of Carbon Center, near Delta, are putting up a building preparatory to using a gasoline engine to furnish power for their mine.——Geo. Busen and partner are cleaning bedrock, near Delta.——A 400-foot tunnel is to be run on the Wakeup Jim property, near Delta.—— The Golden Chest tunnel at Murray is in 1800 feet.

J. L. Safford, superintendent and manager of the Sampson M. & D. Co., has reports that the tunnel has reached the ledge. The Sampson group is on Big creek, near Wallace.——A. L. Thurston is preparing to start work on the Rough Rider group, near De Borgia.—— T. L. Greenough, of Larson & Greenough, owners of the Morning mine, has bought control of the Snowstorm mine, near Mullan, the only copper producing mine in the Cœur d'Alenes. During the year it has been worked under lease and produced $300,000 worth of copper. Ore has been extracted from the upper workings, the only portion of the mine which is leased. The lessees are J. H. Howard & Co. of Missoula. The lower workings have been under development by the owners and large bodies of low grade copper ore have been disclosed in both the upper and the lower workings.——The Headlight M. Co., which owns claims adjoining the Mammoth, near Wallace, will resume work.

KANSAS.

J. E. O'Neil, of Independence, vice-president and general manager of the Prairie Oil & Gas Co., says that the Standard Oil Co. has decided to resume work in the Kansas field and will complete the storage tanks in Kansas, construction of which was discontinued when the last Legislature was in session. At that time producers of oil under 30 gravity were notified that no more heavy oil would be taken and pipe lines to such properties were disconnected. O'Neil's order is to the effect that as soon as tanking can be built and other arrangements can be made, it is proposed by the Prairie Oil & Gas Co. to buy oil between 22 and 30 gravity, and so long as present conditions exist to pay 25 cents a barrel for it.

The Whiting pipe line has begun taking oil from the southern field. The line is not yet completed, but as it will require ten days to fill the pipe it is believed that it will be completed before the end of that time. It will take 150,000 barrels of oil to fill the pipe. In addition to this there is completed tankage along the route for 70,000 barrels more. The working capacity of this line is 18,000 barrels a day, but it will be some time before the line will take this amount, as several pumping stations have yet to be built. The Whiting line, constructed and owned by the Standard Oil Co., runs from the southern Kansas oil fields through Kansas City to Whiting, Ind.

MICHIGAN.

Houghton County.

The Baltic will have its permanent equipment completed at No. 2 shaft late this fall. The permanent hoisting engine is almost completed. Grading has just started and foundation material is now being delivered for the boiler plant at No. 2 location. Bids are being received for the 60-drill compressor for No. 2, which will have a capacity of 4000 cubic feet of air per minute. The drifts are being extended southward from No. 3 shaft to the No. 2 territory.——The permanent hoisting engine at shaft D of the Champion mine is completed. The Champion's experimental plant in the mill extension, in which a test is to be made in crushing the copper rock entirely by rolls, will probably go into service about Aug. 1. An increase in fuel economy and a reduction in tailing losses are hoped for.

The Calumet & Hecla is to operate another shaft on the Osceola amygdaloid lode. The unwatering of No. 16 shaft is progressing for this purpose, while on surface important improvements and overhauling are going on in the shaft rock house. The shaft, which is less than 500 feet deep, was filled with water to within 100 feet of surface. There are also two levels, each drifted 600 feet. The levels are 8x8 feet and the shaft is three compartment. The water is being raised entirely by pumping. One pump is placed in the skip and is thus lowered as the water goes down. This pump lifts the water to an established pump station at the first level, and a fixed pump there raises it to the surface. The work in No. 16 shaft, like that which has been progressing in No. 13

shaft on the Osceola lode for about a year, is for exploration and a thorough mill test.

MISSOURI.

Under the supervision of H. F. Bain of the U. S. Geological Survey, G. H. Girty will study the stratigraphy and paleontology of carboniferous formations in southwestern Missouri, with reference to associated lead and zinc. Topographic work in the Forsythe and Shelbyville quadrangles will be in charge of H. Munroe, assisted by C. G. Anderson and G. L. Hoopes.

Jasper County.

The Joplin Commercial Club is agitating the need of protection from British Columbia zinc ores, that have been coming into the country the past ten months duty free. It is trying to secure a tariff on zinc ore. The law applying to the importation of ores is an old one and imposes an ad valorem duty of $\frac{1}{2}$ of a cent a pound on lead ores. At the time of its imposition its purpose was to stop the importation of lead ores from Mexico. The amount of zinc at that time was very small and did not represent the industry it does to-day.——The lease of the Helen Lead & Zinc Co. at Chitwood has been sold for $80,000 to the Pittsburg-Missouri Zinc & Lead Co. by L. P. Cunningham. There are eight operating mills upon this tract.

Regarding mines, near Joplin, the News Herald says that Batten & Co. have a shaft down 80 feet on the Rex M. Co.'s land.——After being idle several months, the old Sherwood mill has resumed operations.——The Lilly M. Co.'s new mill in the Sherwood district has begun operations.——W. Leffen and partners have made a good strike of lead ore on the Riseling land.——P. E. Campbell & Co. have let a contract for 1000 feet more drilling on the Amazon land.——The Searcher Dev. Co. is preparing to sink a shaft on a lead prospect on Turkey creek.——J. H. Cook, of Carthage, has opened up a good prospect on the Reynoldsville land, south of Reeds. ——Flock Bros. of Villa Heights are mining at a depth of 20 feet on the Rex M. Co.'s land.——The Dickerson land, 1½ mile north of Joplin, is being drained by powerful pumps. P. Hennessey has taken a lease on twenty acres of the Rex M. Co.'s land and is sinking a shaft.—— The Smith-Kernohan Co. of Cleveland, O., has secured a lease on ten acres of the Cissna land.——The mining land at Lehigh, south of Carl Junction, is being put in shape for resumption of mining operations. —— The Providence M. Co. are sinking a shaft on the Lyon M. & D. Co.'s land at Porto Rico. —— C. Rinehart of Carthage is manager of a company that is operating on the Show Me mill and lease on the Bloomington M. Co.'s land. —— S. B. Rauch and L. Casey, who are working a two-lot lease on the Missouri Lead & Zinc Co.'s land, southeast of Joplin, are cutting a prospect drift at a depth of 100 feet.

Newton County.

The La Sallier concentrating plant on the Allen land at Spring City is to be started July 1.

MONTANA.

Broadwater County.

Work on the Park and New Era, near Hassell, is under the direction of Manager Atwater. The shafts and upper levels have been unwatered and connections made with the lower tunnel. A cyanide plant is contemplated, in addition to the 100-ton concentrator, which will be started as soon as the lower and upper workings are connected, so that ore can be taken to the mill at low cost.

Fergus County.

A large body of ore is said to have been made on the Bullard property, at Kendall, being worked by the Queen G. M. & M. Co., F. S. Weidenborner, president and manager.——P. W. McAdow will start work on the Alpine, near Maiden.

Jefferson County.

Work has been started at the Huot mine, near Basin, by G. Freeburg and P. Dowling.——G. W. Winter is developing a silver claim near Clancy.——The Morning Star mine, 10 miles north of Basin, is being operated by Waldie, Jackson and Bullock under lease and bond from Hieber Bros. This property has been idle for several years.——W. F. V. Young of England has succeeded T. Clearage as manager of the dredge on Gold creek, 30 miles northwest of Basin. The boat is now in operation.

Lewis and Clarke County.

G. H. Babcock has secured options on practically the whole of the Seven-Up-Pete district, on the main range of the Rockies in the gold belt that extends from Helena through the Marysville, Gloster, Jay Gould and Stemple districts. The properties acquired are the Rover, Columbia, Donnely, Howe, Hokan Johnson.——The Red Bird Co. of Helena has sunk another 100 feet on the incline of the Red Bird and is drifting to the vein. The company is also developing three claims which join their Reliance mine in High Ore gulch. There is a tunnel 140 feet and a shaft 50 feet deep on the properties.

S. T. Hauser reports that negotiations for building of another power dam on the Missouri river have been completed, and that the work will be commenced at once. The new dam, which will add 10,000 H. P. to the power already furnished by the Missouri River Power Co., near Helena, will double the cheap power available. The new organization is the Helena Power Transmission Co. The new dam and plant will be located at Stubbs Ferry, 16 miles from Helena. Power will be furnished at from $35 to $50 per year per horse power.——Among the contracts for power is that of a Cleveland syndicate which has secured 3000 H. P., and will build at Helena an electric reduction and refining plant.

Silver Bow County.

(Special Correspondence).—The mining companies of Butte have completed their annual reports to the assessor for the purpose of taxation on net earnings. The reports show a total in net earnings of $9,942,310.45, an increase over last year of $2,596,701.11. Of the increase $2,452,218.98 is credited to four amalgamated companies and $87,726.16 to the United Copper companies. The Heinze or United Copper companies reported the following net earnings: Montana Ore Purchasing Co., $335,573.27; Hypocka M. Co., $96,995.57; Guardian M. Co., $117,739.29; Corra-Rock Island Co., $56,644.43; total, $606,952.56. Last year the total net earnings of the Heinze companies were $519,226.40. The following items are from the reports for comparison: Tons of ore extracted, Boston and Montana Co., 1,138,307; Anaconda, 1,473,644; Butte & Boston, 260,433; Parrot, 167,963; Trenton, 150,296; Washoe, 102,941; Montana Ore Purchasing, 170,169; Hypocka, 77,103; Guardian, 43,591; Corra-Rock Island, 122,697; Original, 343,850; Speculator, 112,940. Gross yield per ton—Boston & Montana, $12.86; Anaconda, $9.36; Butte & Boston, $7.42; Parrot, $8.63; Trenton, $5.64; Washoe, $10.66; Montana Ore Purchasing, $8.59; Hypocka, $8.35; Guardian, $9.30; Corra-Rock Island, $7.36; Original, not given; Speculator, $8.43. Cost of reduction per ton—Boston & Montana, $2.21; Anaconda, $3; Butte & Boston, $2.45; Parrot, $2.74; Trenton, $2; Washoe, $3.79; Montana Ore Purchasing, $2.65; Hypocka, $2.68; Guardian, $2.59; Corra-Rock Island, $2.53; Original, $3.02. Cost of extraction per ton —Boston & Montana, $2.91; Anaconda, $3.51; Butte & Boston, $3.31; Parrot, $3.75; Trenton, $3.02; Washoe, $4.29; Montana Ore Purchasing, $3.72; Hypocka, $4.17; Guardian, $3.76; Corra-Rock Island, $4.11; Original, $3.31; Speculator, $5.85. Gross proceeds—Boston & Montana, $14,634,923.46; Anaconda, $13,787,345.07; Butte & Boston, $1,932,837.12; Parrot, $1,449,851.37; Trenton, $847,421.35; Washoe, $1,097,018.79; Montana Ore Purchasing, $1,461,241.20; Hypocka, $643,887.15; Guardian, $405,527.07; Corra-Rock Island, $902,264.91; Original, $2,599,615; Speculator, $952,084.20. Net proceeds—Boston & Montana, $5,855,620.07; Anaconda, $2,259,693.73; Butte & Boston, $178,712.81; Parrot, $328,106.69; Trenton, $70,110.22; Washoe, nothing; United Copper, $606,952.56; Original, $349,387; Speculator, $291,385.20; miscellaneous mines, $2,342.17.

Butte, June 26.

Teton County.

The Midvale Lubricating Oil Co. has been incorporated to develop the oil fields around Lubec. The company has 1600 acres. M. L. Bevins of Spokane, Wash., is president, T. H. Thompson vice-president, G. P. Mulcahy secretary.

NEVADA.

A detailed economic investigation of the Goldfield mining district and reconnaissance economic and geologic surveys of other districts in southern Nevada will be made by J. E. Spurr, assisted by G. H. Garrey and F. Hewitt A geologic reconnaissance of quadrangles in southern Nevada will be made by S. H. Ball, under the supervision of Mr. Spurr.

Lincoln County.

(Special Correspondence).—Ore high in silver and copper from the Tecopa and Resting Spring mines is being hauled to Sandy preparatory for shipment to smelter.—— The Keystone mine and mill are running steadily on high-grade gold ore. Thirty-five men are at work under management of M. R. W. Rathbone. —— H. Hardy of Salt Lake City, Utah, operating the Chiquita, 5 miles from Sandy, has made a rich strike on the property.

Sandy, June 28.

The Searchlight M. & M. Co.'s new 15 H. P. gasoline hoist is being put in at Searchlight. The shaft has been straightened and a station cut at the 250-foot level.—— The G. M. Rose cyanide plant at the Southern Nevada at Searchlight has been started. Eight of the tanks have a capacity of fifty tons each, and by loading and unloading two each day 100 tons will be handled daily. It is estimated that it will require six months to clean up pile of tailings.——Prospect shafts are being sunk on the X-Ray group, near Searchlight, to determine the best location for a deep working shaft.——Work has begun on the Empire crosscut tunnel, near Searchlight, which, when completed, will have a length of 500 feet. Eventually the mine will be worked by this tunnel.——The El Dorado M. Co. has set up a whim and is sinking the main working shaft, near Searchlight, to the second level.

The Boston & Pioche, at Pioche, are pushing the North Pole tunnel, being in 330 feet, and will start a permanent deep shaft on the Boss soon.——The Nevada-Utah is putting in a hoist at Meadow Valley No. 5, a three-compartment shaft, and will sink to the 2000-foot level.——The Abe Lincoln, at Pioche, has thirty-five men at work and intends to do considerable development this winter in addition to running the mill.

The new schedule of rates on ore shipments from Los Vegas to the smelters in Salt Lake valley is looked upon with favor by miners and smeltermen and will tend to aid development in the Bullfrog district. The rates over the Salt Lake Route are as follows:

Ore Value.	Rate Per Ton.
$25	$ 5 25
35	5 75
50	8 50
100	11 00
200 to 300	14 30

Add 2% for all ore above $300 in value.

Nye County.

The Western Ore Purchasing Co. has commenced work on the sampling plant they are to construct at the company wells, 12 miles from Tonopah, on the Tonopah Railroad. Manager Chas. Snyder states that as soon as the plant is completed fifty men will be put to work.

G. D. Johnstone, in the Bullfrog Miner, gives the following information regarding the mines at Crystal Springs, 7 miles north of Beatty: At the Gold Coin group of six claims one man is employed. Will let contract to two men for 100-foot tunnel. The Mackay-Graham syndicate of Denver, Colo., has bought the property for $10,000. Grape Vine group of five claims is prospecting with two men. Bond & Gaut have three claims. They have opened a pay chute, crosscutting the ledge on the surface. The Mayflower ledge has been opened up by Duvahl on Duvahl mountain. The Gold Reef claims are working two men. The Tripolite claim has one man at work.

NEW MEXICO.

A reconnaissance economic investigation of mining districts will be made by W. Lindgren of the United States Geological Survey, assisted by L. C. Graton. A reconnaissance investigation of the Gallup coal field, in the northern part of the Territory, will be made by F. C. Schrader, under the supervision of M. R. Campbell, assisted by M. K. Shaler. A geologic reconnaissance of the northwestern part of the Territory will be made by Whitman Cross, assisted by W. H. Emmons, L. H. Woolsey and G. F. Kay.

OREGON.

Baker County.

The Yankee Girl G. M. Co. has been formed, with principal offices at Wheeling, West Virginia, to work the Yankee Girl and May Girl claims, near Sumpter. A hoist and pumps will be put on the property and the shaft continued from the 40 to the 100-foot points. Guy Pierson is superintendent and W. C. Fitzsimmons, consulting engineer.——Gilkey & Kershaw have given control of the Belmont mine on Vincent creek, near Tipton, to A. Mohr and O. Herlocker of Sumpter.——It is reported that Abel & Rose of Sumpter have located claims, near the Belmont, from which they took $2040 in nine days.

The Granite Mountain G. M. Co. is prospecting on their property, near Weatherby.——M. N. Thompson is manager.——It is reported that dredging is to be resumed in Burnt river, near Weatherby.——At the Indiana mine, 28 miles from Baker City, J. W. Messner intends to explore the promising copper deposit.——A strike is reported in the Esmeralda mine, 2 miles from Bourne, 150 feet from the tunnel portal. W. B. Robinson, D. S. Kinsey, J. W. Gray and J. C. Shea of Baker City and W. P. Kinsey of Portland are owners.

Grant County.

A hoist, boiler and engine have been put in at the Gem mine, in the Susanville district. J. Dunstan is superintendent and will put on a large force. The shaft will be continued 300 feet from its present depth.

A hoisting plant is being put in at the Gem of the Mountains, near Susanville, and a mill is to be put up to treat the ore.

Josephine County.

Manager A. F. Hoofer of the Mt. Pitt mine on Jump-off-Joe, near Grants Pass, plans to haul ore to the smelter being built near Grants Pass, using a traction engine and a stationary engine and cable for the grade from Jump-off-Joe to Evans creek divide.——H. B. Nye of Medford has leased the Bertha quartz mine, on Foots creek, near Gold Hill, from Young & Meyer.

SOUTH DAKOTA.

Lawrence County.

It is reported that the Golden Reward M. Co. is considering building a cyanide plant near Terry.——The Big Lead Company, operating near Roubaix, has struck rich ore. One shaft has been sunk 200 feet and a second is being sunk to explore the vein. The company intends building a 100-ton amalgamating and cyanide mill.—— W. L. McLaughlin, of the Horseshoe Co., has settled with the insurance adjusters for the recent loss of the Mogul mill, for $232,542.53.

Pennington County.

Gill, Weber & Leisy of Cleveland, Ohio, have purchased wolfram mines from N. Ervin, W. L. Miner, J. W. & N. J. Smith, through J. Truax of Hill City. The property purchased includes sixty acres, 2 miles east of Hill City, on which a strong vein of wolfram-bearing ore has been opened. The new owners intend to at once begin work and prepare the mine for production.——Work at the Dakota-Calumet, near Hill City, has been suspended, owing to the inflow of water which could not be handled with the equipment. A boiler was purchased of C. E. McEachron of Hill City, and a new Cameron pump ordered from Denver. This machinery will be put in and sinking resumed.——Geo. Bain, superintendent of the Walton M. & M. Co., which has taken over the Tea and Dolcode properties, near Hill City, has men at work putting in new machinery and a new hoist building.

UTAH.

Beaver County

(Special Correspondence).—The Horn Silver mine at Frisco is operating with forty to sixty men. The mill, which has been handling zinc ores from the mine, has not been able to run for some time on account of the water supply being short. It is understood arrangements are being made for water. Several properties are being worked in the vicinity.

Frisco, June 26.

Juab County

The shipments of ore from the mines of Tintic district during the week ending June 24 consisted of 105 carloads as follows: Eagle & Blue Bell, 11; Yankee Con., 6; Centennial-Eureka, 45; Bullion-Beck, 4; Gemini, 7; Ajax, 2; Carisa, 2; Grand Central, 4; Lower Mammoth, 1; Mammoth, 8; Victoria, 4; Victor, 2; Swansea, 6; Tetro, 2; Godiva, 1. Total, 105. Uncle Sam mill, 2 cars of concentrates.

The Raymond and Illinois mines at Tintic have been united and will be worked by the Raymond-Illinois M. Co. J. C. Sullivan is president and general manager; J. D. Woods, vice-president, and J. C. Lynch, secretary and treasurer. It was decided to proceed with the exploratory work at a depth of 1500 feet in the shaft in Raymond territory, and to run north and south in the ledge.

The management of the Grand Central mine at Eureka has made connection with the main ore-bearing channel, off the 1300-foot level. C. E. Loose is manager at the mines.

Salt Lake County.

C. H. Doolittle, of the Bingham & New Haven of Bingham, and the Utah & Eastern, operating the Dixie mines and smelter of St. George, says that shipments will be increased as soon as the aerial tramway, which will span a distance of 4700 feet between the mines and receiving station on the line of the Copper Belt railway, has been completed. Work will be started in July to undermine that portion of the ground which recently caved in at the Dixie mines, and to drive an 825-foot tunnel. To make this connection, the furnaces of the smelter will remain idle until it is accomplished. An air compressor with machine drills will be put in.——The

United States M. Co. has decided to extend the Niagara tunnel, from the 2500-foot station, to open up the Galena mine at Bingham.——W. J. Craig, manager of the Kennebec mine at Alta, will drive an intermediate tunnel which will tap the ore-bearing channels in the Reed & Benson lode at a distance of 400 feet from its mouth.

Sevier County.

Secretary M. F. Murray, of the Franklin syndicate in the Ohio mining district, near Richfield, reports that the new compressor at the mouth of the Franklin tunnel runs well. Operations will be confined to the Franklin tunnel, which is in 1000 feet. O. Larsen is superintendent.

Tooele County.

(Special Correspondence).—Near the head of Soldier Bridge canyon, at the property of the New Stockton M. Co., the work is being done under contract. The station at the 850-foot level has been completed and drifts started from this level. They claim to have four ore bodies on the east and three to the west of the shaft. A new hoisting engine and air compressor will be put in. A 75-ton concentrating mill near the shaft handles the product from the mine. Ore is not being taken out at present, hence the mill is not operating, but they expect to start taking out ore and run the mill in a short time. H. D. Trenam is superintendent.——Work is being pushed as rapidly as possible in the Honerine tunnel. When completed this tunnel will be 200 feet below the 1100-foot level of the Honerine shaft. Ore is not being broken in the mine at present and no ore is being taken out of the mine except as they cut through same. Development work is going ahead in drifts from the shaft. The tunnel is being worked both from the tunnel entrance and from the shaft. The tunnel will be used for draining the ground and for transporting the ore to the mill located at the tunnel entrance. The tunnel will be about 2 miles long when completed. There is 1100 feet farther to be driven. New shaft buildings have been erected at the mine since the fire several years ago.——On the east side of Tooele valley and 1 mile from Stockton is the 500-ton Honerine mill, handling the dump from the old mill of the Honerine Co., as well as all the ore from the Honerine mine. A spur from the San Pedro, Los Angeles & Salt Lake Railway runs to the mill. The power plant at the mill consists of Rand compressor, four boilers, engine, pumps, dynamo, etc. The tailings dump which is being treated in the mill is hauled about ¼ mile and dropped into the tunnel through an air shaft, and from there trammed to the mill by mules. The ore is taken from the ore bins in the mill onto a conveying belt, thence to the crusher, then elevated to a conical screen of ¼-inch mesh, the oversize going through dry rolls. The whole product goes to the top of the mill and is sampled by means of automatic samplers. The mill is automatic throughout and contains three Huntington mills, one Chilean mill, twenty-three Wilfley tables and three Wilfley slimers, besides jigs and trommel screens. The Sherman tank system is used. This system is composed of seven tanks.

Stockton, June 26.

Utah County.

G. & F. C. Tyng, operators of the Wyoming mine, are hauling ore from the mine to American Fork to be shipped to Salt Lake smelters. The 539-foot tunnel which has been completed will facilitate the handling of the ore.

Weber County.

(Special Correspondence).—The Napoleon - Maghera mine, in the Sierra Madre mountains, 12 miles north from Ogden, is being developed by Don Maguire, manager of the property. Excellent values have been obtained. Two tunnels are being driven into the property, which carries gold, silver and copper.——The Santa Maria group is being developed by the same party in the same neighborhood. The tunnel is in 500 feet and it is expected the contact will be cut in the next 100 feet. Work is being done under contract. Dirt assays $6 in gold and 3% to 10% copper.

Ogden, June 26.

WASHINGTON.

Whatcom County.

(Special Correspondence).—At Nooksack Falls, above Excelsior, the Bellingham Bay Improvement Co. will put in a power plant of 2000 H. P. The Post-Lambert Co., near Excelsior, began operation with a 10-stamp mill in July, 1903, and now has fifteen stamps. A tramway will be built this summer to convey the Lulu ore to the mill. The Great Excelsior, near Mt. Baker, is equipped with twenty stamps, a roller mill, regrinders, fifteen concentrators and an electric light plant. Three stopes have been opened up and forty-five tons of ore are milled daily. When the new machinery is in working order this will be increased to 100 tons, says President T. P. Sanders. The Nooksack, on Sumas mountain, has put in a 200-ton cyanide plant, which is expected to be in operation in a short time. In the Baker district, the Red Mountain people plan to put in a 10-stamp mill this year. On the upper level 180 feet of drifting has been done and a shaft sunk. On the lower level 250 feet of crosscutting, 110 feet of drifting and 100 feet of raising have been completed. The Gold Basin has two fissure veins 400 feet apart and three smaller ones. Tunneling and drifting will be pursued this year and, if possible, a stamp mill will be put in by J. O. Carlisle. At the Goat Mountain property (free milling) a 5-stamp mill will be put in this year, says Manager Blondin. The First Chance will put in machinery next year and power will be secured from the Nooksack Falls electrical plant. The leading mines in the Slate Creek district are the Eureka, Mammoth, Chancellor and North American. With the exception of the Chancellor, all of these have stamp mills, although the ten stamps of the North American have not yet been placed. The Chancellor G. M. Co. is considering putting in ten stamps. The Granite Creek G. M. Co. is the only incorporated placer concern operating in the district. Hydraulic machinery to cost $15,000 will be put in this summer.

Bellingham, June 27.

Snohomish County.

It is reported that machine drills and a concentrator are to be put in at the Buckeye mine, near Index.——The Bunker Hill concentrator at Index will be run day and night after July 4. Concentrates are shipped to the Everett smelter. V. V. Clark is superintendent.

Stevens County.

The Velvet mine and concentrator, on Sophie mountain, 12 miles from Northport, is to be started up.——The Blue Bell, on the same mountain, has 800 feet of tunnel and will continue until the ore body is cut.——L. Bobo has started work on mines adjoining the Blue Bell.——The George Foster galena mine, on Deep creek, near Northport, has been taken over by Eastern parties, who have started work.——The Copper King mine, at Chewelah, is shipping regularly to the Northport smelter. The Second Relief mine, near Erie, B. C., is a new shipper to the Northport smelter.

FOREIGN.

AUSTRALIA.

Victoria.

(Special Correspondence).—The deep gravel channels of the Ballarat region which have been worked more or less extensively in the past, but on which mining operations practically ceased when the heavy flows of water were struck, have been under investigation by Bewick, Moreing & Co. of London for several years past, and bore holes sunk to determine the course of these channels and their probable value in gold. It having been found impossible to drain the channel by ordinary methods, a shaft was sunk in the bedrock outside the rim of these ancient buried channels, which in many respects resemble those of California, and drifts run underneath the gravel. For many months an average of 20,000,000 gallons of water have been raised daily without in any way decreasing the flow of water, but the pressure has been reduced from nearly 200 pounds per square inch to about 35 pounds, and this is reported constantly decreasing, so that in time it is hoped the water will have been drained from this underground reservoir, when it is thought that the water problem will practically have been solved, as the rainfall in the district is very light. The gravels are known to be rich in gold, and when the water is under control the mining industry in Ballarat will no doubt receive an impetus which nothing else could give it.

Ballarat, May 20.

CANADA.

BRITISH COLUMBIA.

Boundary District.

G. W. Cornish has bonded the Capital Prize, near Greenwood, and will commence development work.——The unwatering of the Jewel has been finished and the engineers of the Le Roi No. 2 have sampled the mine. Until such time as a decision has been made as to purchasing, the mine will be kept clear of water.——On the Golconda in Deadwood the long tunnel is in 550 feet.——Water is being kept out of the Brooklyn and Stemwinder mines, pending examination.

Ore shipments from Boundary mines for week ending June 24 were: Granby mines to Granby smelter, 12,518 tons; Mother Lode to British Columbia copper smelter, 3584; Mountain Rose to British Columbia copper smelter, 264; Emma to Nelson smelter, 331; Oro Denoro to Granby smelter, 132; Bonnie Belle to Trail smelter, 20; Skylark to Granby smelter, 30; total for week, 16,879 tons; total for year, 442,034 tons. Boundary smelters this week treated: Granby smelter, 12,660 tons; British Columbia copper smelter, 3935; total for week, 16,595 tons; total for year, 453,945 tons.

According to the report of M. M. Johnson, who has recently examined the mines and smelting plant of the Montreal & Boston Con. M. & S. Co., near Greenwood, the property consists of one smelting plant at Boundary Falls and mineral claims and fractions of other claims in various parts of the Boundary district. This plant has two furnaces, 40x176, with a daily capacity of 300 tons. Three directly connected Connersville blowers, one 7x12 steam locomotive, slag cars, sampling mill with crushers and rolls, assay office and laboratory complete the outfit. Steam is the motive power. The mineral claims are as follows: At Phœnix are the Brooklyn, Idaho, Stemwinder, Standard, Montezuma and Rawhide; at Wellington are the Athelstan and the Jack Pot fraction. The Summit camp contains a three-fourths interest in the Mountain Rose and one-half of the Lancashire Lass. The Deadwood camp contains the Sunset, C. C. D., Crown Silver and Morrison. The cost of freighting the ore from the Phœnix and Summit camps via the Canadian Pacific Railroad is 30 cents a ton and from the Deadwood camp 17 cents a ton. The Athelstan is not connected with the railway. The Brooklyn lode has been developed to a depth of 350 feet and has 3500 feet of underground workings; the average sample taken from this mine represents the group: Copper, 1.43%; gold, $1.32; silver, 25 cents per ton. There are 260,000 tons of ore available for the smelter, which at current prices has a gross value of $5.86 per ton. The diamond drill indicates that there is an equal amount of ore below the developed ground. The Stemwinder is developed to a depth of 125 feet, but sufficient work has not been done to indicate the tonnage. Samples show: Copper. 1.4%; gold, $1; silver, 25 cents. The Idaho shows surface indications of the same body that is being worked in the Granby. The Rawhide has 600 feet of underground workings at a depth of 180 feet. Average assays show: Copper, 1.4%; gold, 90 cents; silver, 25 cents; available tonnage, 230,000 tons; prospective tonnage, 1,000,000 tons. The Mountain Rose vein has been explored for 125 feet; ore contains 40% to 50% iron, 20% sulphur and about $1 in copper, gold and silver. It is valuable only as a flux. The Lancashire Lass has a shaft 50 feet deep, is stripped for a distance of 500 feet and is of the same quality as above and has from 2000 to 3000 tons on dump. The Athelstan is merely a prospect. The Sunset has a shaft 200 feet deep; no drifting below 100 feet. The equipment at the mine is not of the proper type or of sufficient power for economical work. In order to put the mine on a production of 1500 tons a day and keep the cost of production down to a point that would make the operation profitable, there should be an expenditure of $250,000 for an additional furnace, converting plant, electric power equipment, compressor and mine development.

East Kootenay District.

The No. 1 lead stack of the Marysville smelter has been blown in with satisfactory results. Power for all purposes is derived from four 48-inch Pelton wheels operating under a head of 325 feet, the water being delivered to the nozzle from a 24-inch steel pipe. Steel cable transmission from the Peltons delivers the power to all parts of the works. The ore is dumped from ordinary cars into the bins of the sulphide and sampling mills, and from there runs across to the storage bins. From these latter it goes on a belt conveyor, and by an ingenious system of short levers any particular furnace can be fed from the same conveyor. The roasting plant consists of four hand-stirred roasters and two of the new Haberlein rotary pattern. The latter are circular in shape and are peculiar in that the floor or hearth which carries the ore revolves on a central axis, and the ore is worked from the central feeding point to the circumference by means of fixed rakes. The roasted ore, on reaching the outer edge of the hearth, is discharged through three apertures, one portion being red hot and another portion being comparatively cool. The cooler ore goes to the upper floor of the conveyor building and the hot portion is run direct in on the perforated bottom of the Haberlein converters. The cold ore is run down over the hot and the blast is turned on, burning out the sulphur and leaving mass in a spongy, porous condition. When the blast is turned off the converter is inverted and the mass is shot out onto the cooling floor. The roast is then run across to the assembling house, where the furnace charges are made up. The ordinary smelter cars carry the charges to the feeding floor; but here, as elsewhere, hand labor is eliminated as much as possible, as the cars ascend and descend on a chain conveyor. W. G. Smith is manager of mine and smelter.

Nelson District.

The Ivanhoe mine has closed down indefinitely. The resignation of J. B. Kendall as manager has been accepted.——A new vein has been discovered on the Rambler-Cariboo ground, near Nelson, of which W. E. Zwickey is manager.

Ontario.

W. G. Miller, provincial geologist of Ontario, reports that no white arsenic was produced in Ontario during 1904. The only producer in previous years was the Deloro mine, Hastings county, and this mine has been closed for more than a year on account of a strong flow of water in the 500-foot level. Operations will probably be begun again here soon. Some mispickel concentrates were produced in the treatment of gold ores at the Atlas arsenic plant, which adjoins the Deloro, but these concentrates were not roasted. The new arsenic districts of the Province which are being developed are near Lake Temagami and Cobalt Station on the line of the new Government railway, the Temiskaming and Northern Ontario. Lake Temagami lies 300 miles north of Toronto by rail, and Cobalt Station is 25 miles farther north. There are two deposits of mispickel being developed near Temagami. The deposits in which the mineral is found are rather irregular in form, the mineral occurring in bunches or masses and more or less disseminated through greenstone and related schists of the Keewatin system. At Cobalt Station the arsenic-holding ores consist essentially of arsenides of cobalt and nickel, such as smaltite, niccolite, chloanthite, etc. Associated with these ores is much native silver, together with several silver minerals, such as pyrargyrite, argentite, dyscrasite, etc. Native bismuth is found in all the deposits, together with tetrahedrite and other ores, a similar assemblage of minerals to that of the well-known Saxon deposits. It is interesting to find that the iron arsenides of Temagami are auriferous, gold occurring in commercial quantities in these ores; the nickel-cobalt arsenides of Cobalt Station are argentiferous and contain no gold. The latter deposits occur in the form of distinct veins, which cut the almost horizontally lying fragmental rocks of the lower Huronian, which here consists of conglomerates, breccias, slaty graywackes, etc., in an almost vertical direction.

Rossland District

It is reported that the Gooderham-Blackstock Syndicate has sold out its control in the War Eagle, Center Star and St. Eugene to a syndicate headed by Osler & Matthews of Toronto, who have associated with them in the deal other Montreal and New York capitalists. The reason for the sale is the death of G. Gooderham and the illness of T. G. Blackstock. Osler & Matthews are directors of the Canadian Pacific Railway, and it is presumed from this that the C. P. R. R. and the Trail smelter have an interest in the deal.

The shipments for the week ending June 24 were as follows: Le Roi 1930 tons, Center Star 1770, War Eagle 1000, Le Roi No. 2 90, Jumbo 300, Spitzee 30, Gopher 60, Homestake 30; total, 5210 tons; total for the year to date, 162,404 tons.

Slocan District.

Regarding the Highland mine, near Ainsworth, Norman Carmichael manager, the report of the British Columbia Minister of Mines says that the Highland ore is quartz carrying galena, with low silver values and small amounts of pyrite, pyrrhotite and zinc blende. The galena carries ½ to ¾ an ounce of silver to the per cent of lead, the concentrates running 70% lead and 20 to 25 ounces silver. The concentration ratio is 1 to 7 or 1 to 10. The galena values are all that are saved. The mine has been opened by tunnels to a vertical height of 500 feet. The ore from all the workings is delivered by chutes to the lowest level, whence it is trammed to the upper terminal of the aerial tramway which carries it to the concentrator on Kootenay lake. The concentrator is run by water power under a 450-foot head, a 48-inch Pelton wheel being placed on the top floor and the waste water used for concentrating. The crushing is done by a Gates crusher and three sets of rolls. The coarse rolls run at eighty-five revolutions, the medium at ninety-five and the fine at 105 per minute. The concentrating is done by two coarse jigs, three 3-compartment and two 4-compartment jigs and six Wilfley tables, with hydraulic classifiers, settlers, etc. The extraction is 80% to 85% assay value. For 39,148 tons treated, debiting the value of the new wearing parts at the beginning

and crediting the estimated value of the wearing parts partially worn, the cost of crushing and concentrating was $0.1425 per ton, divided as follows: Crusher $0.0195, rolls 0.0495, trommels 0.0191, jigs 0.0091, launders 0.0066, elevators 0.0096, belting 0.0074, dynamo 0.0029 and general 0.0188.

Manager H. M. Stevenson will resume work at the Highlander mine, 2 miles south of Ainsworth. The group includes the Little Diamond, Black Diamond, Highlander, Eagle and Ivanhoe claims, and extends from the shore of Kootenay lake to the top of the hill. To cut these leads at a depth of 1000 feet below the old workings, the company in 1899 started a crosscut tunnel from the Eagle claim, 300 feet above the lake level. After running 2610 feet it has cut the Highlander and Black Diamond veins.——Work is to be resumed by A. Smith on the Surprise mine at McGuigan. It is the intention of the owners to run a long tunnel from the south side of the hill to tap the lead at a depth of 700 feet below the present workings, which are now down 300 feet.

BOLIVIA.

The British Consul at La Paz reports that only a part of the Bolivian mines are worked at present, owing to difficulties of transport and communication with the coast. Bolivia is said to occupy the third place in the world's production of tin—but if her output continues in the same proportion as of late years she may occupy the first. Silver mining, which in former years was the chief industry, has greatly decreased of late, partly on account of the fall in value in European markets and also owing to the mines being more or less worked out. Copper is almost exclusively produced from the Corocoro mines. Gold is also found in Bolivia, but with the exception of the works at San Juan del Oro and Chuquiaguillo, there are no other establishments worthy of mention. The latter place is 3 miles from La Paz. The amount of tin exported from Bolivia during 1904 was 45,597,967 pounds, representing an official value of £1,275,944. Sulphur is found in Tomina and Acero (department of Chuquisaca), Carangas (department of Oruro), Sililica, Chayanta, Atacama, Lipez and Tacora. Pure sulphur in Carangas, Lipez, Atacama, Chayanta, Porco and Tomina. Antimony in Sicasica, Ayopaya, Tapacari, Arque, Pisacoma, Guanuni, Antequera, Ichucollo (these last four in Oruro), Poopo, in North and South Chichas, Pacajes, Porco, Palca and La Paz. Arsenic in Choquelimpia (Carangas), Chayanta, Lipez, Atacama and Porco. Asphaltum in Concepcion and Tomina (Tarija). Quicksilver in San Jose (Chiquitos–Santa Cruz), near the city of Potosi, Chayanti, Huarina (Omasuyos), Challatiri (Potosi), Moromoro (Chuquisaca), San Javier (Chiquitos), Santa Rosa and San Jose, Calamarco (La Paz). Coal in the neighborhood of Sucre, Tarabuco, Chorrete (Aziro), Tomina, Sicasica and Pacajes, around Lake Titicaca, Mojos, River Tuiche (Caupolican), Buena Vista (Santa Cruz). Copper in Yungas and Yamparaez, Cinti, Tomina and Azero, Tahuapalca (La Paz), Corocoro, Collocollo, Poopo, and the district of Oruro, North and South Lipez, Atacama, Tarija, Abilez, Osiloque, Suapi (Lipez), Jura (Porco), Colcha, Huatacondo, Esmoraca, Tarabuco, Macha, Paria, Chayanta, Turco, Curaguara (Pacajes), Ulloma, Cusillomayo and Porco (province of Potosi), Turco (Oruro). Tin in San Javier (Santa Cruz), Yamparaez, Oruro district, Poopo, Pisacoma, Guanuni, Chayanta, Carabuco (Omasuyos), Colquiri (Oruro), Ampaturi (La Paz), Milluni, Vilaque (La Paz river), Huayna-Potosi, Chorolque, Maragua, Ocuri (the last three in Potosi), Chacaltaya in La Paz, Caluyo, Pacallo, and the Totoral. Gold in Cinti (San Juan river), Ancoraimes, Morochata, Surpo, Capasina, Amaya-Pampa, Chayanta, Yura (a river in Porco), Caiza, Linares, Pomabamba, Azero, Chuquiaguillo (La Paz district—in this placer mine was found a nugget of 22½ kilos), Santa Rosa (Chiquitos), Concepcion (Santa Cruz), Sorochi in Chayanta, Tipuani in Larecaja, Cajones, Yani, Chungamayo river, Suches (Caupolican), Araca (Loayza), Camaqueni, Ananea, Ayopaya, San Simon mountains, Guapore, Chiquiots, San Javier, Santa Rosa (province of Velasco), Paria, Choquecamata, Urulica (South Chichas), Chuquimia, Ipoco on the Oruro district, Capasisca, Atacama, in Susques, Tasonanco, Chuita, Choquehuata (Chayanta), Chichas, Ubina, Rosario, Olasos, Coroico, River Perry, Esmoraca, Sopachui, Presto, Chuquichuqui (Sucre), River San Juan (Chichas), San Jose del Abra, Huantajaguita, Siera Gorda, Collpa, Camol, Chitihue, Santa Maria, San Cristoval, Rosario, Catua, Guanaco, Obisidiana, Tipia (all in Atacama), High Guapore, Huarayos river, Vilaque in La Paz, La Paz river, Cavari, in Inquisivi, Cocapata, Cotacajes, Chumavi, Incasacani, and nearly all the rivers, especially in the provinces of Munecas, Larecaja, and Caupolican. Silver in Yamparaez, Tomina, Acero, Charasani (Munecas), Guarina, Omasuyos, Cavari, Carachapi, Mohoza, Ichoca, Carabuco, Inquisivi, Berenguela, Pacajes, Sicasica, Ayopaya and Mancaestancia, Chuyavi, Minascaca. Minasuta, Jalgular (department of Cochabamba), Colcha (Arque), Sayari (Tapacari), Quicoma, Mizque and Cliza. The whole departments of Oruro and Potosi, the same as in the department of Atacama. Platinum in San Javier and San Ignacio (Santa Cruz), in Illampu mountain. Lead in Cinti, San Cristoval (Oruro), Chichas, Andacava, Sombrio, around Potosi, Carabuco, and Escoma (Omasuyos), Araca, Tres Cruces, Inquisivi and Yaco. Petroleum in Tumupasa, Caupolican, Tacuru (Santa Cruz), around the city of Santa Cruz, Buena Vista, Serranias de Espejos, in the province of Cordillera. Precious stones on the north of San Ignacio (Santa Cruz), in the mountains between Callapa and Ulloma of the province of Pacajes, Caquingora, Lipez, Atacama, Santa Corazon, Candelaria (department of Oruro), and Salinas de Garci-Mendoza.

MADAGASCAR.

The French Government has prohibited prospecting for gold in Madagascar. This affects many miners from the Rand, South Africa, who have located claims and got money to exploit the gold deposits. The Madagascar minerals known in commercially exploitable quantities are gold, iron, copper, coal and tin. The gold is obtained mostly from placers.

MEXICO.

J. I. Limantour, Minister of Finance, has made plain the new regulation covering the collection of taxes on mining claims in the following circular to the director of the stamp revenue: "With a view to the application of the amendments made by Art. 10 of the decree of March 25 last, in the law governing the mining tax, the President of the republic has been pleased to direct that, when the claims (pertenencias) of one and the same company are embraced under a single title deed, the tax shall be collected from the outset at the rate of 6 pesos for the first twenty-five claims and 3 pesos for each claim in excess; and that, when the property of a company is constituted by various mines, each covered by a separate title deed, the tax shall be collected at the rate of 6 pesos per claim for each group if the area of said group does not exceed twenty-five claims, or, in the form above mentioned, if it does exceed said number, but always separately for each group; which, however, does not prevent the interested parties from having recourse to this department and demonstrating to it, with a view to the assessment of the tax, that the claims (pertenencias) covered by different title deeds are, nevertheless, contiguous to one another, and in such cases the resolutions that may be reached will in due course be communicated to you."

Jalisco.

The Mascota M. Co., operating north of Mascota, has completed a smelter of 100 tons. H. S. Church, manager of the company, has been operating an experimental plant for several months and has extracted 35% of zinc from the company's ore.

Sinaloa.

C. Butterfield and associates of Los Angeles, Cal., have acquired the Oro Fino properties, in the Sierra Madre, 30 miles beyond Rosario, and are putting in a 10-stamp mill.

Sonora.

The report of W. S. Cranz, president of the Zambona Dev. Co., which has taken over the Minas Nuevas, near Alamos, says that, since taking over the Zambona, Superintendent A. Yaeger has taken out the water and commenced placing guides in the main shaft, which is 530 feet deep. A new head-frame was put up, a tramway built, arrangements for handling the ore completed and the mine is now in condition for regular work. The mill is expected to be ready Aug. 1. An electric plant, capable of running a high-pressure main pump and electric hoist for underground work, is being put in. A new steam hoist for the main working shaft is expected to be in operation by July 8. In the mill most of the old machinery has been torn out, but it has been thought advisable to put the twenty stamps in repair. Besides the stamps, the mill will have sizing screens, a slime separator and six concentrators. It will be equipped with a water-saving system, as the water is from the surface thus far and is variable. It is the intention to double the capacity of the mill as soon as everything is in working condition, by crushing much coarser in the batteries and finishing the fine crushing with grinders.

Personal.

R. C. SHAW has returned from Costa Rica to New York City.

J. F. BRANDES of Denver, Colo., is on a professional trip to Utah.

H. BLAKE is superintendent Gold Bug mine, near Sumpter, Or.

W. A. KIDNEY is manager Basin Reduction Co., Basin, Mont.

OSCAR WHITE is superintendent Slocan Star mine, at Sandon, B. C.

S. P. DONNER is manager Ben Hur G. M. Co., near Republic, Wash.

W. R. WAPPLES has charge Pioneer mill at Sandy, Salt Lake county, Utah.

W. W. MILLS has been appointed State Geologist of Michigan, to succeed A. C. Lane.

H. F. BEST is manager Treasure Hill mine, Stockton Hill district, near Kingman, Ariz.

B. CLAPHAM, superintendent Fordice M. Co., has left Custer, S. D., for Columbia, Iowa.

AL. ROBERTS has been appointed superintendent January mine at Goldfield, Nev.

A. J. HOSKIN has been appointed assistant professor mining in Colorado School of Mines.

T. R. GARNIER of Los Angeles, Cal., has been at the St. Louis mine, near Kingman, Ariz.

E. W. BRADEN, manager East Helena, Mont., and Monte Cristo smelters, is in San Francisco, Cal.

E. P. FARNHAM of Deadwood, S. D., has been elected superintendent Chicago & Black Hills G. M. Co.

W. R. INGALLS assumes editorial charge of the Engineering and Mining Journal of New York to-day.

C. L. TUTT, president Takilma and Waldo mining companies, has been visiting the smelter at Takilma, Or.

N. HAAS of Spokane, Wash., has accepted the position of mining engineer for the Snowshoe mine at Libby, Mont.

A. W. MCCUNE has returned to Salt Lake City, Utah, from the mines of the Cerro de Pasco Copper Co. in Peru.

M. P. KIRK of El Paso, Texas, has succeeded W. L. Study as superintendent Big Bend M. Co. at Big Bend, Texas.

NORMAN CARMICHAEL, manager Highland mine, Ainsworth, B. C., has returned from a business trip to England.

C. P. AMES, formerly of Deadwood, S. D., has charge of the cyanide department of the Mainstay mill at Keystone, S. D.

A. D. WHEELER, formerly superintendent Hunter V mine, near Ymir, is operating the Krao mine, Ainsworth, B. C.

G. S. BINCKLEY has returned to San Francisco, Cal., from a professional trip to Santa Barbara and Los Angeles, Cal.

J. D. SPARGO, formerly superintendent Gold Road mine, will take charge of the West Gold Road M. Co., near Acme, Ariz.

T. A. RICKARD has resigned as editor of the Engineering and Mining Journal, the resignation going into effect on June 30.

A. H. ELFTMAN, who is now at Roosevelt, Idaho, will investigate properties in Nevada and may be addressed at Tonopah, Nev.

G. H. GRANT has taken charge of development work on the June group, Quatsino Sound, west coast Vancouver Island, B. C.

F. L. HARRINGTON of Bisbee, Ariz., vice-president and general manager Saginaw D. Co., has charge of work on the property.

W. Y. WILLIAMS, late superintendent Granby mines at Phœnix, B. C., has returned from a visit to Europe to the Similkameen district.

HUDSON H. NICHOLSON, general manager Standard Consol mine, is in Denver, Colo., on his way to San Juan, Colo., on professional business.

N. MCL. CURRAN, manager North Star mine, Kimberley, East Kootenay, B. C., has returned to the mine from a trip to Montreal, Quebec.

H. M. STEVENSON, manager Highlander mine at Ainsworth, B. C., has returned from a six months' visit to Mexico and the Eastern States.

H. A. PERKINS has resigned as manager New Era M. Co., Searchlight, Nev., and President W. R. Grosewich has been appointed his successor.

W. J. MORPHY, manager American Gold Fields Co., is in San Francisco, Cal., buying machinery for the Granite Hill mine, near Grants Pass, Or.

THOS. BAKEWELL, formerly with the Fearnot M. Co., Victorville, Cal., is now foreman Marfa & Mariposa M. Co., producing quicksilver at Terlingua, Texas.

T. C. LENTZ of Columbus, Ohio, president Ohio-Beaver Creek M. & M. Co., has been visiting the property in western Lawrence county, South Dakota.

H. C. HOOVER of the London firm of Bewick, Moreing & Co. left San Francisco, Cal., on the 29th ult. for Australia, where they have large mining interests.

JAMES W. NEILL, mining and metallurgical engineer who has served the United Copper Co. and F. A. Heinze in Butte as chief engineer for the past eighteen months, has severed his connection with these parties and has resumed his consulting engineering practice with headquarters at the Palace Hotel, San Francisco, Cal., and Dooly block, Salt Lake City, Utah.

DR. ROBT. H. RICHARDS of the Massachusetts Institute of Technology, and author of a comprehensive work on "Ore Dressing," is in San Francisco, Cal., accompanied by F. W. Horton, E. M. They are on their way to Portland, Or., where they will take charge of the work of investigating the platinum-bearing black sands of the United States, under the direction of Dr. David T. Day of the United States Geological Survey.

Books Received.

"Index to the Hydrographic Progress Reports of the U. S. Geological Survey, 1888 to 1903," by J. C. Hoyt and B. D. Wood.

Folio 123 of the United States Geological Survey, "Elder's Ridge, Pennsylvania," gives topographic and geological maps and description of the coal fields of western Pennsylvania.

As extracts from "Mineral Resources of the United States for 1904," the United States Geological Survey publishes "The Production of Mica in 1904," and "The Production of Arsenic in 1904."

Bulletin No. 262, "Contributions to Mineralogy from the U. S. Geological Survey," includes discussions on carnotite and associated vandiferous minerals in western Colorado; additions to the alunite-jarosite group; minerals from Clifton-Morenci district, Ariz.; emmonsite and tedradymite (tellurium minerals) from Colorado; lawsonite, yttrialite, pseudo-serpentine from Stevens county, Wash.; californite and dumortierite.

Obituary.

F. A. HUNT, a pioneer mining man of Denver, died in Denver, Colo., June 22, aged 70 years.

CHARLES CHRISTY, formerly superintendent of a large mining syndicate near Port Arthur, Manchuria, died June 26 at the Stockton, Cal., Insane Asylum.

ALFRED BENNETTS, lessee of the Landers mill at Silver City, Nev., and one of the prominent mine owners of the Comstock, committed suicide June 28. He was 53 years of age.

Commercial Paragraphs.

THE Crane Co., Chicago, Ill., have moved their general offices from 10 North Jefferson street to 519 South Canal street.

GEO. W. MYERS has returned to San Francisco, Cal., from a trip to the northern Pacific coast States and Alaska and reports large sales of chrome steel shoes, dies, etc. He leaves San Francisco in a few weeks for an extended trip to Australia and New Zealand.

THE Cyclone Drilling Machine Co. of Orrville, Ohio, report a phenomenal sale of prospecting drills, blast hole drills and "Economy" blast hole loaders. Since introducing the "Economy" blast hole loaders among the railroad contractors the sale of them has increased rapidly, many contractors having placed orders to supply their different camps.

THE Bethlehem Steel Co. is at work on three crank shafts which will weigh 86,600 pounds each when finished. They are turned out of solid steel ingots 25x4x4 feet, and are intended for three gas engines which are to drive 4000 kilowatt Crocker-Wheeler alternators, said to be the largest gas engine driven generators ever built, and ordered by the California Gas & Electric Corporation.

THE National Wood Pipe Co. of Los Angeles, Cal., and San Francisco, Cal., have made a shipment to the Detroit Copper Mining Co. of Morenci, Ariz., of 14-inch machine-banded redwood water pipe made for a head of 250 feet, or 108 pounds pressure per square inch, to be used by them for conveying water for their concentrators. They claim that this pipe is particularly adapted for water and soils heavily charged with acids, minerals or alkali. The staves for this pipe are made from 1½x4-inch clear, seasoned redwood stock. The Cananea Consolidated Copper Co. are using 8-inch, 10-inch, 12-inch and 16-inch machine-banded redwood water pipe for conveying water to the concentrators.

THE Chicago Pneumatic Tool Co. has brought suit in the U. S. Circuit Court for the southern district of New York against the Aurora Automatic Machinery Co. and the Scully Steel & Iron Co. for alleged infringement of the Chicago company's Kimman patent No. 630,357 of August 8, 1899. The bill of complaint prays for an injunction and an accounting for profits and damages against both companies. The Aurora Automatic Machinery Co. is the manufacturer of the "Thor" pneumatic tools and is represented by the Scully Steel & Iron Co. as selling agents in New York City. The suit is brought to enjoin the Aurora Co. from continuing to manufacture and sell the alleged infringing tools and the Scully Steel & Iron Co. from continuing to sell and offer for sale such tools. The application for an injunction to enjoin both companies will be heard at an early date. The Chicago company claims that the so-called "Thor" pneumatic tools infringe not only the referred to Kimman patent, but some of its other patents, and that the present suit will be followed in quick succession by other suits of a like character.

Trade Treatises.

"Mine Cages, Skips and Ore Cars" forms the subject of the latest trade treatise from the Wellman-Seaver-Morgan Co., Cleveland, Ohio, beautifully illustrated and finely descriptive of such mine appliances.

The S. H. Supply Co., Eighteenth and Lawrence street, Denver, Colo., have issued a neat catalogue describing Wild's shaking screen for ore sizing. It is designed to screen wet or dry, or fine or coarse.

Bulletin No. 58 from the Crocker-Wheeler Co., Ampere, N. J., is entitled "An Electrified Railway Shop Described by Its Mechanical Engineer," and shows how electric devices and appliances were successfully used in economically supplanting the former system in a large machine shop. The manifest economic value of the treatise is supplemented by the practical manner in which the various changes were effected.

"The Pelton Water Wheel" is the subject of an elaborate trade treatise issued in sumptuous style by the Pelton Water Wheel Co., 125 Main street, San Francisco, Cal., and 143 Liberty street, New York City. It is the tenth 1905 edition of a monograph that sets forth the variations of construction and application of the Pelton system of power, and in its arrangement and general plan is worthy of the establishment whose power producers are therein so finely illustrated and described. The book is standard size and deserves a place in the working library of a mining or hydraulic engineer.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JUNE 20, 1905.

792,747.—LEAF BINDER—Anderson, Weinss & Miller, Spokane, Wash.
792,875.—BLOCK SIGNALS—C. P. Bass, Portland, Or.
792,756.—SIGNS—H. Christensen, Seattle, Wash.
792,815.—SHOE POLISHER—S. M. Cohn, Portland, Or.
792,966.—DOOR FASTENER—Coleman & Gregory, Index, Wash.
792,587.—RAIL TIE—T. A. & J. V. Enloe, Pinole, Cal.
792,699.—EXCAVATOR—W. H. Fulcher, Oakland, Cal.
792,770.—VEHICLE SHAFT—F. C. Goetteri, Los Angeles, Cal.
792,987.—AIR COMPRESSOR—G. J. Henry, Jr., S. F.
792,991.—BOTTLE—F. Jost, S. F.
792,779.—GRAMAPHONE—G. Konigstein, S. F.
792,717.—GARMENT CLASP—Mensor & Greenblatt, Seattle, Wash.
792,718.—HEADLIGHT—O. E. Mitchell, Los Angeles, Cal.
792,840.—LOOSE LEAF BINDER—M. C. Neuner, Los Angeles, Cal.
793,020.—SWAGE—Newell & Staley, Buckeye, Wash.
792,610.—METAL COATING TANK—G. Porter, S. F.
792,923.—MONEY BOX—W. N. Porter, Lents, Or.
792,792.—ELECTRIC IRON—E. H. Richardson, Ontario, Cal.
792,821.—CAN—A. H. & T. A. Schlueter, Oakland, Cal.
792,734.—ELECTRIC SWITCH—H. A. Schultz, Berkeley, Cal.
792,949.—PUNCH—L. Van Dorin, San Bernardino, Cal.
792,687.—PROPULSION—K. O. Woll, Tacoma, Wash.
792,648.—DRILL SHARPENER—J. H. Word, Soulsbyville, Cal.

Latest Market Reports.

SAN FRANCISCO, June 30, 1905.

METALS.

SILVER.—Per oz., Troy: London, 27d (standard ounce, 925 fine); New York, bar silver, 58⅝c, refined (1000 fine); San Francisco, 58⅜c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, $15.00; Lake, 1 to 3 casks, $15.00@15.25; Electrolytic, 1 to 3 casks, $15.25; Casting, 1 to 3 casks, $14.50@14.75. San Francisco: $16.00. Mill copper plates, $17.00; bars, 18@24c. London: £66 2s 6d spot per ton.

An Eastern authority says in the Boston Financial News: "The statistical position of the metal is so strong that I do not expect the level of prices to be lowered beneath the 15-cent mark for at least a year. The general feeling is that an early peace between Russia and Japan might have effects that have not been calculated. At the present time the life of the market is the demand from European sources, and this demand has been largely stimulated by what is called Chinese buying. Whether this nomenclature is correct or not is a matter of question to those who know the circumstances. It has been known that a great deal of copper from Japanese sources has been consumed in China, and that this supply has largely been cut off by the war. But the Japanese themselves have consumed great masses of the metal for manufacture into brass, which is largely used in the manufacture of cartridges and other war paraphernalia. It does not escape notice that copper so used might have been considered contraband of war, and as the lines which have their terminals in Hongkong all pass through at least two Japanese ports, it is a matter entirely of conjecture as to how much of the copper bought for the Chinese mint has really arrived there and how much has found its way to Japanese sources. This matter is important only in considering what effect the end of the war will have on the continuance of the demand. The logical conclusion to be reached is that with the ending of hostilities the Japanese mines will again begin production on the same scale that obtained before the war started. The insistent demand for the metal will abate and the demand can be filled leisurely. If that should prove to be the case, there would undoubtedly be a lessening of the demand for copper that might well affect the market adversely."

LEAD.—New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.12½; San Francisco, $3.70, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £13 6s 3d ℔ long ton.

SPELTER.—New York, $5.30; St. Louis, $5.70; London, £24 ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $30.75; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, ℔ lb., 35@37½c. London, £140.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.50 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER.—New York, $39.00@$40.00, large lots; London, £7 7s 6d; San Francisco, local, $38.00@38.00 ℔ flask of 75 lbs.; Denver, $45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20.75c; San Francisco, Plumbers', 100-lb. lots, 17.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.60; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@$23.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lbs. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ℔ set; 14 oz., 40s., 9¾c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¾c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¼@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¾@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 62c; cs., 67c; raw, bbl., 60c; cs., 65c; Lucol oil, boiled, bbl., 54c; cs., 59c; raw-bbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

MOLYBDENUM.—Best, $2.75 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

URANIUM.—Oxide, ℔ lb., $3.50.

MERCURY.—Bichloride, ℔ lb., 77c.

TUNGSTEN.—Best, ℔ lb., $1.25.

PHOSPHORUS.—American, ℔ lb., 70c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¾c; less than 500 lbs., 8c.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MAGNESIUM.—Pure, N. Y., $1.60.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

MULTIPLE-VIEW CAMERA.—No. 792,245. June 13, 1905. James W. Anderson, Santa Cruz, Cal. This invention relates to improvements in photographic apparatus, and pertains especially to a multiple or consecutive view camera or camera attachment employing a sensitive glass plate, cut film, or any flat sensitized surface upon which may be photographed in more or less rapid succession objects in their various natural positions or movements. The main object of the invention is to provide a camera or an attachment for a camera particularly adapted for gallery use which will enable the operator to take a series of pictures of moving or stationary objects in most rapid succession on one plate or which will allow each photo separately to be given a prolonged exposure, as by removing the cap each time in the manner of ordinary multiple cameras, or which will permit the whole plate to be exposed at one exposure, as for ordinary portrait work. The invention comprises mechanism for imparting an intermittent horizontal reciprocating movement to a plate across a light aperture and a movement of the plate transverse to its line of reciprocations whereby the plate momentarily is stopped during each exposure and whereby the whole sensitive surface may be taken up with one or more rows of distinct individual pictures.

CONTAINING AND POURING CAN.—No. 792,621. June 20, 1905. Adolph H Schlueter and Theodore A. Schlueter, Oakland, Cal. The object of this invention is to permit the withdrawal of liquids from larger to smaller receptacles without overflow and waste and to provide an apparatus for this purpose which can be effectively used without a faucet or separate filling nozzle. The device consists of an improved containing can having an air tube contained wholly within it, having one end fixed in the head of the can, said tube extending at an angle toward the side of the can and terminating short of said side, a filling nozzle connecting directly with the opposite or outer end of said tube, and a siphon-shaped pouring spout fixed in the head of the can at one side of the center thereof.

EXCAVATING APPARATUS.—No. 792,699. June 20, 1905. William H. Fulcher, Oakland, Cal. This invention is designed for making excavations of any sort, especially for digging ditches or canals, removing the earth and delivering it either to form embankments or to discharge it at a distance from the digging apparatus. It is also susceptible of use in removing earth which is piled above the surface, leveling it or changing its grade, and for various similar operations. The device comprises a frame having turnable bearings and guiding wheels, cables connecting with said wheeled frames winding drums by which said cables are moved to turn the wheels of a motor carried upon the main frame, reversible clutches, mechanism comprising chain and chain pulleys whereby motion is transmitted to the wheel-steering apparatus.

AUTOMATIC ELECTRIC SWITCH.—No 792,734. June 20, 1905. Herman A. Shultz, Berkeley, Cal. This invention relates to an apparatus by which pumps and other machinery may be automatically set in motion or their operation discontinued through the medium of an electric current. The object of the invention is to provide a simple, practical form of electrical circuit-closing mechanism which is applicable for use particularly in the pumping of water, such as in cellars, basements, mines and other places where flooding or overflow is liable to occur and where the rise and fall of the water will start or stop a suitable pump or equivalent apparatus for reducing the amount. The device consists of the combination with an electric switch, of a float, of a fulcrumed lever, connections between the float and the lever, connections between the lever and a movable member of the switch, and a wedge-shaped yieldable member against which one end of the lever is traversable.

GRAMOPHONE ATTACHMENTS.—No 792,779. June 20, 1905. Gabor Konigstein, San Francisco, Cal. This invention relates to an attachment which is designed for use in conjunction with the movable arms of gramophones or talking machines; and it is especially designed to protect the diaphragm and its attachments from injury. The device comprises a readily attachable and removable cap-shaped member adapted to fit the sound box of a gramophone, said member serving to protect the stylus-support of the box and being made perforated to permit the free passage of sound-waves.

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Single Expansion & Compound
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Electric Locomotives
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STEAM and COMPRESSED AIR.

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Compressed Air for Underground or Hazardous Surface Haulage—Most Economical. Dependable, Safe and Satisfactory. Illustrated Catalogue on application if mine owner or official. Address, mentioning this paper.

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Has no equal for operating over heavy grades, sharp curves and temporary tracks.

Weights, 10 to 150 tons.

Broad or narrow gauge. Fitted with strictly modern appliances.

We are also builders of Direct-connected Locomotives of 3 to 50-ton sizes.

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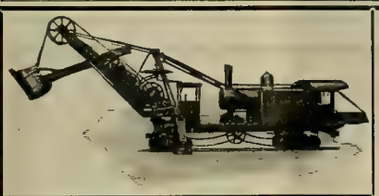

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WILLIS PLANIMETER.
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HINE STEAM SEPARATOR.

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ASSESSMENT NOTICE.

ALTA SIERRA GOLD MINING COMPANY.—Location of principal place of business, Room 620, Kohl Building, 406 Montgomery street, San Francisco, California; location of works, Sierra County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 22nd day of June, 1905, an assessment (No. 2) of thirty (30) cents per share was levied on all the issued capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, Room 620, Kohl Building, 406 Montgomery street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on Saturday, the 19th day of August, 1905, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 18th day of September, 1905, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

SAM. W. CHEYNEY, Secretary.

Office—Room 620, Kohl Building, 406 Montgomery street, San Francisco, California.

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Do you realize that a gas engine using distillate is the cheapest source of power in California?

Why not find out what such a plant would cost YOU?

Tell me where you are, how much power you require and what it is used for, and I will send you a written estimate without cost to you.

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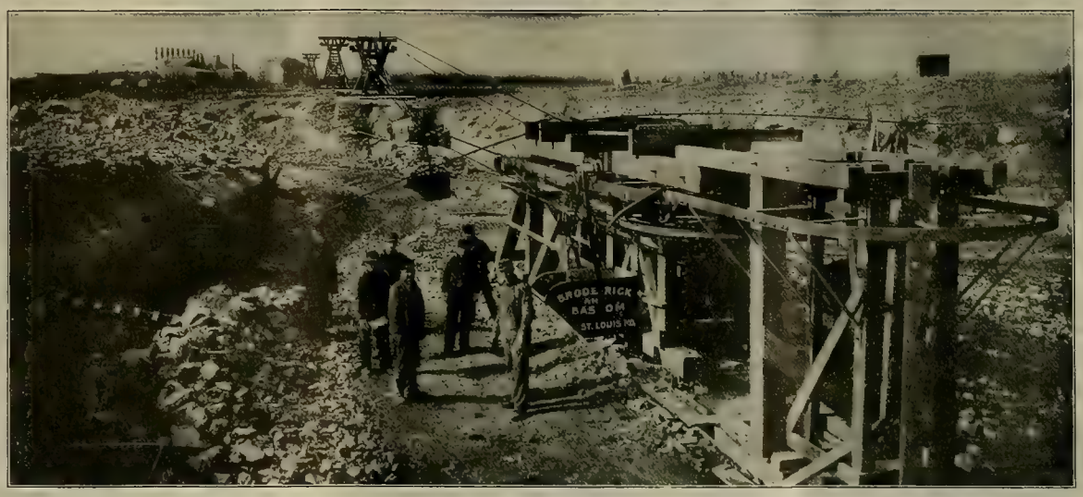

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For the Reduction of Ores.

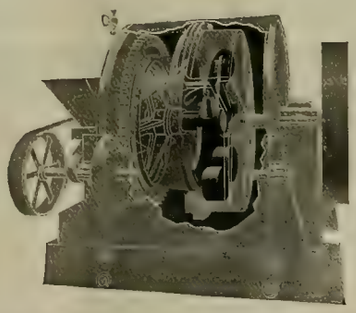
A Mill that will give the greatest capacity with least wear and least horse power expended of any machine of this type.

A Direct Drive.

Has but 5 Bearings.

Screens the Ore Before Grinding.

Screen and Automatic Feeder a Part of Mill.



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Dust Proof When Crushing Dry.

Requires No Expensive Foundation.

Made in Three Sizes:

NO. 1	MILL,	30-Inch	Ring	Die,	Capacity	4 to	8	Tons,	Weight	2,000	Lbs.
" 2	"	42	"	"	"	20 "	40	"	"	6,400	"
" 3	"	60	"	"	"	35 "	60	"	"	14,000	"

THE GREATEST SALE OF ANY MILL EVER PLACED ON THE MARKET.

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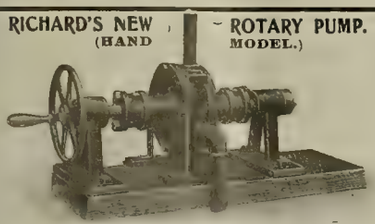

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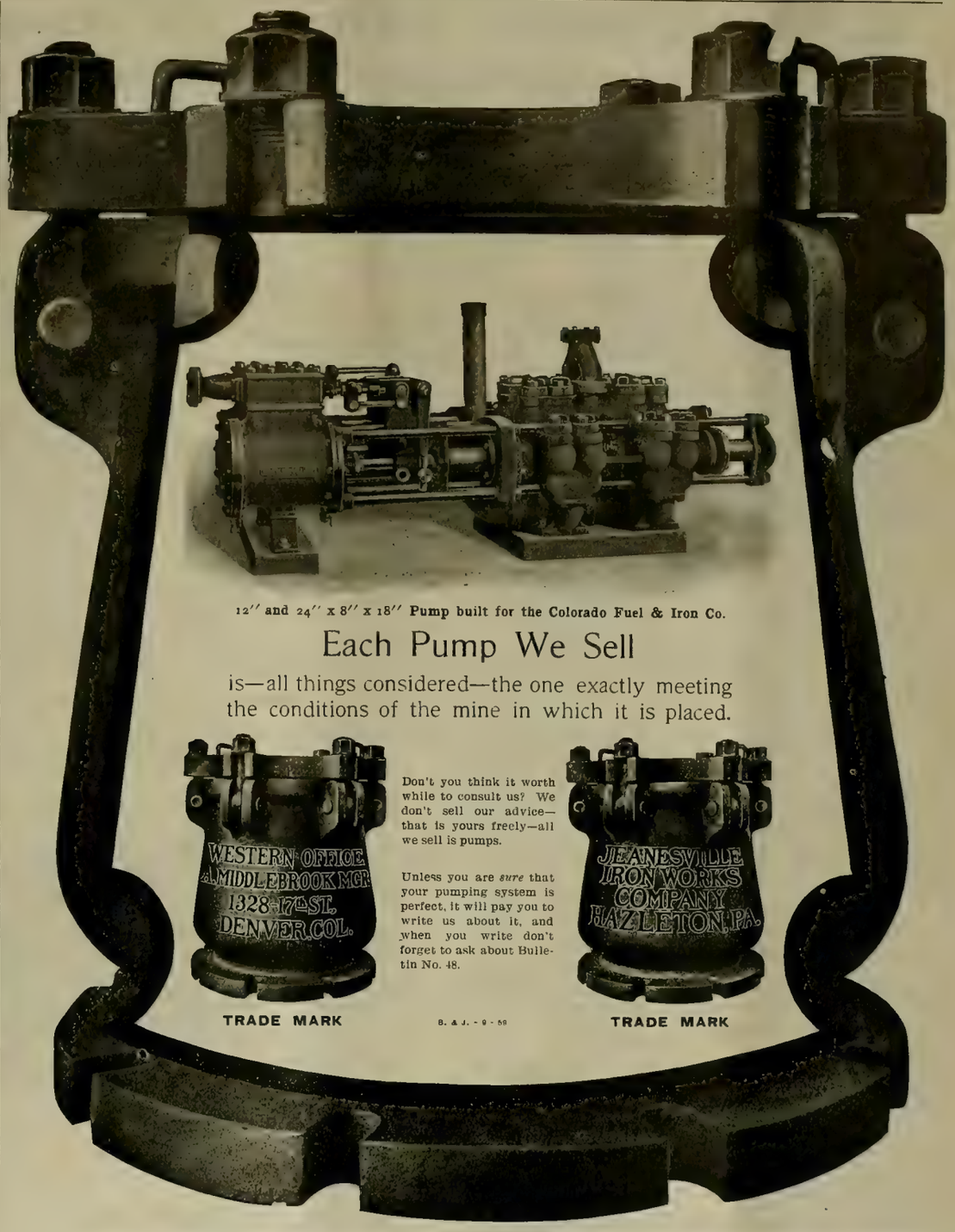

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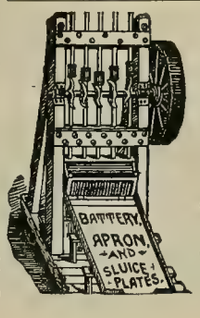

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Keystone Lubricating Co.

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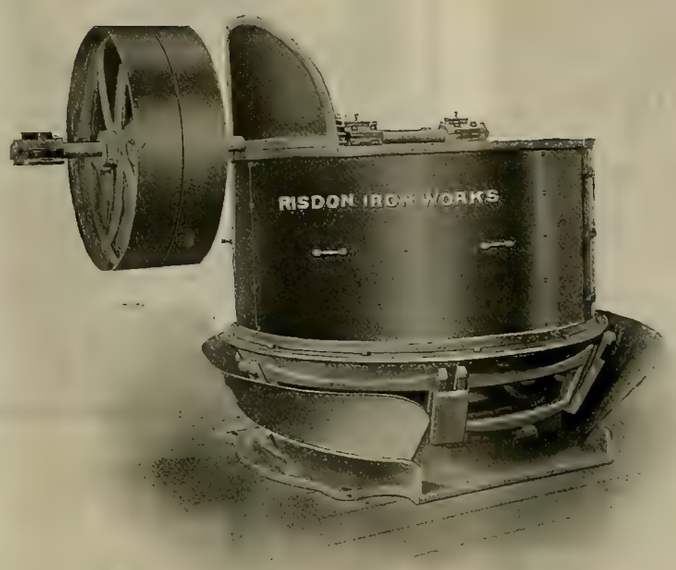

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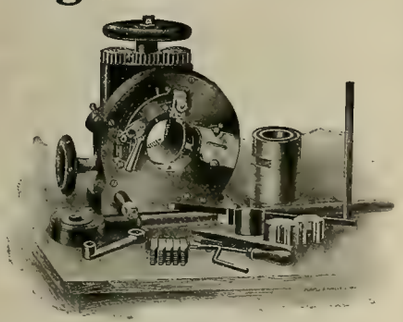

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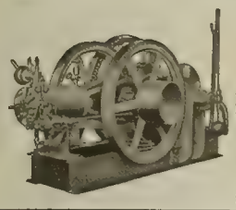

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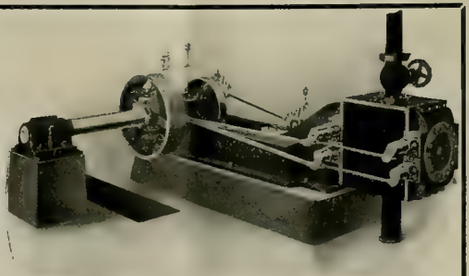

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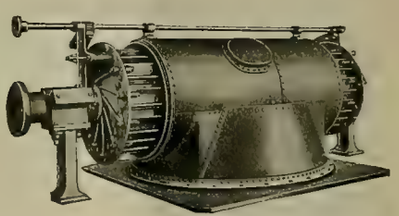

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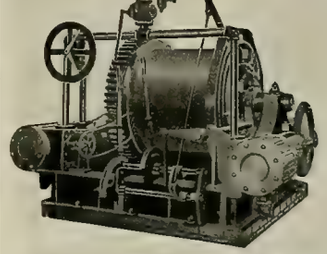

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CALIFORNIA SAFE DEPOSIT AND TRUST COMPANY,

Corner California and Montgomery Streets.

For the six months ending June 30, 1905, dividends have been declared on the deposits in the savings department of this company, as follows: On term deposits at the rate of 3 6-10 per cent per annum, and on ordinary deposits at the rate of 3¼ per cent per annum, free of taxes, and payable on and after Saturday, July 1, 1905.

J. DALZELL BROWN, Manager.

DIVIDEND NOTICE

San Francisco Savings Union

532 California St., Cor. Webb.

For the half year ending with the 30th of June, 1905, a dividend has been declared at the rate per annum of three and six-tenths (3 6-10) per cent on term deposits, and three and fifteen one-hundredths (3 15-100) per cent on ordinary deposits, free of taxes, payable on and after Saturday, July 1, 1905.

LOVELL WHITE, Cashier.

DIVIDEND NOTICE

The German Savings and Loan Society,

526 CALIFORNIA STREET.

For the half year ending June 30, 1905, a dividend has been declared at the rate of three and one-half (3½) per cent per annum on all deposits, free of taxes, payable on and after Saturday, July 1, 1905.

GEORGE TOURNY, Secretary.

Dividend Notice.

SECURITY SAVINGS BANK,

316 MONTGOMERY ST.

For the half year ending June 30, 1905, dividends upon all deposits at the rate of three and one-quarter (3¼) per cent per annum, free of taxes, will be payable on and after July 1, 1905.

FRED W RAY, Secretary.

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Dividend Notice.

Mutual Savings Bank of San Francisco,

710 MARKET STREET

For the half year ending June 30, 1905, a dividend has been declared at the rate of three and one-quarter (3¼) per cent on all deposits, compounded semi-annually and free of taxes, payable on and after Saturday, July 1, 1905.

GEO. A. STORY, Cashier.

Dividend Notice.

SAVINGS AND LOAN SOCIETY,

101 MONTGOMERY ST. COR OF SUTTER.

Has declared a dividend for the term ending June 30, 1905, at the rate of three and one-half (3½) per cent per annum on all deposits, free of taxes, payable on and after Saturday, July 1, 1905.

EDWIN BONNELL, Asst. Cashier.

Dividend Notice.

Office of the HIBERNIA SAVINGS & LOAN SOCIETY, Corner Market, McAllister and Jones Streets.

San Francisco, June 28, 1905.—At a regular meeting of the Board of Directors of this Society, held this day, a dividend has been declared at the rate of three and one-half (3½) per cent per annum on all deposits for the six months ending June 30, 1905, free from all taxes, and payable on and after July 1, 1905. ROBERT J. TOBIN, Secretary.

Dividend Notice.

THE CENTRAL TRUST COMPANY OF CALIFORNIA,

42 Montgomery Street, Cor. of Sutter.

For the half year ending June 30, 1905, a dividend has been declared on the deposits in the savings department of this bank, as follows: On term deposits at the rate of 3 6-10 per cent per annum, and on ordinary deposits at the rate of 3¼ per cent per annum, free of taxes, payable on and after Saturday, July 1, 1905. FRANK J. SYMMES, President.

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=FOR=
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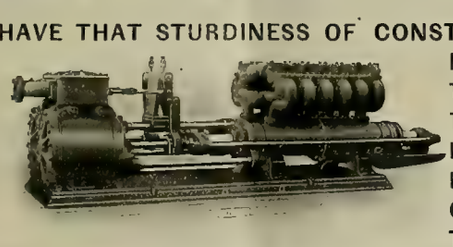
HAVE THAT STURDINESS OF CONSTRUCTION THAT ENABLES THEM TO WITHSTAND THE HEAVIEST DUTY WITH A MINIMUM OF CARE AND ATTENTION.



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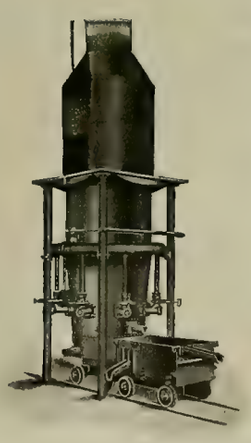
A BARGAIN.



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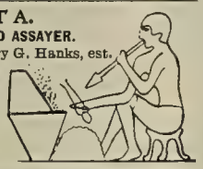
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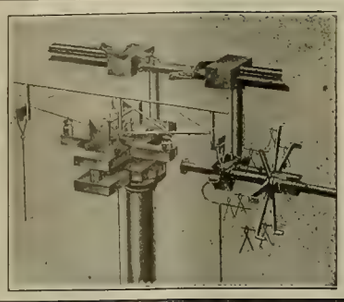

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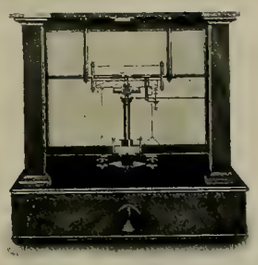

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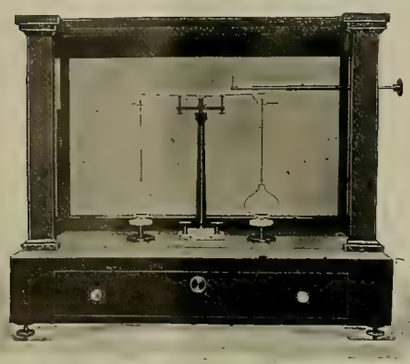

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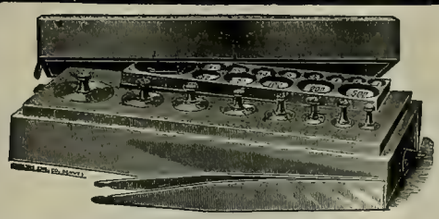

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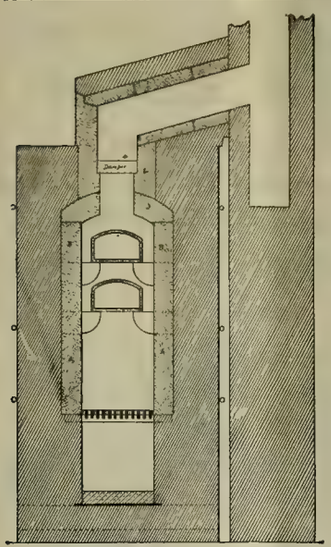

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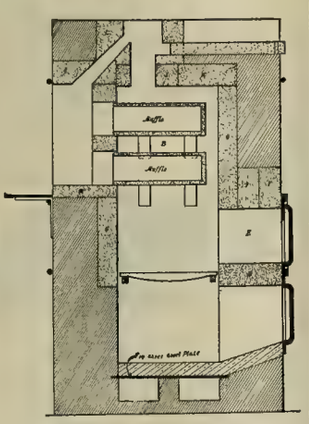

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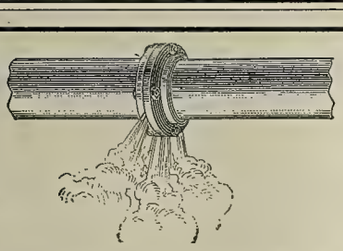

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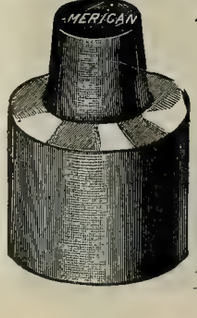

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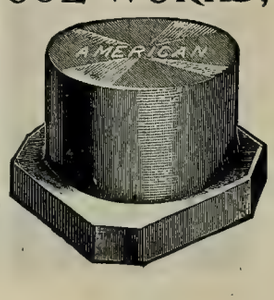

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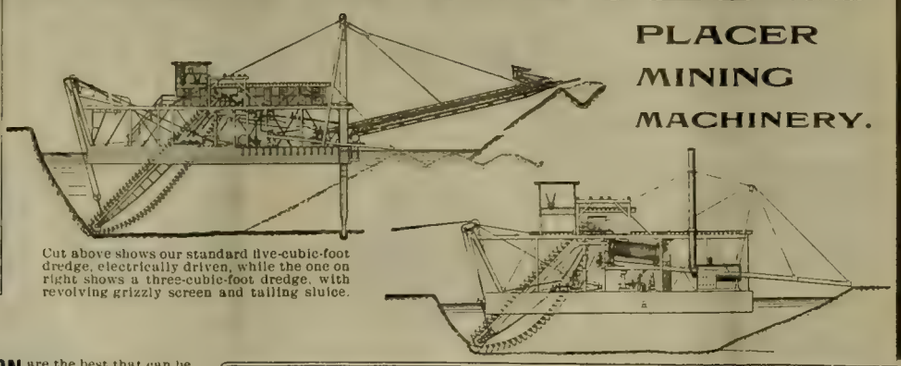

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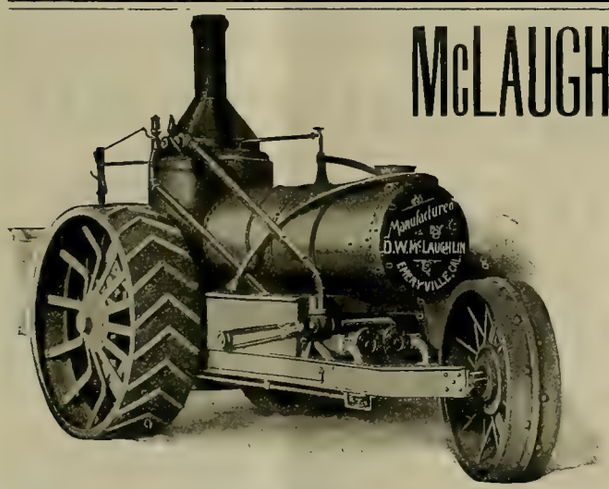

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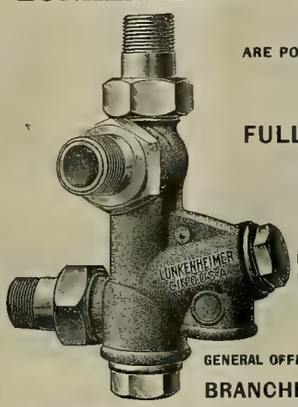

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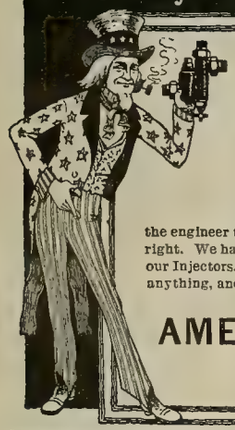

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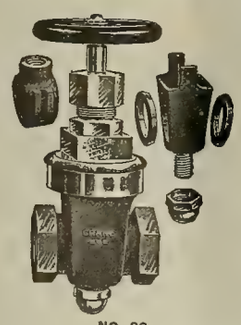

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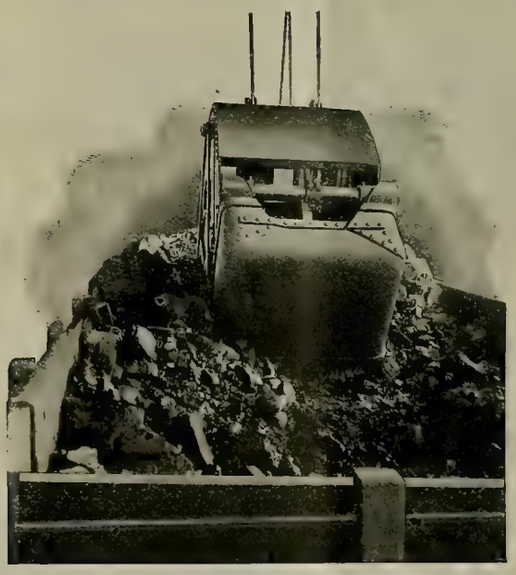

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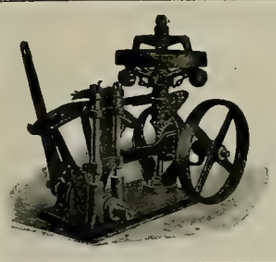

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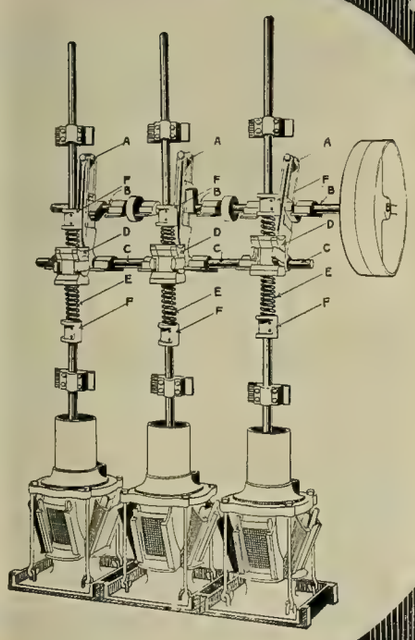

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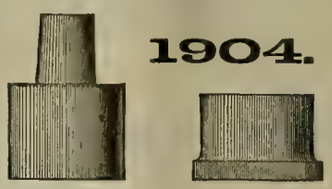

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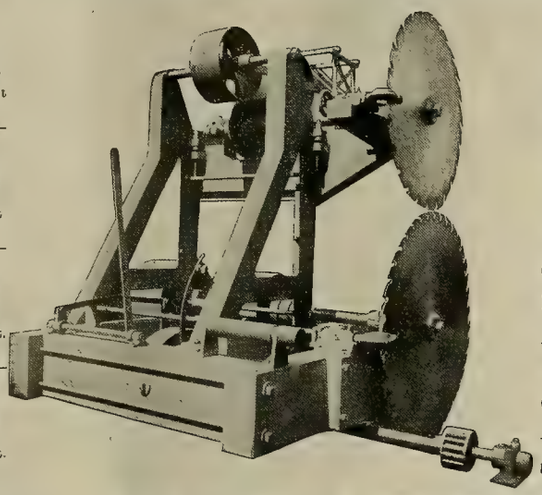

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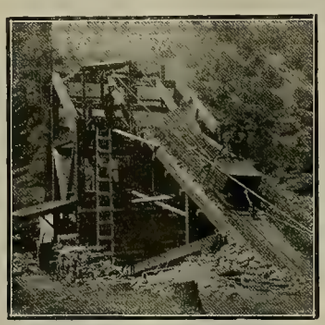

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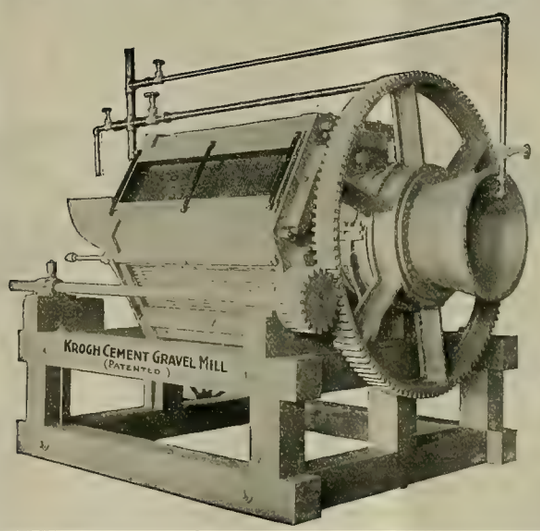

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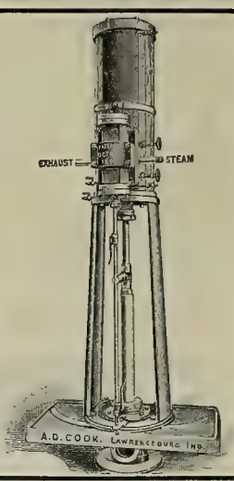

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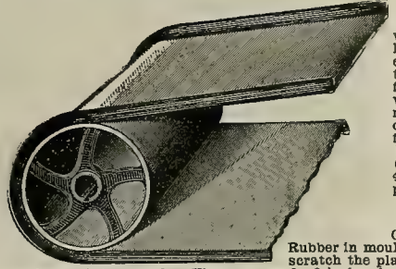

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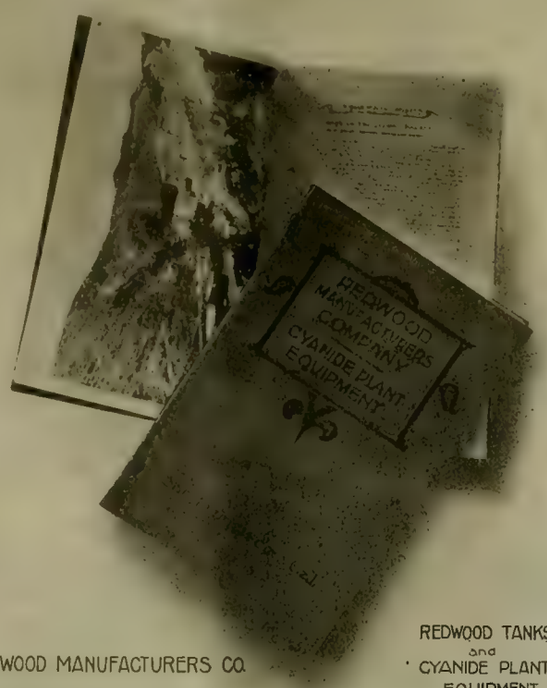

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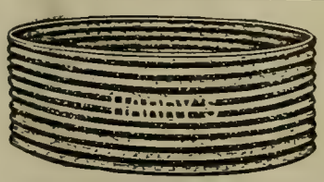

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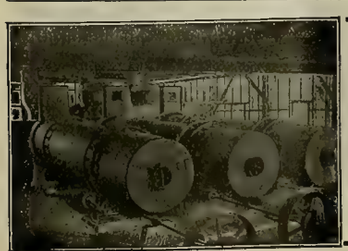

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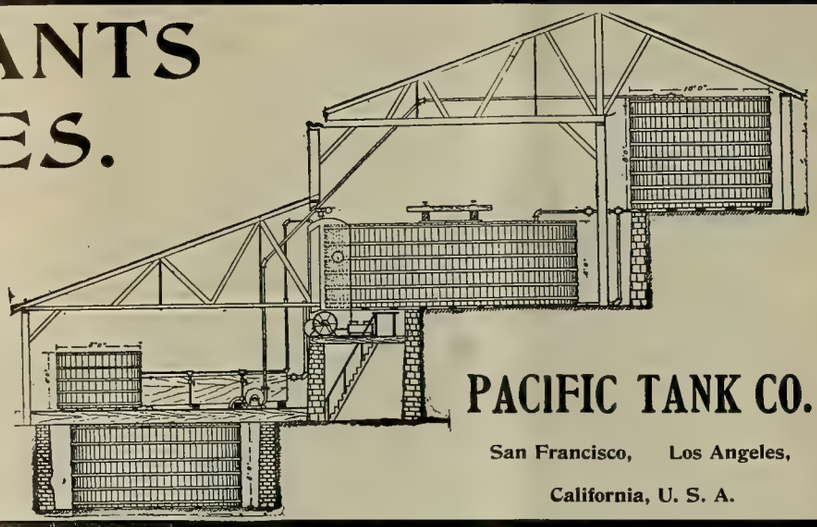

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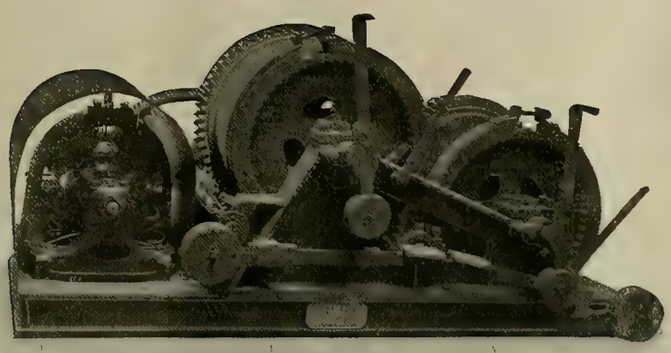

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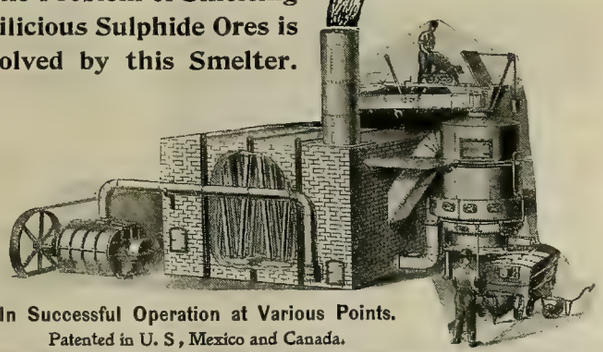

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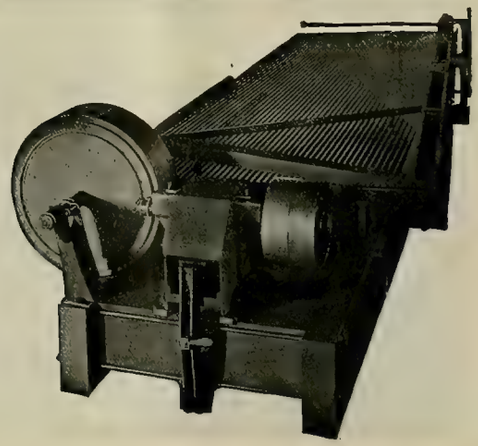

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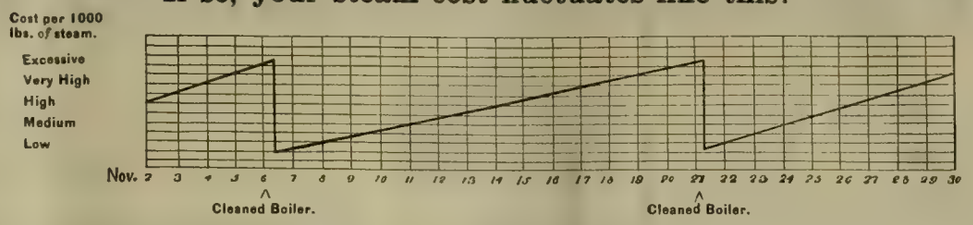
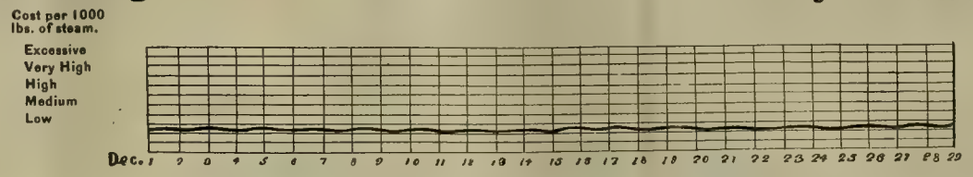

Cost per 1000 lbs. of steam.
Excessive
Very High
High
Medium
Low
Nov. 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Cleaned Boiler.
Cleaned Boiler.

Here you will notice that although the cost of steam is comparatively low, right after the boiler scale has been removed, yet it rapidly rises because the scale immediately commences to deposit and thus insulates the tubes.

The Dearborn Chemical Treatment Prevents Scale Forming and the Cost of Steam is Always Low.



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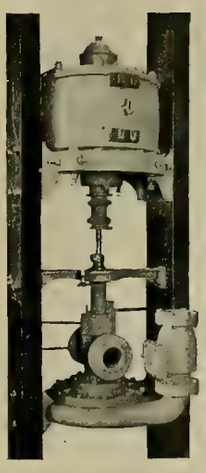
As illustrated, is rigged up in the shaft of a mine, allowing the pump to be raised or lowered as desired. It is driven by a Westinghouse Induction Motor.



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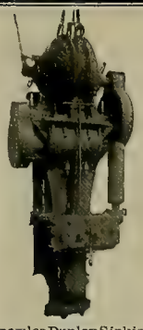

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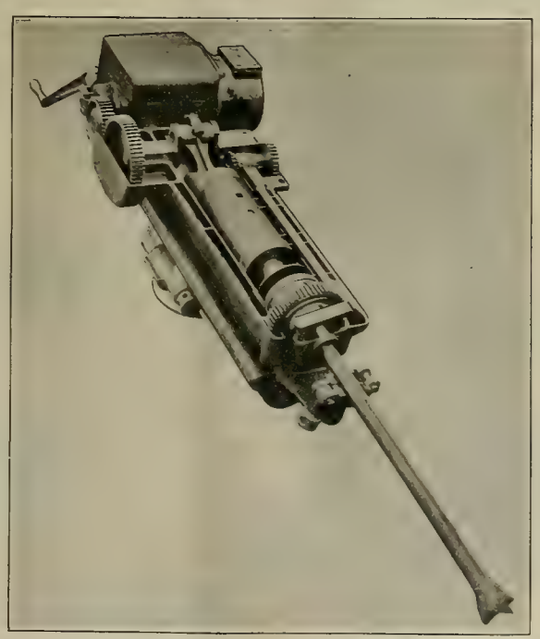
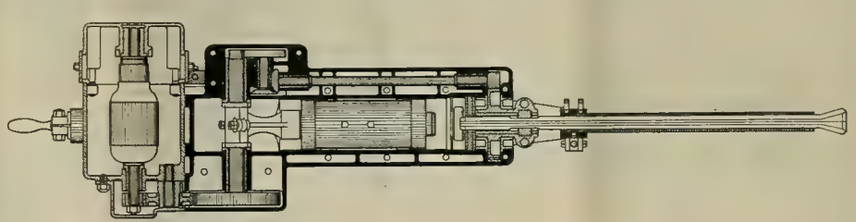
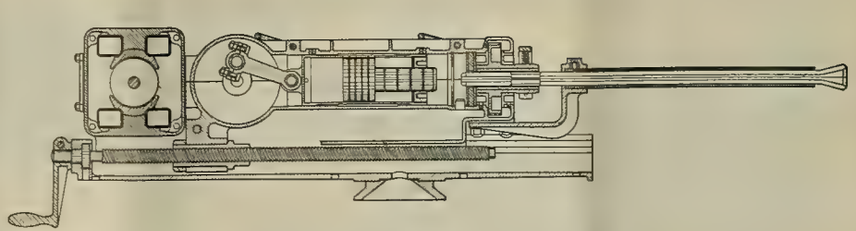
NO FLEXIBLE SHAFT. NO SPRINGS.



The entire moving mechanism is so constructed as to require only two bolts to hold it together. There are no keys or setscrews to get loose. All moving parts run in oil-tight case except the motor, and this does not require oil. No ball-bearings or other delicate details of construction.





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Whole No. 2346.—VOLUME XCI. Number 2. SAN FRANCISCO, CAL., SATURDAY, JULY 8, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

The Honerine Mill, Utah.

One mile from Stockton, in Tooele county, Utah, and on the east side of Tooele valley, is the Honerine mill, which is treating the ore from the Honerine mine and also the tailings from the dump of the old Honerine mill. The accompanying illustration shows the Honerine mill, with the track running into the mill from the drainage and transportation tunnel, also the railroad track underneath where the cars are filled with concentrates from the side of the building by means of iron chutes. The photo shows the machine shop and end of mill. The mill is fully equipped with modern devices for the treatment of the ore. The tailings from the old mill dump are being hauled about 1300 feet and run down to a chute in the tunnel through an air shaft and from there hauled in trains by mules to the mill. The ore is handled by conveyor, which delivers it from bins to the mill, where it is crushed and elevated to a trommel filled with ½-inch mesh screen. The oversize goes to rolls and is crushed dry. The fine ore is elevated to the top of the mill where it passes through an automatic sampler, the mill throughout operating automatically, by gravity and elevating devices. In the mill are three Huntington mills, one Chile mill, jigs and sizing devices, beside the Sherman system of hydraulic classification. From the Sherman classifiers the pulp goes to Wilfley tables and slimers, of which there is a total of twenty-six machines.

The Honerine Mill, Near Stockton, Utah.

Passing of a Lake Superior Copper Mine.

The Phœnix mine, comprising over 2000 acres of land in the copper belt of the Keweenaw peninsula, Michigan, after an existence of sixteen years, has been closed indefinitely. The original Phœnix vein was vigorously explored from 1844 to 1886 and was an important producer in those days. The largest mass of copper ever discovered came from this mine. There are several veins on the property which are well equipped. A large mill was completed in 1903, but this has never run continuously to its full capacity. The ore carried about 1.5% copper. It is apparent that the small veins in this property have failed to yield sufficient ore to keep the mill in continuous operation. Some recent development is stated as having been disappointing. This withdraws one of the noted mines from the list of producers on the Lake, for a time at least, if not permanently, but its failure will scarcely be noticed.

Mining operations were commenced in the Lake Superior region about 1845, under permits issued by the War Department. Out of 1000 permits issued, 960 locations were taken. One of the first mines opened was the Cliff, in which was discovered the first mass of copper. The Cliff mine yielded a large amount of mass metal. Skilled men, known as copper cutters, were employed to cut these great masses into sizes that could be economically handled. Contrary to the common belief, masses are less profitable than when metal occurs in disseminated grains.

The Comstock Silver Mine, Near Park City, Utah.

Intake Side Pumping Plant, Bouldin Island, Cal. (See Page 28.)

Comstock Mine, Summit Co., Utah.

One of the important mines of Summit county, Utah, is the Comstock, situated in Thayner's canyon, in the Park City district, and is presumed to be on Silver King fissure system. The main shaft has three compartments, timbered with 12x12 inch, Oregon pine, and the property is also extensively developed by means of tunnels. The accompanying illustration shows the mine, dump and mill. The concentrating mill has a capacity of 120 tons per day. The Comstock vein can be drained by a tunnel at a depth of 2000 feet, connecting with the Alliance tunnel. The main offices of the company are in Salt Lake City, Utah.

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Again the Broad Lode Case.

The "broad lode" question is again likely to receive considerable attention in the courts, in the suits recently instituted in the Cœur d'Alene district of Idaho, where at least two apex suits against the Bunker Hill & Sullivan Company will be tried. Whether the prior locator on a vein takes the entire lode within the end lines of the claim having a part of the lode only, the courts do not uniformly agree. In a few instances lodes are found to be of such great width as to extend outside of the side lines of the claim. Particularly is this the case in those sections where local laws have made narrow locations (less than 600 feet) the rule. In one instance a territorial court decided that the prior locator, having a portion of the apex, took the whole lode, even if it did extend beyond the side line. In another case where a claim was located along the strike of a broad vein, and a junior locator took up a claim on the portion of the lode beyond the senior locator's side line, but laid his end lines at an angle of about 45% to the side line, the court decided each had extralateral rights, but that the junior locator's rights did not begin until the vertical projection of the end lines on the dip had passed beyond conflict with the senior locator's rights—one following the dip of the vein in a direction normal to the strike of the vein, the other taking a segment at an angle conforming to the direction of the angling side lines. The complex conditions arising from the situation now again attracting so much attention in the Cœur d'Alenes teaches one lesson at least, and it will no doubt have a tendency to induce large companies in the future to secure all the ground possible, not only in their immediate vicinity, but far beyond, as a protection against lawsuits should the mines prove rich and extensive. There are few great mines in the Western United States where there has not been more or less litigation over adjoining properties before the legal rights of the several mine owners were determined by the courts. In a few instances a more wise policy has been pursued, and the contiguous property owners have agreed upon definite boundaries, and the rights of each have been well established, as in some of the copper camps of southeastern Arizona, but it is too late to expect to find anything of this sort in the mines about Wardner, Idaho, when large sums of money are involved, and where there still remains an uncertainty as to the legal rights of the contestants.

In the Rut.

In no branch of industrial life are men so prone to fall into routine in their work as in gold mining. The old-time methods, which have been used for years, are too often considered good enough, and the conservative gold-mill man complacently views his work and "falls into a rut." He becomes ultra-conservative, and in time looks with suspicion upon a new device with which he is unacquainted, and deprecates innovation of any kind. It is not so much, perhaps, the firm belief that no better work is possible than that being accomplished by himself or under his direction, as it is the thought of the disagreeable consequences of having it shown that for years he has been losing values that might have easily been saved had he been a little more flexible in his methods and a trifle less conservative in his ideas. If a reason for such a condition is sought, it will be found possibly that the production of gold is without competition. An ounce of pure gold has a fixed value in every civilized country in the world, and the gold miner's only competitor is the expense of production, and if, perchance, the mine is a dividend payer this only competitor is often considered as of small consequence. There have been as many innovations in the metallurgy of gold as in that of other metals, due to this competitor—expense. In copper, tin, lead, zinc and iron mining there is brisk competition, both at home and abroad, and he who seeks success in the production of base metals must needs keep well informed as to the best and latest improvements in the metallurgy of the metal he is producing. In copper smelting particularly has there been taken the most rapid strides, and here the most radical changes have been made, and the boldness of some of them is somewhat startling. The new superintendent of a large smelter sought to reduce the expense of matting. He found two large furnaces built in line with a considerable working space between. He drew the fires, cut the back end out of each furnace and constructed a central section similar to the remainder of the two furnaces, uniting them in one long furnace. The result of this previously unheard of innovation in furnace construction was the increasing of the capacity nearly 100%, in addition to which the gases from the furnace are utilized, furnishing several hundred horsepower.

The old-time mill man needs to bestir himself—the industrial world is moving, and moving rapidly, and he who fails to move with it will be left so far behind that it will be far more difficult to catch up than it is to keep up.

It is a good thing for the miner and metallurgist to travel about occasionally and to take notice of how things are done in other places by other men. It is true many are so situated that they cannot move about from place to place, and the only thing left for these is to keep informed by carefully reading the technical journals, which make a specialty of their line of work. In the best of these is found the latest of everything pertaining to mining and metallurgy, and they are indispensable to the man who seeks knowledge but cannot leave home to obtain it—they lift him "out of the rut."

THE Granby Mining Co. of British Columbia have been operating their large copper property on a liberal scale, and have demonstrated that a profit is possible in mining, transporting and reducing an ore containing 1.25% copper and less than $2 in gold and silver per ton. Of course this is only possible under very favorable circumstances, where the vein or ore deposit is of great size, and the ore of a kind requiring little or no foreign admixture of barren fluxing material, and where the fuel is cheap. Since such is the case it would seem that there may be more promising copper deposits of great possibilities than has been generally supposed.

Inaccuracies in Mill Sampling.

In many cases too much dependence is placed on rudely taken mill samples, and this dependence on an unreliable source of information is prolific of much friction between the mill superintendent and the home office. Those who have had experience in taking "grab" or "car samples," or samples from the ore bin chutes of the feeder hoppers, realize better than most others the inaccuracies incident to these methods. It cannot be said that it is impossible to take a fairly representative sample of ore as it passes along its journey from the stopes to the battery in the mill, for samples may be taken, which represent as accurately as it is possible for machinery to accomplish it, the value of the ore. The usual make-shift methods of grabbing a handful, a piece, or a shovelful at stated intervals, cannot be depended upon for results which are even approximately accurate. The ore as it comes from the mine consists of pieces which vary in size from particles which will pass a 100-mesh screen to masses weighing 100 pounds or more. In the average mill the run-of-mine rock is dumped on the grizzlies, the fine passes through and accumulates in one portion of the bin, while the harder coarse pieces are fed to the breaker and usually drop from the breaker jaws into another part of the bin beneath. The result of this practice is that some of the stamps continually receive the greater part of the fines, which may be either richer or poorer than the balance of the ore, and the coarse rock passes to other stamps. The cleanup shows the difference, as a rule, between the batteries working on hard rock and those crushing the fines. Hand samples from the several feeders must give differing results.

As the material varies somewhat in the relative quantity of fines to the amount of coarse rock produced, another element of uncertainty is introduced. These ordinary methods of taking head samples in the mill cannot possibly represent the average of values, and the bullion account generally proves this to be the fact.

Samples of headings can be taken with a very fair degree of accuracy, but to accomplish this the ore must all be crushed in breakers outside the mill, and both coarse and fine run together in the ore bin.

The rock thus crushed may then be taken from one point to another on a conveyor belt or bucket line, and a sample taken at stated short intervals. The amount taken during the day's run will be large—several hundred pounds, or possibly several tons, but accurate samples of large quantities of ore cannot be taken by cutting out a few shovelfuls.

The accumulated sample of the day's run, or the shift's run, can easily be quartered down in the sampling machinery, which should be an attachment of every well appointed mill, and an accurate sample thus obtained.

Another cause for discrepancy in estimates and results is the method of estimating tonnage by basing the estimate on the number of cars trammed into the mill. At some mills thousands of cars are trammed to the mill and not a car ever weighed. The cars are of standard dimensions and are supposed to hold a stated amount—usually about 2200 pounds, sometimes more—and occasionally the smaller mine cars are trammed into the mill. If all the rock be first broken to small size, say 2½ inch and smaller, the cars, if filled level full each time, would undoubtedly weigh very closely to a constant figure, but where coarse and fine are shoveled in indiscriminately, as is generally the case, or the ore is drawn from the bin at the mine, the weight per car will vary 200 to 300 pounds. A scale should be situated on the tramway at some convenient point and cars frequently weighed, or, if not rushed for time, the trammer should weigh each car.

With such a scheme for weighing and with proper methods of sampling, the value of each day's gross value in ore can be accurately determined. If it is impracticable to adopt the suggestions here made, it were better to discontinue sampling outside the mine entirely and look to the value of the mill tailings as a guide to operations, and the bullion output and the value in the tailings will give the gross value of the ore, but this information cannot be so quickly arrived at as by the adoption of the methods above suggested, which are not only reliable, but necessary where accurate information is required.

CONCENTRATES.

METALLIC MANGANESE is unknown in nature. It is manufactured from its oxide, pyrolusite, at considerable expense for laboratory purposes.

THE tin-bearing veins near Mount Wills, near Oneo, Gippsland, Victoria, Australia, were discovered by a Government prospecting party in 1888. They first found stream tin in the gulches and later found the veins by prospecting the adjoining mountain side.

THE necessary preparations for drainage should always be made in driving a tunnel, whether the tunnel be started in wet ground or not, for, if dry near the mouth, water may be found farther in, and if the grade is not sufficient the tunnel will be wet and sloppy, a condition in which there is no economy.

IN Canada a patent issued by that government is good for eighteen years. The patented device or idea must be applied and in actual use within three years from the date of issue of the patent. If a good cause can be shown for failure to use the patent, the time may be extended at the option of the patent office.

THE "salt cake process" of ore concentration as practiced at Broken Hill, New South Wales, Australia, is a patented process. Full particulars as to its application, with details, can be obtained from D. G. Delprat, manager Broken Hill Proprietary mine, Broken Hill, N. S. W. This process is the invention of Mr. Delprat.

THE tendency for grizzlies in quartz mills to become clogged may be reduced by spacing the bars at the lower end somewhat wider than at the upper end. This can be done either by having bars wider at the upper end than below or by using wider thimbles on the spacing bar at the lower end than those at the upper end.

IF a few drops of a solution of cobalt salt, or a small quantity of sesquioxide be added to a clear, concentrated aqueous solution of calcium chloride, which is then slowly heated, oxygen is evolved, the bleaching powder being wholly resolved into oxygen and calcium chloride according to the equation: $2CaCl_2O = O_2 + 2CaCl_2$.

A BELT SHIFTER should be placed near the driven pulley and on the slack side of the belt. A shifter composed of rollers, the length of which is twice the width of the belt, is better than a straight bar of wood or iron. The shifter should be set at an angle of 75° with the lay of the belt, or the edge will be badly worn by the repeated use.

BY a 10% grade is meant a rise or fall of 10 feet in every 100 feet of horizontal distance. If the distance be measured on the slope it will fall short of the horizontal distance, more or less, according to the percentage of the grade. In saying a grade of 500 feet to the mile, the mile measured on the slope is usually meant, and not the horizontal distance.

A MILLSITE cannot be entered by a stranger for the purpose of searching for mineral veins and ore deposits, for the reason that the person so doing is a trespasser. The law presupposes that a millsite is on non-mineral ground. A millsite may be taken up by a person owning no mine. Custom works are frequently located on government lands under the millsite law.

THE expedient of double roasting silver ores with salt—that is, roasting the ore with a small amount of salt, and then again roasting it with an additional amount—has been tried many years ago, and it was found by C. H. Aaron, who made experiments in this, that the losses sustained in the first roasting were repeated in the second, and no advantage was found in the double roasting.

IT is deemed by electrical engineers impossible to place conductors carrying high voltage currents of electricity underground. It is said were an attempt made to place wires carrying 50,000 volts underground an element of danger would be created. Greater safety is found in substantial poles or towers, with a distance between these supports, which has in it a sufficient factor for safety.

BY employing a sheet of gold as a positive electrode in a sulphuric or nitric acid solution, the gold will become tarnished brown, and if continued a reddish-brown powder will be precipitated to the bottom of the electrolyzing vessel. This is hydrate of gold, resulting from the oxidizing action of the electrolytically evolved oxygen. If this gold be collected, dried over sulphuric acid and heated, it will explode.

SOME ores are amenable to cyanide after roasting in the form of small lumps, the ore being rendered porous by the roasting of the sulphides. Also, some raw ores are susceptible of treatment by this process in lumps (as run through a breaker or rolls). An example of this is found in the gold ores of Camp Floyd (Mercur) district, Utah. Most ores have to be crushed fine, however, for successful treatment by cyanide.

THE use of the pneumatic hammer drill for mine sampling has been suggested and it would, in many instances, no doubt, prove an excellent method of obtaining samples, particularly where it was desired to cut a channel across a face of hard quartz. Work with hammer and moil on this kind of vein material is slow and wearisome at best, and here the pneumatic hammer would find a useful field for its operation.

ONE of the first deep channels to be opened by a bedrock tunnel in California was one of those under Table mountain, in Tuolumne county. This channel was very rich, but also exceedingly wet. Ross Browne stated in his report on the Mineral Resources of the United States, that in one place "10 feet square, superficial measurement, produced $100,000, and a pint of gravel not infrequently yielded a pound of gold.

MORE mistakes have been made in running drainage tunnels too high than too low. Particularly is this the case where tunnels have been driven to cut and drain old river beds. Whether a tunnel be run high or low for the drainage of a quartz mine simply means more or less ore, as the case may be; but a tunnel run to drain an ancient river, or any wet gravel deposit that proves to have been run too low, is practically useless for the purpose for which it was intended.

THERE are some mineral deposits known in the Grand canyon of the Colorado river. Silver-bearing lead ores are known near the mouth of Cataract canyon, and copper ores are found in various places in the schists of the Archæan, in the inner or lowest gorge of the Grand canyon. Copper is also found on the surface of the carboniferous limestone plateau through which the canyon has cut its way. These latter ores are very superficial in character and lie upon the surface for most part.

WHAT is known as No. 1 nitro powder contains 70% nitro glycerine, and No. 2 40%. In hard, tough rock No. 1 powder is advised, as greater force is generated by the explosion of this grade of powder, and the energy can be developed near the bottom of the hole. If many of the holes fail to break to the bottom, and if the remaining portion of the hole is a foot or more in depth, the holes are drilled to an unnecessary depth, as the powder fails to break them. Try shorter holes.

GOLD is known to occur in association with a great many minerals beside quartz. It is found in calcium carbonate (marble), with scarcely a trace of silica; in garnet, in hornblende and chlorite, in pegmatite dikes, in feldspar, jasper and sandstone; in quartzite, granite, diorite, rhyolite, and in an aggregate of mica scales; also in epidote, and associated with many ores, such as copper, lead, zinc, tin, antimony, quicksilver, iron, manganese, arsenic, selenium, tellurium, and other rare minerals. Aplite dikes are often payable in gold, and also basic dikes, such as diabase.

EXTENSIVE METAMORPHISM may occur in sedimentary and eruptive rocks along a contact, but such metamorphism is not necessarily an indication of ore deposition, although similar metamorphism may occur in connection with extensive ore deposits. The idea that a copper deposit is restricted in size and value because garnets occur in the accompanying wall rocks and within the ore deposit itself is a fallacy, for some of the largest and most profitable copper mines have extensive deposits of garnets. This is more frequently the case where one of the wall rocks is limestone.

A HYPOSULPHITE solution of silver chloride may be precipitated by the addition of sodium or calcium sulphide. When there is zinc in the ore being treated, if the zinc be in soluble form, due to imperfect roasting, the solutions become deteriorated, and the hyposulphite solution loses much of its solvent power, due to the accumulation of zinc hyposulphite in it, with a corresponding loss of sodium hyposulphite, the zinc hyposulphite being a non-solvent of silver chloride. If the zinc present be precipitated as carbonate by the addition of sodium carbonate, the sodium will unite with the sulphur, forming additional "hypo" to replace the zinc hyposulphite.

NO class of unpatented mineral locations is exempt from assessment work in the United States. And the assessment for next year can not be done in this. If it was not done last year and the claim has not been relocated by another, the work done now counts for this year alone as no assessment work is now required for last year. The title remains in the locator whether he performs the annual assessment or not, until the claim is entered by another and relocated because of the failure of the original locator to perform the necessary work. Then, under these circumstances, the title is transferred to the stranger and the former occupant has no longer a legal interest in the claim.

THE dip and strike of veins is rarely constant in any direction, as both change more or less in passing over a considerable distance—300 to 500 feet. There are no rules or laws governing the dip and strike of veins, and the direction is due to various causes, such as stress and torsion of rocks. Some veins have the normal dip changed by a falling over of the inclosing strata on the side of a mountain. Thus a vein which at the surface may have a dip to the westward, on an east hill slope, in depth may be found to dip eastward—its normal dip—the west dip near the surface being due to the formation having been overturned or folded by the weight of the mountain mass above.

PRODUCER GAS in metallurgy is not new. The use of producer gas was successfully introduced at the Marsac mill, Park City, Utah, by C. A. Stetefeldt, in 1890. At that time wood was used for fuel and the gas was used in firing two dryers and a Stetefeldt furnace. Coal was soon substituted for wood and it was found that the producer gas was not only more economical than other fuel, but that its use resulted in securing a better roast of the ore. Those contemplating the employment of producer gas should carefully investigate the coal to be used. A coal should be chosen the ash of which will only slightly slag upon being subjected to high temperature. The gas producer may then be run with little difficulty or loss of time from annoying stoppages.

IN iron moulding, fine, white, beach sand, free from iron, is used in making small, smooth castings, but for large castings a coarser and highly refractory sand is required, that is, a sand which will not be readily affected by the heat of the molten iron. In the use of coarse sand there is an opportunity for the gas to escape when the metal is being poured. No kind of sand wholly free from clay is suitable for moulding, for the sand will not be sufficiently coherent from merely moistening and ramming. Where sands are free from clay it is customary to add molasses, resin, flour, clay, glue or some other substance which will cause the sand to remain in the form in which it is moulded. Some sharp sands from beds of tuffa, such as rhyolite tuff, make good moulding sand.

WHEN amalgam is squeezed through a buckskin, canvas or other fabric in the cleanup room, it is a fact—well known to mill men—that some fine gold always passes through with the mercury, particularly where the gold in the ore is very fine. After standing for a time this gold will mostly settle at the bottom of the pot or bottle in which it may be placed. A simple method of securing this gold with the minimum amount of retorting is to take a 2-inch pipe about a foot long, to one end of which is screwed a cap. A hole should be bored through the pipe about 2 inches from the bottom, and this hole fitted with a suitable wooden plug. Into this the strained mercury should be poured and allowed to settle for several hours. Then upon withdrawing the plug the mercury above the top hole which contains little gold will flow out, leaving the enriched "quick" in the bottom of the pipe. This may be retorted and both gold and mercury recovered.

THE distance from the bottom of a shaft to which it is permissible to carry shaft timbers depends upon conditions. It is rather a question of how far shaft sinking may be carried ahead of the timbering. In some cases the timbers must be placed immediately the ground is cleared, and in running ground the lagging must be driven ahead of the main members of the set (forepoling). Where the ground is so soft as to require timbering to be carried very close to the bottom, it usually requires little powder, if any, to break the ground. On the Rand, in South Africa, the shaft sinking operations are sometimes carried as much as 150 feet ahead of timbering, the ore being raised in skips, guided by cables secured from the guides to the bottom where they are made fast to a bar fitted with a screw, like a drill bar, and with an arrangement to tighten the ropes, by turning a part of the bar. This gives security and permits very heavy blasting without danger to the timbers.

THE croppings of copper veins and deposits, as well as those of other minerals, are often deceptive as to the actual conditions below. This is particularly the case with copper, for the reason that copper sulphides are readily susceptible to the decomposing influences of the atmosphere, with the formation of new copper compounds, nearly all of which are considerably richer than the normal chalcopyrite. The copper sulphide on decomposing becomes sulphate, which is redeposited in a gradually enriched deposit. These secondary products of the decomposition of copper pyrite are chiefly chalcocite (copper glance), bornite (a rich copper sulphide), malachite and azurite (carbonates), and several varieties of black oxide, beside the richest of copper ores cuprite, the red oxide. The sulphate solutions may seep downward through the adjoining wall rocks of the original vein or deposit and form an enriched zone many feet in width, but upon carrying mining operations downward into the deposit, the enriched superficial deposit gradually grows poorer and eventually only the narrow original vein is left, which is too low grade or too small to longer afford profits from its exploitation. Another reason why large outcrops sometimes are deceptive is due to the disintegration of a mass of quartz, the country rock being softer and the scattering of the float and detached boulders over the hillside often causing a vein of moderate width to appear to be over 100 feet wide. The cause here is wholly mechanical, and due to disintegration of the vein and the scattering of its debris by gravity, and is a condition in which the chemistry of ore deposition and subsequent decomposition play no part. The prospector of experience can usually readily distinguish between these two phenomena, and acts according to his judgment in the matter.

Latent Mineral Possibilities of the Pacific Coast.

Written for the MINING AND SCIENTIFIC PRESS.

The existence of wonderful mineral resources throughout the United States has been shown by governmental and private enterprise, the development of the useful metalliferous minerals is being pushed by miners all over the country, but the complete utilization of many of the most valuable minerals is, as yet, in an embryonic stage. Germany, with its scientists, is pre-eminently the pioneer in this field, and as a consequence reaps a rich harvest from the sale of products refined from crude minerals obtained in the United States. While at present apparently of limited importance, yet this branch of mineral development is destined to take a leading place among the economic industries of the country.

Recent examples are found in the use of certain rare earths in the manufacture of incandescent mantles, the adoption of tantalum as a filament for the incandescent electric light, the demand for uranium minerals in the manufacture of radium, and the use of various metals and metallic oxides in the manufacture of high-grade tool steel.

The western portion of North America is particularly rich in the extent of its mineral resources, yet, except for the mining of gold, silver, copper, lead, zinc, fuel and iron and their by-products, and some quarrying of structural material, this great natural wealth is largely undeveloped.

In Colorado, molybdenite has been developed 1 mile east of Climax, Summit county, by H. Leal. The silver and iron ores of Lake county produce considerable manganese which is used in the manufacture of spiegeleisen, and also as a flux by the smelters. Colorado is also one of the chief sources of crude tungsten ores in the United States. Largely through the efforts of A. B. Frenzel of Denver the vanadium and uranium deposits of the State are likewise receiving some attention.

Wyoming is credited with producing asbestos, graphite, grindstones, metallic paint, platinum and tin. South Dakota has done but little in the development of these mineral resources beyond the work on its tin mines, and the shipment of considerable spodumene for its contained lithia minerals, and wolframite (iron-manganese tungstate), of which there is considerable in the tin regions.

Montana is attracting attention as an arsenic producer, as the output continues from the white arsenic plant at the Washoe copper smelter at Anaconda, which collects and condenses the arsenical fumes formed during roasting of copper ore. Near Dillon and near Ophir molybdenum deposits have been developed to some extent and at times some manganese ore has been produced. The grindstone industry is also receiving some attention. Idaho occasionally produces some cobalt ore.

Washington has been a leader in the production of arsenic. The Crown Point M. Co., in Chelan county, has marketed crystals of molybdenum, and a talc deposit has been worked 7 miles from Marblemount in Skagit county, by T. M. and E. H. Alvord. Graphite has been found near Bossburg. Besides some quicksilver and platinum, Oregon's contribution to the minerals under discussion has been borax, which is found at Chetco, Curry county, as priceite, occurring, according to Chas. G. Yale, as pockets in serpentine, and in Harney county, 130 miles north of Winnemucca, Nev., as borate of soda in marsh lands. Nevada, likewise, has produced some borax and also some quicksilver. A tungsten property near Osceola, White Pine county, has been slightly developed. Nevada and Utah are listed among the States producing sulphur. Utah is also credited with producing manganese ore, uranium, vanadium and sodium chloride.

In Arizona metallic arsenic has been found at Washington camp, in Santa Cruz county, in masses attached to the walls of small pockets in dolomitic limestone. At Troy the Troy Manhattan Copper Co. has done extensive work in developing and concentrating wulfenite as a source of molybdenum, as has also Chas. Eudall of Tucson, in the Mammoth mine, at Mammoth. Near Dragoon, Cochise county, the Primos Chemical Co. has been mining and concentrating hubnerite and scheelite, used in the manufacture of ferro-tungsten and metallic tungsten. Asbestos is being developed in the Grand Canyon of the Colorado.

The U. S. Geological Survey's report on the mineral resources of the United States, from which much of the data for this article has been obtained, credits California with a greater diversity of mineral products than any other State. This includes lithium minerals from San Diego county, asbestos from El Dorado, borax from San Bernardino, Lake, Tehama, Mono and Inyo counties; chromite from several counties; graphite from Sonoma county; infusorial earth, magnesite, from near Porterville, Tulare county; Chiles and Pope valleys, Napa county; Sanger, Fresno county; Placer county, Kern county, Santa Clara county, and at Red Mountain, Stanislaus county; manganese ores, metallic paint, platinum, pyrite, quicksilver, salt, talc and tripoli.

Further possibilities in the development of these resources is suggested by work of the students in the Department of Pharmacy of the University of California. Under the direction of Prof. Frank T. Green of San Francisco, each student was required to take some raw product from his home or district and make from it a series of compounds of industrial importance.

Tulare county is represented by magnesium salts, prepared from heavy magnesium carbonate. These included the sulphate, oxide, nitrate, borate, carbonate, chloride and oxalate, and were prepared by Todd Claubes. From the supposedly worthless alkali soil of Tulare's valleys, A. M. Shaddle prepared sodium sulphate and chloride.

From a stalactite from Amador county, J. Garibaldi prepared calcium benzoate, salicylate and carbonate. Inyo county's cuprite was the basis for magnificent crystals of copper sulphate. Copper ore from Monterey county furnished the iodide and nitrate. The Copper King mine, of Fresno county, gave F. M. Carter the material for making the oxalate, iodide, citrate and ammonium-sulphate. Colemanite from Death valley, Inyo county, furnished sodium borate, boric acid, magnesium borate, potassium borate and borate of chromium.

The iodide, the chloride and metallic mercury were manufactured from San Luis Obispo county's cinnabar. Tuolumne county's pyrite yielded a series of ferric salts, including the carbonate, phosphate, citrate, ferric-ammonia citrate and ferric-quinine citrate. Galena afforded the oxide, chloride, nitrate, sulphate and metallic form of lead.

B. R. Nichols utilized San Luis Obispo's chromite to prepare potassium dichromate and lead chromate. San Francisco's pyrolusite produced manganese carbonate and sulphate. From soapstone was made talcum powder by filtration and by sifting, and from sea water sodium chloride and sulphate.

Potassium carbonate, acetate, citrate and bromide were prepared from oak wood ashes; oxalic acid from sawdust, and stove polish and chain lubricant from graphite. Potassium bitartrate and potassium-sodium tartrate were prepared from crude argol by F. W. Pottle, who also prepared zinc sulphate, acetate oxide and carbonate from franklinite.

In addition to the above, numerous other commercial products were manufactured by the students from the raw materials afforded by the States—California, Oregon, Nevada, Arizona and Idaho. These have been appropriately labeled and placed in 2-ounce screw containers of glass, and the whole placed as an exhibit in the California building at the Lewis & Clark Exposition at Portland, Or. This exhibit, numbering over 200 samples, readily shows the possibilities that Pacific coast minerals offer for the production of an extended list of mineral substances daily used in chemical laboratories.

Mining at Goldfield, Nevada.

TO THE EDITOR:—The number of men working in the mines of Goldfield district is gradually increasing. Another helpful factor is the starting up of several mills, and their successful treatment of the local ores. Four mills are now at work, and two or three more are nearing completion. The Combination Mining Co.'s mill treats the ore by amalgamation, concentration, and cyaniding. The question of a water supply for the town is rather serious. The Rye Patch source, from which Tonopah is supplied, is the most promising, but the big expenses of plant and pipe line render the undertaking rather doubtful for the present. The railroad grading is practically completed to Goldfield, and as soon as the Tonopah road is broadened to standard gauge the rails on the Goldfield line will be laid. This is promised by the latter part of July. It is said that with the advent of the railroad freight rates will be fixed at such reasonable figures that $25 ores can be shipped and smelted, and still leave one-half the gross value to the shipper.

It is reported that the electric power line running from Bishop creek, in California, will be ready to furnish power by September 1st of this year. Advertised rates range from $12 to $20 per horse power per month. This would not be considered cheap power in most countries, but it discounts wood at $18 per cord. It will hardly replace gasoline for hoisting purposes, especially where plants are already installed; but the reduction plants will find it advantageous, no doubt, and its advent will be a benefit to the district.

The future of the camp is still a mooted question. It depends upon the developments in the mines. Wise mining men whose opinions are best worth having are not indulging in loud prophesying as yet. There are decidedly hopeful indications in some portions of the camp; there are less encouraging results of development in others. The geological formation is a new one to the mining men here, and each new development is watched with keen interest. As a rule the mines of the district are in good hands, and there is no lack of capital for properties showing merit, or even for properties whose only apparent merit lies in the fact that they are located somewhere within the mineralized zone. The camp is burdened with the usual number of "wild cats," some of which may possibly eventually prove to be mines, for anything in that line seems to be possible in the Goldfield district. There is no apparent method by which the public can be protected from this class of frauds, but the individual may protect himself by either securing reliable information or refusing to buy stock. Mining men in whose hands the future of the district lie are not only hopeful but confident. Their chief concern is not so much whether the veins go down as whether the values at lower depths will stand the increased expenses of finding the ore bodies and exploiting them. Only the actual work will determine that.

Goldfield, Nev., June 30. F. N. FLETCHER.

An Interesting Ore Deposit.

TO THE EDITOR:—On one of my trips to the Black Hills, S. D., while making an examination of a property not far from Ragged Top mountain, but farther to the southwest, I came upon what occurred to me to be a peculiar state of geological conditions, and not previously either having seen anything like it or having heard of any like condition, it occurred to me that it would be well enough to send you a little description of it.

The country where the observation was made is generally pretty flat but somewhat cut by deeply eroded canyons or ravines and waterways, leaving the intermediate spaces between these canyons much like flat-top mesas, which are more or less broken on the surface by dikes of trachyte, which generally run lengthwise with the mesas and seem to parallel the general direction of the waterways. At the edge of these canyons, which are generally precipitous, one can readily see the line of limestone capping which rests upon the slates and schists. I deem by some prior dynamic disturbance the lime capping was fractured and openings were made that later became the waterways, as the slates and schists are very soft and by the action of the elements have worn away very rapidly. The material next above the slate is limestone; its mean thickness is perhaps from 50 to 75 feet and in many places crops to the surface.

Now, the peculiar part that I wish to discuss is the ore deposit which is on top of the limestone. To me it seems it must have been deposited at the time of the upheaval of the large trachyte dike, which has folded the lime strata on each side of it, and the folds run parallel to the dike—the dike having a width of from 100 to 150 feet. It seems to have pushed the lime strata back and caused the folding, and at the time of this folding it has the appearance of having been covered by water and with no surface dikes. A portion of it appears to have been deposited as a mud, or rather a slaked lime solution which must have resulted from the heat and water during time of the molten eruption of the trachyte, and it settled in the bottom of these folds as ordinary mud would settle in low places from a high water overflow. I am aware that this theory—for such it is—will be combatted by some who will claim that the overflow came with the eruption, but I see one reason to combat this, and it is due to the fact that no debris, such as broken fragments of the trachyte or unslaked lime, is present in the sedimentary deposit. Now, as to the nature of the deposit, it shows plainly the action of heat, and especially is that true in the folds near the dike, as it shows in a good many places much of the lime rock, which is not a very high-grade lime, which is burned to a bright red brick color. The sedimentary deposit, however, is not so high colored, as its color is from light gray to brown, or yellowish brown, and a great part of it is chert of a light gray color and very closely resembles that found in the lead and zinc fields of Missouri and Kansas, and the lime somewhat resembles the limestone of that country also. Much of the sediment has taken the form of chalcedony, and not nearly so firm as the chert, and the strange thing is that these settling troughs have caught some gold and have values ranging from $6 to $12 per ton. On the top of this auriferous deposit is a covering of surface debris, and of all sorts of rock, and some very large quartz boulders among the other rock and dirt. The quartz has no connection in any way with the sedimentary deposit, as these pieces of quartz are all over the surface and are a very pretty fluorine stained quartz and also carry from $10 to $15 in gold, and no place has as yet been found where such quartz is discovered in place anywhere in the vicinity. The fact that there was no covering on or above the sedimentary deposit would show conclusively that it is not at all likely that the water, or values either, came from below.

I may state in conclusion that I reported unfavorably upon this property for my people, but since that time two other men have reported favorably, stating that the conclusions reached by myself regarding the folding of the lime strata were in error, and a 100-ton cyaniding mill has been erected to treat these ores, which are well adapted to this treatment and will stand ½-inch crushing, and an extraction of 85% and up is secured from this ore by the coarse crushing and a sixty-hour treatment. ENGINEER.

Denver, Colo., June 25.

How Some of California's Early Mines Were Worked.

Written for the MINING AND SCIENTIFIC PRESS.

In southern California many years ago were gold mines which were profitably worked, the history of which is now obscure, and the whereabouts of some of the mines is uncertain. In Los Angeles and Ventura counties particularly were there profitable mines, both quartz and placer. These mines were developed and operated for most part under the direction of the priests who were stationed at the missions in the neighborhood of the mines. The missions were established late in the eighteenth century, and some of them early in 1800. It may be said that they were in the height of their success from 1810 to 1840. It was during this period that the mines were worked for gold, and if the stories told by some of the old Spanish settlers can be relied upon, and there is no reason to discredit them, the result of these mining operations was satisfactory. Some of the Indians living at San Gabriel tell of rich gold and silver mines in the San Gabriel range, north of San Gabriel. It is a well known fact that a few miles up the San Gabriel canyon, from its mouth, is a system of silver veins which have been worked more or less within the past 20 years, and some of the ore was very rich in silver sulphide and native silver. Gold also is known in the San Gabriel canyon, both in quartz and placers. In the Tejunga canyon, near the head, about 40 miles northeast of Los Angeles, are gold-bearing veins, and on Mount Gleason, southwest of Acton Station, a quartz mill was in operation a few years since.

At the time when the missions of southern California were enjoying their greatest prosperity, when there were several hundred Indians attached to each, these had to be cared for in body as well as mind. In return for this support from the padres, the Indians became the friends of the missionaries and did what they could in the way of manual labor. Each spring the padres of San Buena Ventura and San Fernando missions, who had learned of the gold in the Castec and Piru canyons, sent Indians to work in the gravel deposits to secure such gold as they could by the primitive methods of those days. This was long before the discovery of gold at Coloma, in El Dorado county, the discovery which made more history than any discovery of gold either before or since. These Indians worked under the direction of Jose Bermudas, of the mission at Ventura, and Francisco Lopez, of the Mission San Fernando. The Indians worked these placers as long as water was available, and in some instances worked by dry blowing, using baskets to toss the dirt into the air, the lighter portion being blown away by the wind. By this means only the coarser gold was recovered, the fine usually being lost. Panning with the batea or wooden bowl was the favorite method of getting the gold. Each fall the several crews of Indians returned to the missions with considerable gold.

After the missions had been closed and their property confiscated by the Mexican authorities, and mining by the Indians came to an end, Bermudas and Lopez petitioned the Mexican government to set aside the territory between Piru creek, in Ventura county, and Soledad canyon, in Los Angeles county, and extending northward to Mojave desert, as a mineral district, and asked that no grant of land be made taking in any portion of this territory, and this the government did.

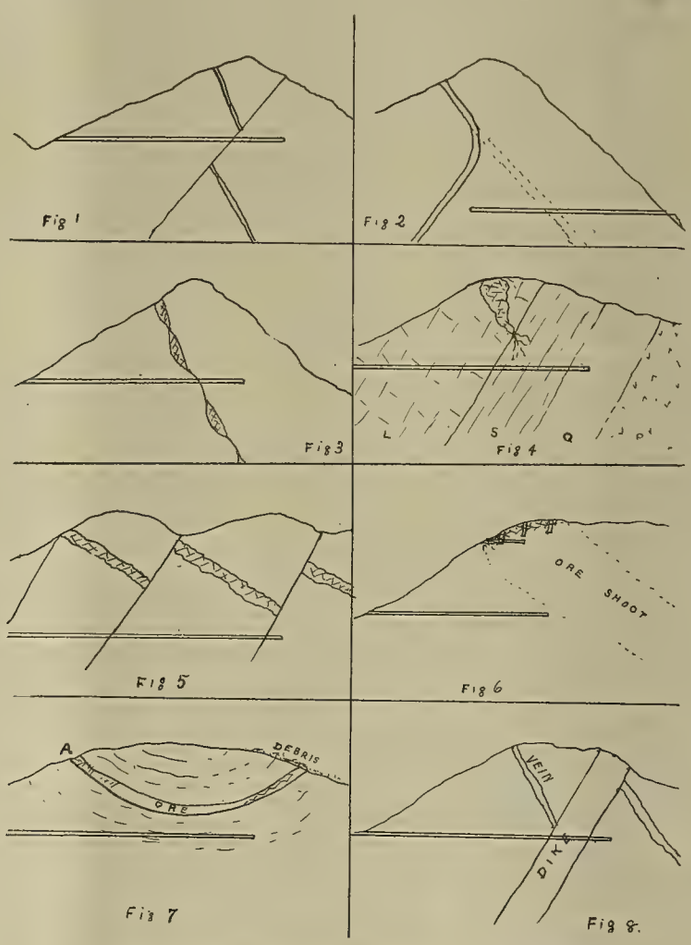
It is said that in 1854 there was considerable excitement in the district owing to a number of miners making handsome clean-ups that season. It was reported that a Mexican miner named Garcia took out in San Feliciana canyon over 200 pounds in gold nuggets, and a number of others got from $5000 to $20,000. These placers were superficial and quickly worked out. Four years later, in '58, other good strikes created another stampede, and 1500 men were mining there that season. Whether these old stories are true or not, there is scarcely a canyon or gulch in all the area extending from Soledad canyon northward to the desert and westward to Piru creek, and in the region south of Newhall, that hillsides and gulches do not show abundant evidence of extensive mining operations. Bars have been worked out, the gulches have been mined probably several times. Dry ravines have been turned over and over, as the heaps of cobbles piled alongside of the rocky beds attest. Numerous and lengthy ditches abound. Many of these are obscure, but they were undoubtedly ditches. In the stampede of 1858 many quartz veins were taken, and some of them were rich in gold, though "spotted." One man is credited with obtaining nearly $40,000, the quartz being beaten up with hammers, and the pulverized rock being washed in the batea, no amalgamation being practiced at that time. In the Fraser Mountain district are numerous gold veins, and in the region around Acton there are a score of old mines and numerous prospects. All the gulches heading into the mountains south of Soledad canyon prospect in gold, and large amounts of gold have been taken from Placerita canyon near Newhall. In upper Soledad, near Lang's, Southside, Ravenna and in that vicinity, there are great beds of conglomerate, and some believe the gold found in the gravels are derived from these conglomerates. This may be true, but the gold, if from the conglomerates, originally came from veins in older and underlying rocks. The region has been practically neglected for years, but it possesses much that is of geological and scientific interest, and careful prospecting by experienced men may discover some good paying mines in that district. Its principal drawback is lack of water. In the rainy season it is fairly abundant, but at other seasons of the year the canyons are dry and the region is little better than the desert.

Practical Mine Development.

There are numerous maxims familiar to miners, and these trite sayings are usually the result of experience—often of unfortunate experience. One of the most frequently heard of these sayings is, "follow your vein wherever it goes." Without doubt this advice has been suggested by the disastrous results financially sustained by some miners who left their vein to do systematic and methodical but ill-advised work, and whose purse was not "long" enough to accomplish the desired ultimate results. Without doubt it is good mining for the prospector whose means is limited to follow his vein by shaft or tunnel if he can. Many men in the first years of their mining experience, having found a promising prospect well up on the mountain side, think they can see an advantage in driving a crosscut tunnel several hundred feet below the outcrop of the vein, in order to get "backs," and save the expense of hoisting and pumping or bailing water. Very often this tunnel, the estimated length of which is usually several hundred feet, is started before much else has been done—perhaps not more than a fifty-foot hole has been sunk on the vein In a great many instances this is not good mining, as has been demonstrated by results There are too many uncertainties in vein formation, and in the distribution and value of ore deposits to justify uncertain and expensive development to reach veins or ore deposits which may not exist. When the development on the vein has been performed to an extent which will pay for the driving of a long tunnel, so that the miner is not out of pocket should he fail to find what he is seeking, it may be good business to undertake the long drainage tunnel through barren rock, but not before. In a far worse predicament is he who not only runs a long and expensive tunnel only to find his vein has not come down to that level, but also builds a mill or smelter in addition to the former folly.

The accompanying sketches illustrate some of the geological conditions which may result in a tunnel not finding an ore deposit or vein in depth which makes a good showing on the surface. To these might be added many others equally common and simple, and some far more perplexing in their structure.

Fig. 1 illustrates a very common occurrence—a vein displaced by a fault. The tunnel driven from near the base of the hill passes through the fault at a point where it is merely a seam in the rocks and misses the vein entirely, although it is both above and below it. Fig. 2 shows a vein deflected from its true dip by a fold in the country rock, which has carried the vein with it. The long tunnel has been driven far beyond the point where it was expected the vein would be found, and the funds of the owners being exhausted the work comes to a standstill—for a time at least. In Fig. 3 the vein is continuous, but where cut by the tunnel has dwindled to a seam of clay of knife-blade thinness and is passed through unnoticed, as there are other similar seams in the country rock. Fig. 4 shows a strong outcrop of lead-silver ore in limestone. The deposit dips regularly into the mountain, but on coming to a reef of slate the vein scatters, and the tunnel driven under the croppings fails to find anything. Fig. 5 shows a condition not uncommon in regions of sedimentary deposits, such as at Leadville, Colo. Here a series of faults have repeatedly dislocated the vein, and the tunnel finds nothing but barren rock. At Leadville



Diagrams Representing the Uncertainties of Vein Continuity,

the faulting is on such a grand scale that this difficulty has not been met with in many cases, but the principle is well illustrated. Fig. 6 is a case where a long tunnel has been driven on the vein, but the ore shoot pitching away from the tunnel, the owners become discouraged, or "broke," before the pay is reached. In Fig. 7 an anticlinal fold deceives the miners who found the outcrop at A. Debris covered the outcrop on the opposite side of the hill, and it was naturally supposed that the vein continued downward, as it had started at A. In Fig. 8 is shown a vein intersected and thrown by a dike. The tunnel driven in ignorance of this condition fails to find the vein, but enters and crosses the dike, discovering nothing on the opposite side. Each of these instances have practical illustrations many times over, and many others might be added to show the inadvisability of driving long tunnels to develop an ore body or vein of which but little is known at the surface, and particularly where the miner's means are limited.

Ammonia in the Cyanide Process.

Some experiments made by A. Jarman and E. L. Brereton, the results of which were published in the Transactions of the Institute of Mining and Metallurgy, showed that for quartzose gold ores containing cyanicides, particularly copper carbonate, ammonium cyanide is a more efficient solvent of the gold

than potassium cyanide alone, but not so good as the latter in presence of a small amount of ammonia. The amount of ammonia required to protect potassium cyanide solutions from dissolving large quantities of copper increases with the strength of the cyanide solution, but is not affected by the amount of copper up to 3%. With more than 3% of copper, a larger amount of ammonia is necessary to obtain a good extraction of the gold. With ores containing from 1.5% to 3% of copper, and with a 0.25% solution of potassium cyanide, the best extraction is effected in presence of 0.1% of ammonia. A mixture of ammonia and potassium cyanide can be prepared which dissolves less copper carbonate than either of the components alone; and the composition of this mixture is very near that of the solution which gives the best gold extraction (i. e., when using small percentages of ammonia). During the treatment the amount of dissolved copper first rapidly rises to a maximum, but afterwards diminishes steadily, while at the same time the quantity of gold dissolved increases.

Vertical Shaft Sinking on the Rand.*

NUMBER II.—CONCLUDED.

Mr. Bradford said: The figures which have been given us in relation to some of the deep shafts of the Rand, and those which are promised us by Mr. Simpson, are of very great interest. There is one thing, however, in connection with these figures which I would like to have seen stated. In the sinking of any developing shaft speed is worth more than it is in a mine which is already in operation, and consequently the cost per foot is not of such relative importance. All economies are of moment, but a mine can afford to pay a very high price per foot, sometimes, in order to reach its reef quickly. Now, in the figures which have been given us there is no statement as to the method of paying the men. You cannot get speed from any class of man—extra speed—on a mine without he is paid in proportion to it. And I should like to have the figures in reference to the bonus paid in these deep level shafts. I understand that the system of sinking in the case of the Jupiter (whether it is so on the Village Deep or Cinderella Deep I do not know) was to pay a very heavy bonus, and it would be of interest in connection with this paper to know just what these payments were. If you pay a man sufficiently you can get two days' work put into one. Mr. Roche, speaking of headgears, says rightly that they should be erected on first-rate foundations. I would add that they should have ample ore bin capacity and strength Many headgears on these fields have been built altogether too light and too small, and we are finding this out as the mines come to rapid pulling. These faults are being remedied in the headgears now going up, but if there is any error in the size of the bins, let them be too large rather than too small. Mr Roche goes on to speak of bearers in a shaft, but does not refer at all to the blocking, which is of vital importance. As I understand bearers, they are simply a safety catch for the timbering of a shaft. In other words, the blocking of a shaft should be so put in that it carries the weight of the timbers, leaving practically as little weight as possible to the bearers themselves. I presume it has been the experience of many mining men here who have gone over shafts to find the blocking sometimes looking down a shaft and sometimes perfectly straight; and I have seen some places where the blocking was against the studdles, or against the wall plate, midway between the dividers. This is all wrong. In a properly timbered shaft the blocking should be against the wall plate directly opposite the dividers and looking up the shaft, forming a series of trusses which should practically carry the weight of the timbering. I do not mean to say that you should not have bearers at regular and frequent intervals, but they should be for safety in the event of the pit work settling, and not primarily to carry its weight. With the blocking comes the question of hand sinking and machine sinking. In most machine sunk shafts here the walls are excessively rough. It is impossible to sink a clean wall with machines, and easy to do so in hand sinking; and a clean wall makes a great deal of difference with the blocking. In regard to kibbles and skips, I fully agree with Mr. Roche that skips are preferable. Very many of the fatal accidents which have occurred in deep level shafts sunk on these fields have been directly traceable to the use of kibbles. Where skips are used the danger to the lives of the men engaged in the work is greatly reduced. In the matter of the size of the machines, which has been touched on at some length in the discussion just read, I also heartily agree with Mr. Roche. I believe the more work you can get out of a machine that you have once got rigged the better. At the Wolhuter mine in 1902, where a record was made by T. J. Britten for inclined shaft sinking on these fields—and I think a world's record—the machines used were 3½-inch Sluggers. The method of sinking was to break everything to the center cut, drilling the face over to a depth of about 9 feet, with all but the side holes working toward the center. Mr. Britten once told me that he found it advantageous to miter out a short cut first. and when this had broken to fire the remaining holes; but I understand that later he found this unnecessary. In the Star of December 9, 1902, there is an account of this shaft, and I quote from it the following table, which shows what big drills can do, and is a record of excellent work:

SIZE OF SHAFT, 20 FEET BY 7 FEET 6 INCHES, 932 FEET BEING SUNK VERTICAL AND THEN TURNED ON THE UNDERLAY.

	Aug.	Sept.	Oct.	Nov.
Depth of shaft on first month (1902)..	1,115	1,294	1,476	1,680
Sunk during month	179	182	204	209
Number of days worked	31	30	31	30
Number of blasts per day	31	30	32	33
Average sunk per day	5.78	6.07	6.5+	6.97
Average number of holes per blast...	28	28	28	28
Depth of holes from 7 ft. to 9 ft. 6 in., average	8.17	8.5	8.5	8.5
Tons of rock broken and hauled per month	2,237.5	2,275	2,550	2,612.5
Tons of rock per daily blast	72.17	75.83	79.69	79.1
Tons of rock broken per drill per day.	18.04	18 96	19.92	19.77
Average number of drills employed..	4	4	4	4
Amount of gelatine used, cases.....	84	100	106	120
Gelatine used per blast	2.71	3.33	3 31	3.63
Average number of 1¼-in. cartridges per hole	7	8	8	8
Total pounds gelatine used	4,200	5,000	5,300	6,000
Pounds of gelatine per ton of rock broken	1.88	2.20	2.08	2 29
Average time of drilling per day....	12	12	12	12
Average time for clearing rock broken, hours	8	8	8	8

Price paid contractors, £6 per foot. Contractors employed and paid unskilled white machine helpers. Company cleared away all rock broken with white lashers, who were held ready to go down at any hour on signal.

Now, it seems to me that the same argument which applies to the use of big drills in incline shafts applies equally to vertical shaft sinking. If you are going to sink deep holes you must have long, heavy bits, and a big machine is essential to get the necessary pull back. You cannot sink deep holes with light steel, nor can you pull back heavy drills with a light machine.

As to the number of machines, I believe in working just as many as you have room for, because the great thing is to drill the shaft over as quickly as possible. Time is the essence of option. If time is lost in putting the drill holes down, it is lost straight through the month, and you cannot make it up. I do not agree with the writer as to the advisability of Cornish pumps for deep level shafts. High lift air or electrically driven pumps seem to me better adapted to the work, but in the matter of bratticing, instead of putting in ventilating pipes, I think he is quite right. In reference to the comparison of costs, he is also unquestionably right, because there are probably no two mines on these fields outside the same groups where costs are kept in exactly the same way. I remember an amusing story, told me once by the late Major Seymour about a certain headgear on these fields. The costs were particularly high, and when they came to investigate, among other things they found that a span of four mules and harness had been charged to the headgear.

In equipping a vertical shaft with hauling roads where the skip is to run around the turn at the foot of the vertical on to the incline, the general practice on these fields is to put in heavy T rail, carried on the wall plates, and either corresponding T rail or angle iron on the dividers. It is better to use all T rail than rail and angle iron, but it would be still better to do away with such roads altogether, and run the skip in the vertical either on steel or wood guides. The wear and tear would, in my opinion, be much less than with the present system. Certain experiments are now being made in this direction, and if they succeed we shall be able to run our incline skips through the vertical part of the shaft, exactly as the cage runs now, it being so arranged that the skip may leave its guides and take the angle irons at the turn. If this system can be perfected it will be economical, and will conduce to smoother running in the shafts. In the matter of fastening these guides, there is only one mine on these fields I know of which uses a center studdle at the back of the guides. When the Robinson Deep shaft was gone over and retimbered center studdles were put in. As a usual thing, wooden guides are bolted with through bolts to the dividers, so that at the ends of each length of guide the divider carries say four bolts when a guide is 8 inches by 4 inches, or two bolts if it is a 4-inch by 4-inch guide, whereas if a center studdle is used the guides, instead of being always joined at the dividers, are joined between them and bolted to the center studdle, as well as to the dividers, making a solid job from the top of the shaft to the bottom.

T. L. Carter remarked: I have not come prepared to say very much upon this paper, but I should like to raise three points, and one of them is well worth noting, for it will be an important matter in the future. It is the question of good workmanship versus speed in shaft sinking. It is desirable to get the shafts down in record time, but I think there are cases where it is better to make less speed and be surer of the work. Of course, I do not say you cannot have both speed and good workmanship, but if there is any doubt about the thoroughness of the work, I should let off a bit in sinking, timbering, etc. I have seen instances where mines have been hampered for years by shafts being a few inches out of vertical, due to timbers not being attended to properly. In 1896 a bad accident happened on the Rand, in which three white men were killed in a vertical shaft. It was found that the accident was due to slipshod workmanship in putting in the bearers when sinking the shaft. The shafts on a property correspond with the main arteries of the human body, and they are of vast importance in the future working of a mine. If they go wrong, of course, everything is absolutely hung up, and for this reason I think it is a matter worth thinking about to have everything about the shaft as permanent as possible. The preservation of timber, for instance, has reached a high stage, and it is a matter worth going into whether you should not "treat" the timbers before putting them into a shaft. The initial expense will be a little higher, but the final result will be better. The same argument holds good with headgears. The Rand is so well established that most of the mines in future will be mines whose lives will be twenty-five to thirty years. It seems to me a mistake to start off with a little tin pot headgear. It is a permanent affair and should last the life of the mine. For this reason I do not think we should ever use wooden ones at all in a mine of twenty-five or thirty years. We should have best steel headgears, and for the future we should think of no other. In the course of five or ten years a wooden headgear is almost rebuilt with patches here and there, while a steel headgear, although the initial cost is high, is a permanent structure and will last the full life of the mine. Too small bin space is allowed in many of the mines of the Rand, liberality in which is the best policy.

*Trans. Jour. Chem., Met. & Min. Soc., S. A.

Prospecting in the Desert.

With the coming of midsummer reports begin to reach the outside world of the hardships and loss of life on the great desert of southern California and Nevada. There are few people who have never been in that arid region who fully realize the discomforts, the hardships and the dangers attendant upon a trip through this desert in midsummer. The rains have ceased, the heat of day is indescribable, and it lasts far into the night. If it were not for the cool hours from about 11 P. M. to sunrise, which permits the denizens of that region to, in a measure, recuperate their energies, life would be unendurable there. Although after midnight it is almost invariably cool, eighteen hours out of twenty-four of each summer day are so hot that it is all that the average human being can do to exist through it, and yet there are thousands of men and women, and children, too, who have gone into that section within the past few months in the effort to snatch from opportunity a fortune as it whirls by in a cloud of heated desert sand and alkali.

Soon after sunrise the power of the sun makes itself felt. Metal expands and crackles like in a quickly heated stove as the sun's rays grow steadily hotter and hotter. By 7 o'clock in the morning the temperature has usually reached or passed the 100° mark, and shortly after midday it is not uncommon to see the thermometers register anywhere from 110° to 125° in the shade. The heat is dry, intensely dry, and this is the only salvation of the unfortunate beings who have, in most cases, voluntarily exposed themselves to this summer climate of the Great Basin region. Were there much of humidity in the atmosphere at such a temperature human existence would be impossible. The bright metallic glare of the midday sun is terrible, even to those who have for years been accustomed to it, but for those who cannot stand high temperatures, life on the desert in summer is a veritable hell on earth. If the lot of those who remain in the towns is thus made almost unbearable, what of the less fortunate prospectors who venture out into the hills or attempt to cross some scorching stretch of sand to reach the mountains on the opposite side — seemingly so near, but really a long day's journey and perhaps two, distant—for distant objects seem near on this southern desert? One may stand on a hilltop and gaze out across a desert valley in the center of which is a patch of clay colored earth, level as a floor — a dry lake, or perhaps it may be as white as the new fallen snow, due to the deposit of mineral salts on its surface. No object attracts the eye in this lonesome death-like valley. Take a powerful field glass and scan the desert closely, and perchance you will see two or three mere dots on the dry lake. Watch them and you see they are moving. Lower the glass and you discern nothing. The distance is too great—5 miles or more — and yet it seems less than a mile away. These moving dots are probably prospectors with their hardy little burros making haste to cross the valley to the hills beyond for the purpose of searching for a mine. Blistered by the scorching rays of the sun, tormented by the whirling clouds of dust and the eddying columns of alkali, these men plod slowly on to fortune, sometimes, more often to a hopeless ending of their dreams, and not infrequently to their death. Some imagine that with a canteen of water there is no danger on the desert, but such is not the case. Men die on the desert from other causes than lack of water. The intense heat drives

them to insanity and they wander from the trail and are lost. Canned goods are commonly used on the desert, but all who use this class of provisions should know and remember that having once opened a can of fruit, vegetables or meat, it should be removed at once into a crockery, glass or enameled vessel of some kind, for in the heat of that country ptomaine poison quickly develops in opened canned goods — particularly in those which contain acids, such as tomatoes, apricots, etc. Canned milk is also dangerous to leave in the cans when opened. The excessive use of salted meat should be avoided, although unfortunately this is about the only kind that can be carried about with the camp outfit. Bacon, ham, dried beef, canned corned beef, etc., are staples and are almost indispensable, but they should be used in moderation, for the liberal use of these meats only intensifies the thirst natural in this heated dry atmosphere. When stationed in a camp the water should be kept in a barrel or a canvas sack. The latter if hung up will keep the water several degrees cooler than the atmosphere. If the water is in canteens keep the outside covering of the canteens wet continually and put them in the sun, which will have a tendency to quickly dry out the moisture. The rapid evaporation lowers the temperature and cools the water. It is only due to this rapid evaporation of moisture that human beings, horses and other animals can exist under such conditions. No matter how freely one perspires the moisture is rapidly evaporated, and thus the heat is bearable. In the middle of the day it were better to rest and not attempt to travel. Experienced desert men make early and late journeys, resting for several hours during the middle of the day — from 11 A. M. to 4 P. M.—and where possible travel mostly at night.

Some think that the only really dangerous portion of the desert is in Death Valley, but the difference between the climatic conditions in that noted depression and in the region surrounding it is scarcely worth mentioning. The entire region is hot, dry and extremely dangerous to those unaccustomed to its terrors. The months of July and August are the hottest usually, and it would be well for strangers to the desert and its conditions to put off a contemplated journey to that region until October or November at least.

THE PROSPECTOR.

The white rock sample from Camborne, B. C., is marble of fine texture, and if found in large blocks, free from cracks and stains of iron, or other oxides, might prove on development to be a valuable structural and ornamental stone.

The samples from Isabella, Cal., are: No. 1, fine grained mica schist, somewhat silicified, and containing pyrite with possibly gold. No. 2 is a granular quartz rock in which is a considerable amount of iron oxide, both hematite and limonite. Rock of this description is sometimes gold bearing, but is usually extremely irregular in the distribution of values.

The rock samples from Grub Gulch, Cal., are: No. 1, grano-diorite; 2, mica-bearing diabase; 3, crystallized limestone; 4, felsite; 6, ankerite with scales of green mariposite; 7, black clay slate; 8, mica slate; 9, steatite (talc); 10, quartz, apparently a silicified hornblende slate. It is stained green by chlorite and contains pyrite, probably gold-bearing; 11, mispickel (arsenical iron sulphide) in quartz. It shows some gold; 12, pegmatite (granite); 13, diabase; 14, magnesite (magnesium carbonate).

The black rock samples from Althouse, Or., are white quartz containing 2% or 3% pyrite and a large percentage of magnetite (magnetic iron oxide). The rock is unusual in carrying magnetite and pyrite. The magnetite looks much like black manganese oxide, but the magnet will readily take up every particle of it.

The red mineral from Terlingua, Texas, is cinnabar; the white specimens are gypsum (calcium sulphate).

The mineral specimen from Bisbee, Ariz., is pumice and of good quality. Pumice is used as an abrasive material and is salable occasionally. A large amount of pumice is brought to the United States from the Hawaiian islands.

The rock samples from Prescott, Ariz., are: No. 1, andesite; 2, basalt; 3, quartz containing fine needle-like crystals of tourmaline; 4, cinnabar in iron ore; 5, quartz carrying scales of micaceous iron; 6, granite.

The rock sample from Daggett, Cal., is basalt. This rock is of volcanic origin and of comparatively recent age. The bottle green crystals in the black mass of the rock are crysolite (olivine). This mineral is abundant in some basalts and in other basic igneous rocks.

The rocks from Tybo, Nevada, are: No. 1, limestone; No. 2, chert; No. 3, rhyolite; No. 4, porphyry, possibly an altered rhyolite, too much decomposed for determination.

Ore Deposits of the Cœur d'Alene, Idaho.

Written by F. L. RANSOME.

One of the most important lead-silver producing districts of the world at present is that about Wardner, in the Cœur d'Alene district, Shoshone county, Idaho. The following abstracted from Bulletin 260 of the United States Geological Survey written by F. L. Ransome is the most important contribution to the geology of that important region, and is of interest to all miners who are learning to appreciate the value of a knowledge of geology as related to their ore deposits:

Although the Cœur d'Alene region of northern Idaho produces more argentiferous lead ore than any other district in the United States, its geological features are comparatively little known. Lindgren has published brief accounts of some of the mines and has described the principal mineralogical features of a few of the ores. Finlay has given a good general description of the lodes and mines, mainly from the technical standpoint, and has devoted about a page to the geology of the region. These are the only important publications relating to the geology of this part of Idaho that have appeared.

GEOGRAPHY.—The area which may be conveniently called the Cœur d'Alene district (although for purposes of record and administration it has been divided into a number of local mining districts) is, so far as its productive portion is concerned, in Shoshone county, Idaho. It lies almost entirely upon the western slope of the Cœur d'Alene mountains, a broad and rather complex member of the main Rocky mountain chain. The Cœur d'Alene mountains extend from Pend Oreille lake on the north to the headwaters of the North Fork of the Clearwater, or nearly to Lolo Pass, on the south. The eastern slope of the range descends in from 10 to 25 miles to the valleys of Clark Fork and the Missoula river. The western versant slopes as a broad, dissected plateau down to the basaltic plains of Spokane and eastern Washington. The breadth of this western slope is 50 or 60 miles.

Wallace, the principal town of the region and the seat of Shoshone county, has a population of about 3500. It is situated in the south central part of the district, at the confluence of Ninemile and Canyon creeks with the South Fork of Cœur d'Alene river. It is essentially a supply point for the mines, the mining population being housed for the most part in the smaller towns of Wardner, Mullan, Burke, Mace, Gem and Murray.

GENERAL CHARACTER AND DISTRIBUTION OF THE ROCKS.—The prevailing rocks of the Cœur d'Alene mountains are arenaceous and argillaceous sediments of great thickness. They constitute an apparently conformable series, of which neither the stratigraphic base nor top appears in the district nor, so far as known, in the surrounding region. No fossils have been found in them, and they are probably of Algonkian age.

On the west the sediments extend to Cœur d'Alene lake, where they are probably faulted down against the granitic and gneissic rocks forming the western shore of that picturesque body of water. On the north practically nothing is known of the extent of these Algonkian rocks. It is not unlikely that they continue northward past Pend Oreille lake and are connected with the great series of Algonkian beds known to occur in the northwestern corner of Montana. On the east, beds of the same character as those occurring in the Cœur d'Alene district extend to the Missoula river at the mouth of the St. Regis de Borgia. Here there is apparently some change in lithological character, but quartzites and red and green siliceous argillites, probably of Algonkian age, extend at least to the town of Missoula, in Montana, and probably for a distance farther east. The area of Algonkian sediments has a width of about 80 miles between Cœur d'Alene lake and the Missoula river, and it is probable that extensive exposures of Algonkian beds continue 100 or more miles to the eastward, connecting the Cœur d'Alene area with the known Algonkian areas of central and northern Montana.

On the south, Lindgren has shown that the sedimentary rocks near Lolo Pass, which are probably part of the same series that prevails in the Cœur d'Alene mountains, are cut off by the great granitic batholith of central Idaho.

In the Cœur d'Alene district alone, the Algonkian rocks have a thickness of at least 10,000 feet, and it is certain that by no means the entire series of rocks of this age developed in northwestern Montana is represented.

As a whole, the Algonkian sediments of the Cœur d'Alene region exhibit little lithological contrast. They are chiefly shallow water deposits, as shown by the prevalence of ripple marks and sun cracks They comprise dark argillites (mud rocks), graywackes (mud-sand rocks), quartzites of various degrees of coarseness, and usually sericitic, quartzitic sandstones, and impure limestones or calcareous argillites. Secondary cleavage is frequently present in all but the coarser arenaceous beds, but this slaty structure varies greatly in development in different parts of the field.

No sediments younger than the Algonkian occur in the Cœur d'Alene district, with the exception of fluviatile deposits, some of which may be of Tertiary age.

The Algonkian rocks are cut by a number of masses of syenite most of which have the form of small intrusive stocks, and by a few dikes of diabasic, dioritic, and minette-like habit, which have not yet been studied. The principal syenitic intrusions occur northeast of Wallace along a northeast-southwest line. There is no means of determining the age of these intrusions. If the syenitic stocks were intruded at the same time as the great granitic batholith of central Idaho, they are of post-Triassic and pre-Miocene age.

DIVISIONS AND LITHOLOGY OF THE SEDIMENTARY ROCKS.—Owing to the rather monotonous sequence of the Algonkian sediments, and the absence of fossils or unconformities, division of the group into distinct formations is difficult. Sands and silts accumulated on the subsiding bottom of a shallow sea to a thickness of over 10,000 feet. So shallow was this sea that most of the sediments retain the marks of pre-Cambrian ripples and were occasionally laid bare and cracked by the sun. Throughout the entire period of deposition there was no abrupt change in the general character of the sediments. Muddy silts graded into sands and these again into silts.

The Prichard slate is the thickest and the most homogeneous of the formations in the Cœur d'Alene district and occupies the greatest area. It is also one of the most distinctive, the regularly banded bluish-gray slates being readily recognized. It can be distinguished from certain somewhat similar beds in the Wallace formation by its noncalcareous character and by the fact that it weathers in reddish-brown tints, while the weathered exposures of the Wallace formation are yellowish gray. Slaty cleavage is usually fairly well developed and of a more regular character than in the younger formations of the district. It rarely obscures the bedding, to which it is usually inclined at considerable angles. In some places cleavage and bedding coincide, as in the excellent exposures by the roadside just east of Kellogg.

This formation is the prevalent rock along the South Fork from Kellogg to Osburn and occupies almost the entire drainage basin of Prichard creek. It is essentially the gold-bearing formation of the district, though it contains also some promising lead-silver veins, mainly in the transitional beds of its upper part.

The Burke formation consists principally of thin bedded, often shaly, fine grained, sericitic quartzites of prevailingly light tint. With these, however, are included some more massive quartzites, such as form the summit of Tiger Peak, and thin beds of grayish-purple argillaceous quartzite or graywacke. The latter are a more prominent feature of the Burke formation in the eastern part of the area than in the western part. Near the eastern border of the district these purplish-gray beds form the greater part of the upper portion of the Burke.

The Burke is not a very well-defined formation, as the thin-bedded sericitic quartzites and quartzitic shales that characterize it pass gradually downward into Prichard slate and gradually upward into the massive white quartzites of the Revett formation. It is, however, exceeding important from an economic standpoint as it contains the principal lead-silver deposits.

The formation is typically developed along Canyon creek from Burke to Gem, in the vicinity of Wardner, and in many other parts of the district, particularly along the eastern border.

The Revett quartzite is fairly homogeneous and is composed almost entirely of moderately thick beds of white or pale greenish-gray quartzite. The greenish tint is due to the presence of sericite, which forms a considerable part of some of the beds, while others consist of nearly white, pure quartzite. The softer sericitic beds are characteristic of the upper and lower parts of the formation and are in reality transition beds with reference to underlying and overlying formations. The thick white medial beds of the Revett quartzite are exposed chiefly in the eastern part of the district near the Idaho-Montana divide. They contain the copper deposit of the Snowstorm mine, and surround Lake Revett, whence the formation derives its name.

The St. Regis formation consists of siliceous shales or argillites, shaly sandstones, and impure, fine-grained quartzites, characterized throughout by features indicative of shallow water deposition, and by rather bright-green and purplish-gray tints. An irregular slaty cleavage is fairly common. The formation is far from uniform in aspect, however, and shows considerable lithological variation in different parts of the field. It contains beds not ordinarily distinguishable from certain beds in the Burke and Wallace formations, so that it is sometimes difficult to identify the formation when but small areas are exposed. The formation is thickest and best exposed in the southeastern part of the district, particularly about 3 miles northeast of Mullan and in the vicinity of St. Regis Pass.

The Wallace formation in thickness and areal extent is second only to the Prichard slate. It is the

most heterogeneous of all the formations distinguished. The dominant rocks are thin-bedded, light-green shales consisting chiefly of quartz and sericite, associated with impure limestones, bluish-gray argillites, and calcareous quartzites, and characterized from top to bottom by ripple marks and other evidences of shallow-water deposition. In addition to the dominant constituents, nearly all of the beds contain more or less calcite, dolomite, and siderite (or other ferruginous carbonates), which on weathering give a yellow tint to the exposures of the formation. A slaty structure is common, the rocks often being highly fissile, though the cleavage never approaches in regularity that of ordinary clay slate. Fresh surfaces of these green-banded slates have usually a peculiar waxy luster that is very characteristic of the Wallace formation, as is also the presence of carbonates.

The formation is well exposed at the town of Wallace, particularly at the Northern Pacific Railway station. It occupies large areas all along the southern border of the district, and is the principal rock along Beaver creek. The mines and prospects in the so-called "dry belt," between Wallace and Wardner, are mostly in the Wallace formation.

The Striped Peak formation is the least extensive in the district. The largest areas occur near the peak whence the formation derives its name. Lithologically it is almost a repetition of the St. Regis formation, with unusually abundant ripple marks.

IGNEOUS ROCKS. — The most important igneous masses in the district are the irregular stock-like intrusions of syenite. The typical rock of the larger areas, as determined by Mr. Calkins, is a coarse-grained syenite with a tendency toward porphyritic development of the dominant alkali-feldspar. The other essential constituents are plagioclase, amphibole, and pyroxene. Biotite is rare, and neither quartz nor nepheline has been detected. From this central type is considerable variation, particularly near the contacts and in the smaller masses, which consist usually of syenite porphyry. In the largest mass, near Gem, are found monzonitic facies and a number of interesting peripheral modifications rich in amphibole and pyroxene.

The larger syenitic intrusions are surrounded by well-marked zones or aureoles of contact metamorphism. The quartzites are altered to hornfels. The impure quartzites and argillites are recrystallized as aggregates of andalusite, garnet, sillimanite, biotite, muscovite quartz, and feldspar, and in the calcareous Wallace beds amphibole and pyroxene are developed.

The dike rocks of the region, which seem to have no direct connection with the syenitic intrusions, are not of great structural or economic importance. They have not yet been carefully studied, but will be described by Mr. Calkins in the final report on the district.

STRUCTURAL FEATURES OF THE DISTRICT.—The sedimentary rocks of the Cœur d'Alene district have been complexly folded, the folds in several instances being overturned, so that the older formations overlie the younger. They have also been extensively faulted and so strongly compressed as to develop slaty cleavage in all but the massive quartzites. While the prevalent strike of the beds is northwesterly, it is plain that no simple compression along northeast-southwest lines can satisfactorily account for the often highly complex character of the folds and the numerous and important deviations from the dominant northwesterly strike. In the greater part of that portion of the district lying south of the South Fork the strike is about west-northwest, and the axes of the major folds are traceable for considerable distances. In the vicinity of Kellogg peak and Wardner, however, the strike becomes more northerly and the folds more irregular. In the region lying north of the South Fork and west of Beaver and Nine Mile creeks the essential structure is that of an anticline, with a steep pitch to the north. The oldest formation exposed in this anticline is the Prichard slate, which occurs along the South Fork from Osburn westward, and in consequence of this structure forms a semicircular area north of the river.

From Mullan northward past Murray is a broad belt of close and complex folding in which north-south strikes prevail. This structure passes into a zone of more open folds to the east.

The region contains a number of important faults, of which the majority strike nearly west-northwest. Both normal and reversed faults occur, the dip of the reversed faults being usually steep. The west-northwest faults are particularly abundant in the southern part of the district, where seven important dislocations of this group have been mapped and studied by Mr. Calkins. These have throws of from 1000 to at least 4000 feet and observed lengths up to 18 miles. The most prominent fault of this group extends from a point east of Mullan, past Wallace, through Osburn, and for an unknown distance west of Wardner. The fault is normal, with downthrow to the south, and the dislocation brings the Wallace formation against the Prichard slate, near Osburn—a relation that implies a throw of at least 4000 feet.

The west-northwest faults have approximately the same general strike as the lead-silver lodes and were produced by the same or similar stresses. That some of the faults were formed prior to the deposition of the ore is fairly certain.

In addition to the west-northwest faults there are several dislocations of nearly north-south trend, which attain their greatest structural importance in the central part of the district. The most prominent member of this group is the Dobson Pass fault, which has been traced from a point about 3 miles north of Wallace to within 2 miles of Eagle. The fault dips to the west at an angle of 35° or less, and is normal. At Dobson Pass, 5 miles north of Murray, the fault has dropped the Striped Peak formation against the Prichard slate, indicating a throw of at least 6000 feet.

Another great dislocation of this group is the Carpenter Gulch fault, which has been followed from the northern boundary of the district southward, past the mouths of Prichard and Beaver creeks, for 12 miles to a point about 3 miles northwest of Wallace. Its course is irregular and it dips west and southwest at a moderate angle. This fault is an overthrust of approximately 1000 feet.

Slaty cleavage, usually of a rather irregular character, is a well-marked structural feature of the finer grained rocks of the Cœur d'Alene region, and a distinct fissility has in some places been produced in moderately coarse quartzites. It is best developed in the Prichard slate and in the lower part of the Wallace formation. This cleavage is usually independent of bedding, and shows a marked tendency to conform in strike to the general trend of the longer folds and in both strike and dip to the major faults. Local zones of slaty cleavage are the usual accompaniments of the lead-silver lodes of Mullan and Canyon creek. In no case does this structure attain the perfection found in roofing slate. The cleavage surfaces intersect at small angles, and the rocks split somewhat irregularly into lenticular flakes. The dip of the cleavage nearly everywhere ranges from southwestward to southward or westward.

(TO BE CONTINUED.)

Discovery and Development of the Homestake Mines of South Dakota.

NUMBER IV.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS.

The adoption of the room and pillar method of removing ore was eminently satisfactory from every point of view, except that it did not remedy the heavy expense of timbering. It had been the custom in these mines for years to drive great headings in advance of the stopes, and in which no timbers at all were placed. So solid were the walls that it was not unusual to see these cuttings 100 feet long, 40 to 50 feet wide and 30 feet high. On the floor tracks were laid and cars were trammed to the working faces, and the ore broken down was shoveled into the cars and trammed to the nearest shaft. The excellent standing qualities of the ground no doubt suggested the idea of mining without timbers. The miners were well aware, from experience, that there was a limit to the extent to which this idea of great timberless headings could be carried, and therefore had to devise a method of stoping which would permit the removal of ore in safety, and not result eventually in a cave.

A method was finally adopted known as the Homestake system. As in the method last described, the stopes are opened in series, stopes and pillars alternating, and sills are laid on the floors of the rooms in the same manner as in timbered stopes. Concerning this new method of stoping, B. C. Yates says in a paper devoted to the subject:

When the sills are in, three lines of track are laid running lengthwise of the stope, but crossing the ledge, with as many cross tracks connecting them as are necessary. The sill floor posts are put up and lagging placed over the top. The tracks are protected by double lagging on top and the rock is prevented from running in at the sides onto the tracks by lagging or slabs spiked to the posts.

As soon as the timber is in position the mining operation begins. The ore is broken down and allowed to fall through the lagging, entirely filling the sill floor sets, with the exception of the carways The lagging, which serves merely as a staging, is removed as fast as the sets are filled with broken ore. No rock is removed from the stope until this filling is finished. When the next cut or breast is carried across the stope some ore must be removed to make room for the miner. The timbers are carried only one set high.

In the large stopes two D-24 Ingersoll machines are employed, with from one to two "baby" machines, which are used to drill block holes in the large boulders.

Somewhat of an innovation in machine drills for block holing has been introduced. A small pneumatic hammer, such as is used in shops for chipping and caulking, fitted with a rotating movement, operates a small drill bit about 1 inch in diameter. This machine will drill holes from 6 inches to 12 inches deep and has so far proven very successful in block-holing large boulders in the open stopes.

As there are no timbers to break, no limit is placed on the miner as to the amount of rock he may bring down at one blast. The stope should be finished as quickly as possible so that the broken rock may all be removed if needed. Consequently large slabs of ore are blasted down, and these must be broken up to regular car size, either on top of the pile or on the sill floor as it is drawn down by the shovelers.

On account of the uneven size of the rock, chutes are not generally used in these stopes, but the car men shovel the ore into cars from the level of the track, there being as many places to shovel from as there are spaces between posts along the track. However, where the rock is soft and where it breaks fine, chutes are used to advantage.

Should a large rock come down which the shoveler cannot break with a rock hammer, he moves his car to another opening until the "block holer" comes around.

Two or three regular sets on each side of the stope are carried up as fast as the stope is worked, in which are placed the ladders and air pipes. These open sets also assist in ventilating the stope.

When the stope is worked up 80 or 85 feet, raises are made to the level above, through which the filling is to be dumped, and the ore is then drawn out. While the ore is being drawn out the walls and roof are carefully watched and all loose material is dressed down. No accident of a serious nature has occurred in one of these stopes during the two years in which this method has been employed that could in any way be attributed to the method.

When one end has been emptied of ore a section of the sill floor is lagged and the filling is dumped in until it begins to run over the lagging. In this way the filling follows the shovelers and the walls of the stope are supported at one end by the ore and at the other by the waste.

When small ore bodies are worked by this method no pillars are left in, but when one section is worked up a sufficient height another section is started at one end, and the ore is left until the entire body is worked.

Stoping without timber is not confined to the Homestake mine, but there are certain features of the method as employed here peculiar to the Homestake, and which are considered necessary to suit the conditions. In the Treadwell mine, Alaska, the sill floor is not opened on the station level, but drifts are run in the ledge and raises put up from these drifts to a level some 15 feet above.

No timber is required except for chutes, but a back of ore is left in, which takes the place of the sill floor timbers used in the Homestake. The cost of the timber would, in a great measure, be offset by the cost of making raises and putting in chutes. The accessibility of the ore is another advantage in favor of the Homestake method and becomes a necessity in a mine which furnishes nearly 4000 tons of ore every twenty-four hours.

As only a small per cent of the ore can be removed before the stope is finished, there is of necessity a large reserve always on hand, which allows the mine to lay off whenever desirable. The present broken ore reserve of the mine is nearly one million tons.

Timbering at the Mount Rex Tin Mine, Ben Lomond, Tasmania.*

Written by MARK IRELAND.

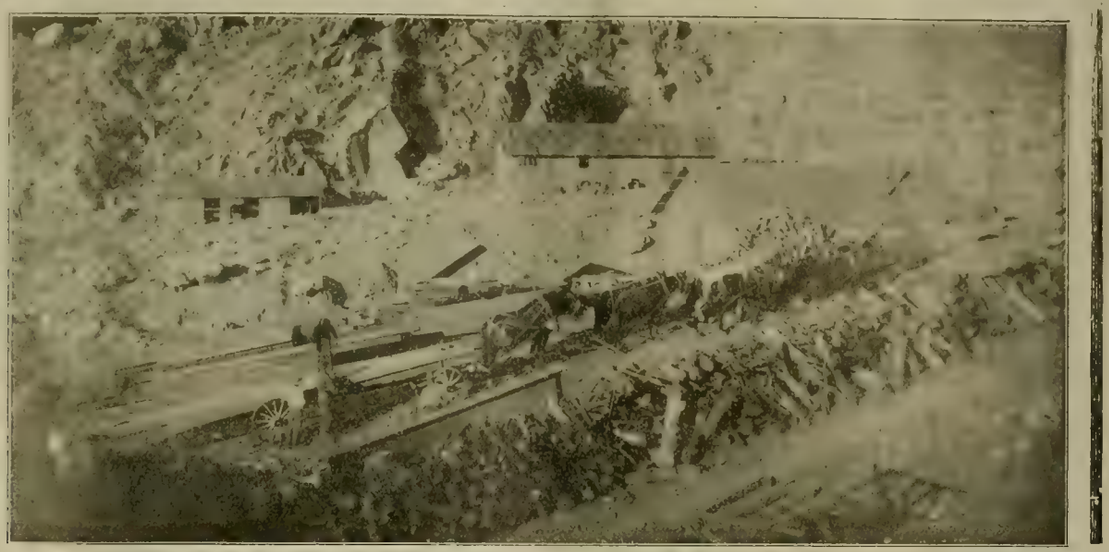
The ore body being worked is about 100 feet in length by 70 feet in width. A face of about 15 feet is stoped over the whole level at one operation, this height standing without any timber.

Double lines of logs, 20 feet in length and from 10 inches to 1 foot in thickness at the small end, are then laid longitudinally, butt to butt, and breaking joint from end to end of the ore body; they are at 10 feet centers from wall to wall. The starting logs are single for the first 10 feet and their ends are hitched into the solid rock. These are called "runners" and are the logs which are picked up as the level underneath is worked up. The double layer gives a better chance of picking up. Logs are now laid from the center of the ore body at right angles to the runners, the ends being hitched into the walls. A space, 7 feet wide, is left open right through the center of the ore body, and a similar space through from the cross-cut leading to the shaft. The cross logs are spiked down 4 feet apart to the runners. Decking of small spars from 3 to 6 inches thick is then laid down. Timber cribs, or pig-styes, are now built up, 4 feet wide, on each side of the open spaces previously referred to, forming a skeleton drive. The pig-styes are constructed as follows: Two logs are laid parallel, 4 feet apart, and upon them in notches at the ends and the middle, three cross-sills are laid, two more logs are laid upon them in turn, and so on until 7 feet high in the clear is obtained. In the spaces between the logs waste rock is filled in as fast as built. Strong caps, 12 to 14-inch timber, are then laid 4 feet apart across from pig-stye to pig-stye. Decking is laid over these caps as on the level. Shoots and traveling ways are then built, and the level is then ready for filling in with waste sent down from the surface. This method is strong and very cheap as compared with the square sets. But little dressing is required, an axe, saw and auger only being required, and any rough but fairly straight timber will do. An additional advantage is that no blasting, however heavy, can injure it.

*Trans. Aus. Ins. Min. Engrs.

The Panamint Mining District of California.

In the news section of this issue is a communication from Panamint district, California, which at this time is again beginning to attract attention. This is one of the high desert ranges in southern Inyo county, and is in many respects more favored in climatic conditions than some of the other desert ranges of lower altitude. The large number of prospectors going into this only partially prospected district is likely to result in the discovery of valuable mineral deposits. The men now scouring the Panamint range are really the overflow from the crowded new camps of southern Nevada, and many of them who dread the intense heat and the dangers of the lower hills are contented to search in this higher mountain range where the heat, though intense, is still bearable. In Bulletin 208 of the United States Geological Survey, J. E. Spurr thus describes, in part, the geology of the Panamint range:



Hauling Lumber Into Panamint, Cal.

The Panamint range is one of the most important of the ranges auxiliary to the Sierra Nevada, which lie in the belt east of it, and runs northeast and southwest parallel to its front. The range is about 130 miles in length. At its northern end it merges into lava flows, which unite with the northern end of the Grapevine range, while at its southern end it passes into low hills of Tertiary (later) strata and associated lavas capped by later basic volcanics. It forms the southwestern barrier of Death valley, which it fronts with a steep slope. This range has been very little explored and not much is known concerning its geology.

On the east front of the range, above the road from Furnace creek, in Death valley, to the crossing of the range at Wing Gap, a large portion of the range consists of the older stratified rocks, which seem to lie beneath unturned Tertiary (later sediments and associated volcanics), and are cut through by masses of intrusive granite. The drift shows them to be in part finely crystalline blue limestone, and in part quartzite, white, grey, or green, often considerably altered and often coarse grained. The amount of quartzite in the drift implies a considerable thickness of this rock and suggests that the strata are of Cambrian age, as this is the only division of the Paleozoic in this region which contains great amounts of quartzite.

From this neighborhood northward the Panamint range is composed chiefly of old Paleozoic stratified rocks till near its northern end, as can be plainly seen from Death valley. H. W. Fairbanks found on the western side of the range, north of Windy Gap, as far as the Pinto range (which is a spur of the Panamint range running northwesterly from the Wild Rose mining district), that a portion of the rocks are mica schists, quartzites and marbles, which have been cut by intrusive granite. The strike of the folds is parallel with the trend of the range, so that unless disturbed by cross faulting the same general formation will be found for many miles. Therefore the Cambrian and Silurian have been represented as extending northward until covered by volcanic flows at the northern end of the range. The eastern flanks of the range fronting Death valley, as seen on the road between Furnace creek and Windy Gap, are composed of upturned, yellow-green strata and associated volcanics lying upon the older rocks with no evident unconformity and partaking of their folds. This belt of interbedded volcanics and sediments grows wider toward the south. The same series occurs along a great part of the road which crosses the range to Windy Gap. The lava in these belts proved, in three different samples, to be andesite.

This series of conglomerates, breccias, tufts, chemical precipitates and lavas is the same as that exposed on the opposite side of Death valley, where it forms practically the whole mass of the Funeral mountains. In the Funeral mountains these rocks have been provisionally correlated with the Esmeralda formation in the Silver Peak range.

In the southern portion of the range the core of the mountains for some distance is made up of a body of massive granite, which varies to granite-porphyry; the granite, which cuts the ancient limestones and quartzites in the mining regions on the east side of the Panamint, is a hornblende-granite with much quartz.

As already stated, volcanic rocks make up a considerable portion of the Tertiary formations. Three specimens of these rocks examined all proved to be andesite, but probably other rocks occurred in these series. Overlying these older lavas unconformably is a later flow of more basic rocks, which cover a considerable area in the neighborhood south of Windy Gap. Mr. Fairbanks states that on the northern slopes of the Panamint range, overlooking Mesquite valley, there are scattered sheets of andesite and basalt. Yet another series of volcanics is exposed in this region. It is that forming the greater part of the Slate range, which lies immediately west of the southern end of the Panamint range. The highest portion of the Panamint range for a number of miles east of Panamint, a body of ancient rhyolite, is regarded as one of the most ancient lavas observed in the region. The northern end of the Panamint range, the Paleozoic rocks, are here covered by extensive flows of lava, which appears to be nearly continuous with the lava area at the extreme southwestern portion of the Silver Peak range.

A Mining Camp in Panamint Range, Cal.

Structure.—That portion of the Panamint range between a point opposite Furnace creek and Windy Gap appears in general anticlinal. There is here a series of alternating anticlines and synclines, having trends due north and south. Each of these folds may be traced continuously for a number of miles. The explanation of this phenomenon may be a series of east-west faults, which fault the folds systematically to the east on the south side. In the Panamint range much of the deformation must be of comparatively recent date. We know much of it occurred since the deposition of the Tertiary beds and associated lavas.

Near Postoffice Springs, H. W. Fairbanks describes gold deposits occurring in folded limestone strata, with slates below and on both sides. The ore is high grade. Near the old town of Panamint is found sil-

ver-bearing sulphide copper ores, with arsenic and antimony. The veins are found in all the sedimentary rocks of the district. In the Wild Rose district similar ores are found.

Panamint is one of the oldest mining districts in Inyo county. It is 70 miles southwest of Bullfrog and about 130 miles due south of Goldfield, Nev. The town of Ballarat is located in the Panamint valley, 63 miles from Randsburg, which is on the Santa Fe Railroad. The district is easily accessible from the different railroad terminals of Keeler, on the Carson & Colorado, and Randsburg, on the Santa Fe.

There are streams of running water in the canyons, always enough for milling purposes and in many cases for power, and forests of pinion pine are to be found near the summit of the range.

The town of Panamint is on the west side of the range, near the head of several large canyons, at an altitude of 6000 feet, and at this place, in the early 70's, a large silver mill was built with a Stetefeldt furnace attachment for roasting the base ores. The mill was destroyed by fire, since which time, until the present, little attention has been given it.

Reclaiming of Bouldin Island, Cal.*

Written for the MINING AND SCIENTIFIC PRESS by JOHN A. YEATMAN, M. E.

An engineer glories in overcoming adverse conditions presented by nature. A detailed account of such work suggests by analogy how other difficulties that perplex the engineer may be met. Mining engineers may learn much for their own use by reading of the engineering achievements of their fellows. Much reclamation work is being done on the Pacific coast, but the following is believed to be unique.—ED.

The annual spring flood waters of the Sacramento and San Joaquin rivers of California are well known. The soil of the lower Sacramento valley is light and unsuited when formed into embankment to resist the force of these streams during flood season. During the past twenty years there has hardly been a year that one or more of these delta islands have not been completely submerged. The flood waters of 1904 reached their highest level in the latter part of March, with the result that Bouldin island, Tyler island, Stattin island and Edwards island, containing 31,000 acres, were submerged, besides twice this acreage on the lower San Joaquin, which was not in such a high state of cultivation. The loss, measured in reconstructive cost and pumping on these three islands, amounted to about $800,000, together with the loss of one year's crop and the unmeasured sum of restoring the land to its former state of cultivation. On March 23, 1904, after contending with flood water for four days, the embankment near Central Landing, on Bouldin island, in a bend of the Mokelumne river, near where it joins the San Joaquin river, gave way, undulating the entire island of 7000 acres to a depth ranging from 7 to 12 feet.

This break is one of more than ordinary interest, owing to the fact that a part of the embankment was routed out to a depth of 97 feet below the river level. After the water started over the embankment, the opening continued to widen until it had reached a width of 700 feet, 400 feet of which consisted only of the surface levee, being washed away; the remaining 300 feet covered the real rupture to the depth of 97 feet, the bottom being defined by a stratum of clay.

Within a week the water had subsided sufficiently to begin the work of reconstructing the levee (repairing the break). The first attempt was made after the regular manner of repairing levee breaks on the river. This being a larger break than usual, seven dredgers were engaged, two of them being suction dredgers, an aggregation of 750 H. P.; the other four dredgers were clam-shell type, having 2½ cubic yard buckets. Night and day for thirty days these dredgers poured their material into the break, the result being that the 400 feet of levee on each side of the break proper was restored; the depth to bottom of break was now 85 feet and no increased effort could decrease this. As the current washed through and carried the material inward and as the tide went out the waters retreated, to have the operation repeated the next day. Further effort along these lines being futile, it was decided to change the method of operation. Accordingly, two floating pile drivers and two hundred 100-foot piles were secured, including three barge loads of brush mats. Two clam-shell dredgers were retained. In this second effort it was proposed to drive pipes in bents of six piles each every 10 feet apart across the break to sink brush mats, which would be held in place, in part, by the piles, thereby breaking the flow of the sub-surface currents, that material might be deposited and remain. Night and day gangs worked at this breach of 300 feet until the season was so far advanced that it became evident that the annual crop could not be recovered. Work progressed from each end with fair success until the last 60 feet was reached, when it was found that the current was so swift—due to the contracted passage—the depth so great and the supporting surface for the piles so meager that all hope of closing the same by this method had to be abandoned. Piles 14 inches in diameter, 100 feet long, driven into 10 feet of sand and into a stiff clay strata and anchored at the top, were readily torn away by returning current after a tide. This second effort occupied about three months, and, while not successful, was contributing to the final closing of the break.

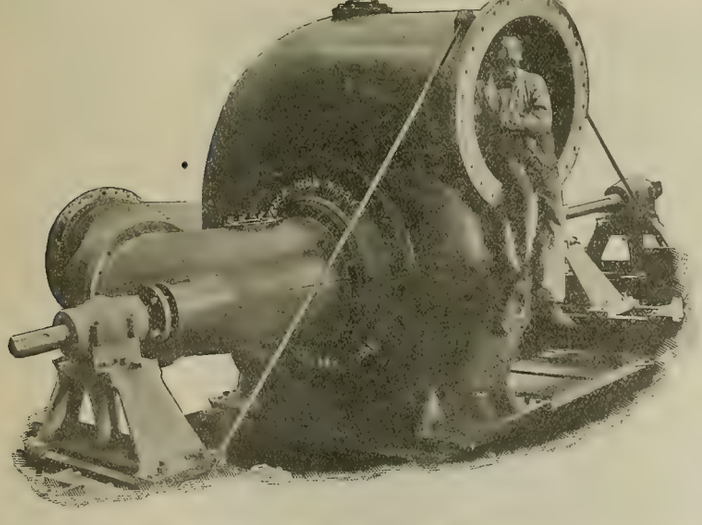
In the third effort it was decided that nothing but rock would ever baffle this current. Accordingly plans were made to lay a base of 80 feet, and as the deposit increased in height to make it narrower. Contracts were made for rock and hauling and the work began. As the nearest available quarry was some 30 miles away, and a large barge load was such a small portion of the embankment to be made, the reader can form some idea of the cost and magnitude of the undertaking. About the time the first 20 feet of the base was in place it was decided to secure an unworthy sea-going ship of 25 feet beam and 250 feet in length to sink across the break, to intercept the current and assist in filling. The ship was secured and sunk on the island side of the break. The feat was accomplished with dispatch and success. From an engineering point of view, it is a question whether the results justified the use.

Depositing rock continued until within 40 feet of the surface, when, to expedite the work that a second year's crop might be secured, it was decided to drive two rows of piling 10 feet apart and fill in the intervening space with rock, thereby reducing the amount to one-third of what it was estimated was yet required. Work of piling was begun on each side and the filling followed after, when the piling was brought within 25 feet of each other. No further piles were driven until the rock work was well carried forward and brought up to 7 to 10 feet below the surface, when it was discovered that the current was so strong as to be actually able to carry the rock away. This was overcome by depositing the rock in a diagonal manner, so that the water could not enter except by reverse current, and in this manner the work proceeded until in November, 1904, eight months after the break, the same was closed and the river excluded. Suction dredgers were again set at work and reinforced the rim of rock embankment. Pile work now proceeded to reinforce the material that had been put in place and to provide foundations for the largest reclamation pumping plant ever placed on the river.

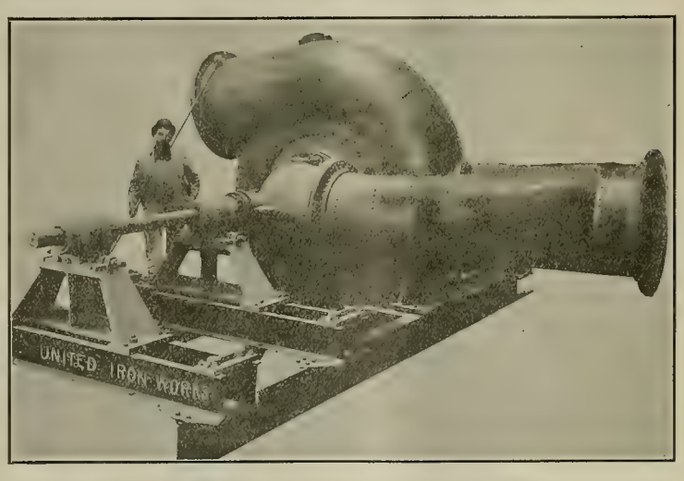
The break being repaired and the 20 miles of levee around the island being in condition to resist the external waters, the work of removing the water from the island was undertaken. It was estimated that the water to be handled was between fifteen and sixteen billion gallons. The height to which it was to be raised was from zero at initial pumping to 12 feet maximum, with a possible 16 feet at high tide. The average pumping head for the entire mass of this water would be about 5 feet.

The time apportioned to accomplish this work was limited to sixty days. There were several reasons why the time was so limited. Chief among these were that it was necessary to remove the water by March 1, 1905, that the 1905 crop would be available; further, it was desirable that the final pumping be done quickly, that the sun would not heat up the water and sicken the asparagus plants. Accordingly purchase was made of four large centrifugal pumps, to be direct connected to short-stroke, cross-compound, high-speed engines, and contract was made with the United Iron Works of San Francisco, Cal., for the installation of the same. Owing to the unstable condition of the embankment, where it was

Discharge Side of Bouldin Island, Cal., Pumping Plant, Showing Flexible Steam Connection to Steamboat.



Forty-eight Inch Centrifugal Pump.



Mounting of Forty-four Inch Centrifugal Pump.

*See illustration front page.

necessary to place the pumping plant to most effectively drain the island, it was a matter of first importance to drive additional piles for foundation In addition to the many piles already driven, it was necessary to pile an additional area of 60x120 feet, and, upon examination, it was decided that, by using mechanically balanced engines, piles spaced 10 feet each way, securely capped and cross-capped, would afford ample stability to carry the load and resist the vibration. Such a foundation was prepared and proved to be all that was required.

Heretofore all the large pumping plants have been placed on the island side of the levee and have been placed so low as to permit the discharge pipes to pass through the embankment. This was impossible in this instance, as the water on the island was on a level with the water without. To cofferdam and provide a place was impossible, and the only thing to do was to install syphon plants, as illustrated herewith. This was the motive that characterized the hydraulic arrangement, and the same proved to be a money saver and an ideal arrangement, insuring safety and facilitating the installation of the machinery.

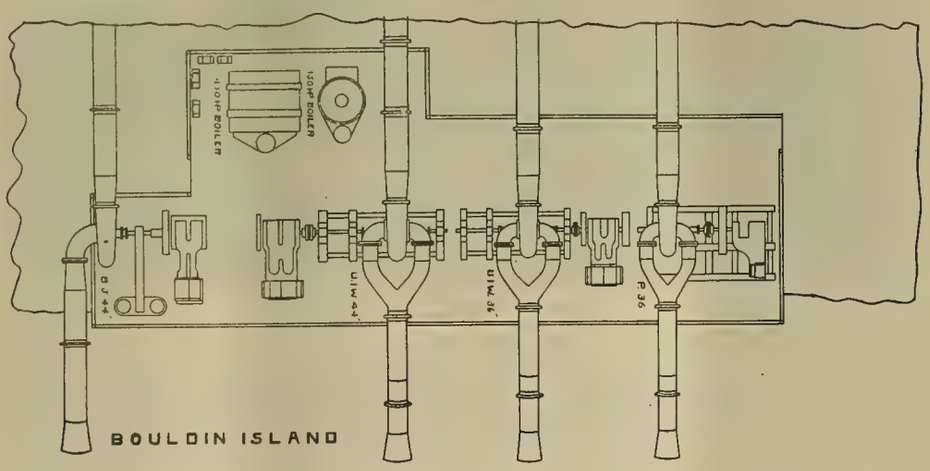
The plant consisted of the following units: The largest pump was furnished by the United Iron Works, having 44-inch suction and discharge openings, connected to 48 inch suction and discharge pipes, having a capacity of 60,000 gallons per minute when running at 230 revolutions per minute. This pump was direct connected to a 350 H. P. Ball cross compound engine on substantial steel sub-base, by means of a flexible link coupling; occupied a space of 28 feet long by 12 feet wide. The top of the pump was 13 feet above the floor and the floor line for all was 2 feet above the water line. The second pump was a 36-inch United Iron Works pump connected to 40-inch suction and discharge pipes, having a capacity of 35,000 gallons per minute when running 250 revolutions per minute. The same was direct connected to a 200 H. P. Ball cross compound engine on I-beam sub-base by means of a special solid coupling. This unit occupied a space of 20 feet by 10 feet; both of these pumps occupied more space than they otherwise would, because they had been prepared to be operated either belt driven, or direct connected, as desired. The third unit was a Byron Jackson Machine Works 44-inch pump connected to 48-inch suction and discharge pipes, having a rated capacity of 50,000 gallons per minute when running at 200 revolutions per minute; was direct connected on I-beam sub-base by solid coupling to a Jackson single valve cross compound condensing engine with jet condenser. The same occupied a space of 14 feet by 14 feet. The fourth unit was a Price 36-inch pump, having a rated capacity of 35,000 gallons per minute when running 210 revolutions per minute. This pump was direct connected upon timber sub-base by solid coupling to 200 H. P. Brownell automatic high speed engine. The space occupied was 14 feet by 12 feet in width.

Steam was supplied by a stationary plant of 550 H. P. and a river steamer (City of Stockton) having a rated capacity of 450 H. P. The stationary plant consisted of one 400 H. P. Scotch marine boiler 12 feet diameter, 13 feet long, having three fire tubes, each fitted with the latest improved oil burners, and one 150 H. P. vertical, 7-foot by 12-foot, boiler. The river steamer was moored to the wharf and steam carried ashore through 125 feet of 8-inch pipe. As the tide varied the water level 3 to 4 feet twice a day, it was necessary to have a flexible connection between steamer and shore line. This was accomplished by means of ball joints, as shown in cut. All boilers were fitted with oil burners. Oil was supplied by oil barge and temporary storage was made in one 10,000-gallon wooden tank and two auxiliary 5000 gallon galvanized iron tanks. Every known precaution was taken to insure safety in handling the oil and maintaining the fires.

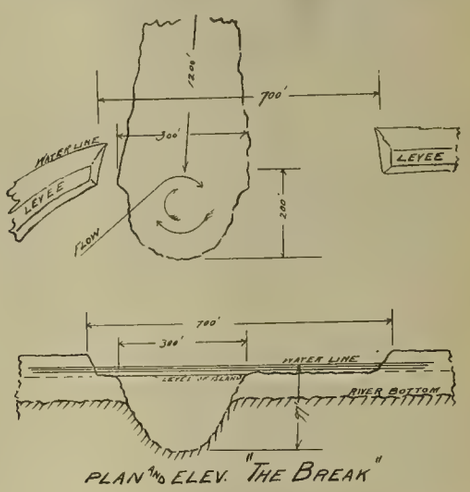
Each pump was primed by steam and no difficulty was encountered, even when water receded to a point 26 feet below the top of the pump The time required at first priming was about twelve minutes, which increased until it took over thirty-five minutes when the last of the water was being handled. No pump unit was run at full speed when all the pumps were in operation, for the pump and engine portion of the plant were in excess of the steam generated. The operation and performance were ideal, and all that could be expected of such a large plant, installed so quickly in face of the difficult conditions surrounding the same.

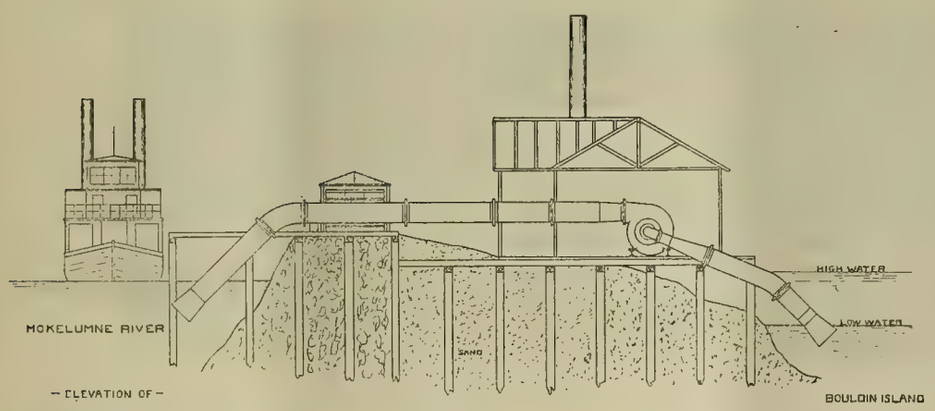
With all pumps in operation the capacity was about 165,000 gallons per minute—equivalent to 10,000,000 gallons per hour. During the time of pumping no less than 6 inches of rain fell on the island, which increased the duty to be performed about 1,200,000,000 gallons. Fortunately, this rainfall occurred during the earlier period of pumping, thereby saving much in head effect. The oil consumption ranged from 60 to 110 barrels per day of twenty-four hours, and 2500 barrels of oil was used in draining the island.

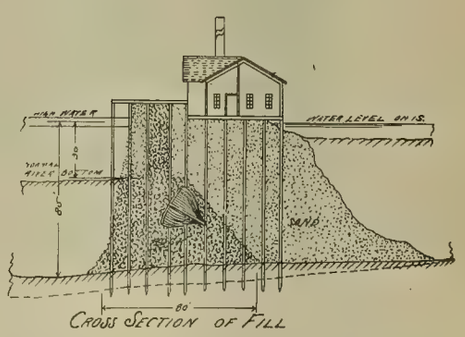
Pumping was begun December 8, 1904, before the plant was entirely completed. All pumps were in operation by January 10, 1905, and operated continuously for thirty days, after which time stops were made on first one pump and then another to lower the suction pipe. By February 15, 1905, the island was practically drained, although intermittent pumping was continued to July 1, 1905. Credit is due to Henry Voorman for foundations, to Walter M. Willet on problems of plant design and materials and to F. W. Langley, of the United Iron Works, on plant installation and operation. Upon these men fell the responsibility of the problems encountered, and to them belongs the credit of successfully performing a piece of work of larger magnitude and more serious import than the above words imply.



Plan of Pumping Plant.







Electric Mine Signals and Telephones.

Written for the MINING AND SCIENTIFIC PRESS by GEORGE E. WALSH.

The introduction of electricity in a mine for power or lighting purposes is usually followed in the course of time by equipments for telegraphing, telephoning or general mine signaling. The mines of Germany and the continent of Europe have developed more efficient systems of electrical communication than in this country, but indications are not lacking that engineers are steadily availing themselves of telegraphic signaling in the Far West where electricity is used in the mines. The harnessing of mountain streams for generating electric mine power is rapidly changing conditions in many of the Western mines and, with current supplied in abundance at a low cost, the work of extending the electrical equipment to all kinds of mechanical operation progresses rapidly. While few, if any, mines are operated throughout solely by electricity, there are many which are electrically equipped, and in some of them nearly every phase of mine work is performed.

In the continental mines lighting, signaling, hoisting, drifting, ventilation, hauling and tramming, and firing of shots are operated by electricity—and as a valuable and economical auxiliary the electric plant has few equals. In the matter of lighting and signaling, electricity has received more attention on the continent of Europe than for power purposes. In a good many mines where steam and compressed air still hold their own for operating machinery, electricity is employed for lighting and telegraphing. Where a small plant is employed for lighting purposes, the installation of a complete signaling system is not difficult or costly to operate. The tendency is thus to use both the telegraphic and telephonic methods of mine signaling.

The telegraphic systems which have been developed for mine uses vary somewhat, but in their final results they attain the same trustworthy end. Usually a transmitter and receiver are installed in each station. In many cases the telephone is used in connection with the telegraph. The voltmeter is arranged with a dial, around which a number of signals or orders are arranged. This receiver is plainly marked, and the signals easily read. The transmitter consists of a magneto machine, provided with a dial and corresponding signals or orders. When the operator transmits a message, he turns a crank on the machine until the handle reaches the signal on the dial. Immediately the voltmeter indicates the

transmission of the message and records the result. In a few mines a further precaution is obtained by a small electric bell, which is immediately thrown in circuit, and the strokes of this bell correspond to the number of the signals: The danger of mistakes appears almost entirely eliminated by this method, but where extreme precautions are demanded the operator must have his message repeated, so that he is sure that the receiver on the other end understands the communication.

At first thought it would appear as if this method might be slow and clumsy, but experience has demonstrated the contrary. The dial is very small and the needle a very fine one, so that the operator can actually send more messages in this way than any other. Repeating the messages furthermore places any mistake in transmitting orders upon the shoulders of the right person, who, realizing his responsibility, is more apt to exercise greater care. The ordinary telegraphic code is employed in parts of the mine where communication is important and frequent, but often only ordinary "sounders" are used for the signaling.

Where simple sounders are used bare wires are strung down the mine and through the different galleries. Nothing is simpler and easier than to equip every part of a mine with such a telegraphic system. With two bare wires running from the signal bell at the hauling engine through the galleries to the trams, the service permits ready adjustments to any conditions. An ordinary piece of metal of any kind completes the circuit for the transmission of signals at any point. The elasticity and portability of such a method of mine signaling particularly recommends itself to mines where the work of the day is shifting constantly from one point to another. Wherever the miners are working they are kept in close touch with the central operator and the managing office itself.

The introduction of the telephone in the mines is of more recent occurrence, but its service is rapidly becoming invaluable. The portable telephone outfit permits operators of any gallery to keep in direct communication with headquarters at every step. The safety and rapidity of signaling by this method proves of great economy in large mines where a large number of men are working. In the German mines, where telephonic communication has been established between the manager's office and the different gangs of workmen, the saving of time in transmitting orders has proved of vital importance in a number of instances. Dangers have been averted in this way, and the miners in more than one instance owe their lives to the underground telephones.

Special telephones have been manufactured for such underground use in Europe. Owing to the noise made in the mine by the cutting or drilling machinery, it is difficult sometimes to hear through the ordinary telephone. To obviate such difficulty loud-speaking telephone instruments are employed. They are also provided with movable receiver tubes, which can be adjusted to the ears to make certain of any messages transmitted. Both the receivers and transmitters are provided with rubber stops, which close them when not in use.

The installation of a telephone system with the different parts of a mine is of a simple nature, and owing to the fact that the wires can be easily strung along the sides or carried on a tram car, by means of an automatically working reel, the expense is not great. The telephone is kept in circuit with the various lines by means of a series of push buttons. The operator at headquarters can thus connect with any gallery when needed, and the foreman of any working gang can as easily call up central for orders. The use of the portable telephone outfit for mines gives an elasticity to this method of communication that cannot be surpassed.

Accidents in mines frequently happen through mistakes in signals. In most cases this is the result of temporarily forgetting the different signals, either in receiving or transmitting, but such mistakes could hardly happen where the orders are given by word of mouth through telephones. As the size and importance of a mine increases, the need of safer and more efficient signaling systems is felt—and in the end the best pays.

Handling Ore Cars.

Herewith is shown a 15 H. P. distillate locomotive, built by the Union Gas Engine Co., San Francisco, Cal., for the Yellow Aster Mining & Milling Co., Randsburg, Cal. The engine is a 15 H. P. double cylinder "Union" of the 1905 type; all parts are so arranged as to be easily accessible. It is fitted with a sensitive governor designed to allow fuel to be used only in proportion to the work performed. It has a speed controller by which the speed can be set at any desired rate and maintained without any further attention. The oil and water tanks are mounted on the rear. The pulling power of this locomotive is stated to be thirty tons gross load 6 miles per hour, on a level straight track, and with a variable speed that permits of slowing down on heavy grades or around curves. The total weight of the locomotive, with water, is 6200 pounds. The net weight of the engine only is 2085 pounds. The Yellow Aster Mining & Milling Co. have been using five "Union" hoists, one of which is of 130 H. P., for the past five years.

"Union" Distillate Locomotive.

"Union" Distillate Locomotive and Train Hauling Ore From the Yellow Aster Mine, Randsburg, Cal.

Compact Oxygen.

A new chemical for metallurgical and other industrial and sanitary purposes has been introduced by the Roessler & Hasslacher Chemical Co. of New York, which affords possibilities for supplying oxygen to charges of ore in the cyanide process. This new substance is called oxone, and comes in solid form. It is described by the manufacturers as follows:

A stone about 1 cubic inch in size, weighing two to three ounces, generating upon contact with water 130 times its volume on pure oxygen gas, is certainly of great value. This is oxone. Oxone is a compact oxygen compound made for the purpose of providing anybody with the means to produce instantaneously, free, chemically pure oxygen gas in a simple manner. As the generation of oxygen is at once obtained upon throwing a piece of oxone into water, and as the amount of gas produced can easily be regulated by varying the quantities of oxone, or controlling the water flow, it is obvious that by this means the important question of an abundant oxygen supply for general use has progressed considerably. Not only will all the users of the gas be benefited, but a number of new fields in hygiene and industry will be opened to that simple and reliable source of oxygen gas.

The way in which oxygen up to this date came on the market was in form of gas compressed in iron tubes or drums. The inconveniences in connection with this means are well known. The expenses of shipping, the clumsy way of handling these heavy containers, the trouble of reshipping for the sake of refilling same, the leakage due to high pressure, the danger in connection with it, and—last not least—the gas being never more than 90% pure; all these facts point to the necessity of adopting a better means to provide us with this most valuable gas of the predominating of all elements—oxygen. The claim is made that oxone produces oxygen gas instantaneously. A light weight and small volume for shipment yields a large amount of gas. It can be stored and used at any time, it is easy to handle, and is not explosive nor combustible. The only precaution to be taken is to protect it against moisture to prevent untimely decomposition. One pound of oxone furnishes fully 2 cubic feet or 57 to 60 liter of oxygen, or 100 grams generate 13,000 c.c.

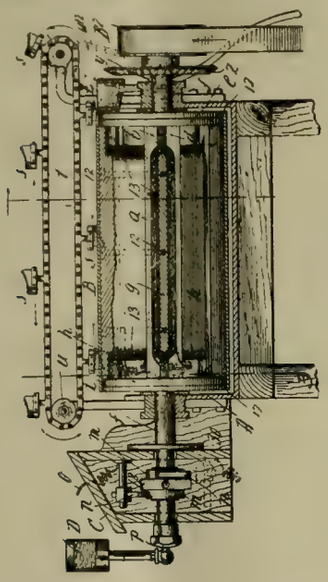
AS THE RESULT of a personal inquiry into the vexed question of the damage done to water courses and water supplies by dredging, the Victorian Minister for Mines is convinced, says the Town and Country Journal, that, with proper conditions as to the leases and the construction of modern types of dredgers, the beds of rivers can be dredged, not only without injury to the streams themselves, but with positive advantage to the rivers. In Victoria, during the last five years, gold to the value of £1,100,000 has been won by dredging and sluicing, in addition to which stream tin to the value of about £15,000 was obtained. The plants employed are valued at £250,000, and there has been about £400,000 of capital called up. In 1903 the industry kept 1310 miners in employment. The companies worked 240½ acres in that year, including the beds of streams that were turned over, and the yield averaged 2.35 grains per cubic yard, giving an average of £636 per acre. Last year £97,000 was paid in dividends by various companies, exclusive of the amounts paid to shareholders in small companies, of which the Mines Department has no record.

Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 27, 1905.

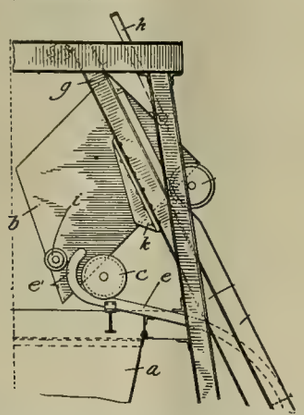
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MAGNETIC SEPARATOR.—No. 792,776; E. C. Kavanaugh, Holyoke, Mass.



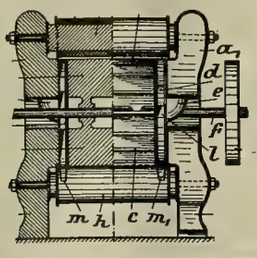
In magnetic separator, inclosed magnetic cylinder rotatably mounted in pulp receptacle, or conduit, having pole pieces and magnetic coils therein, and having hollow endwise-extending journal having at extremity stuffing box, combined with suitably elevated oil receptacle having depending conduit provided with horizontal limb entered within extremity of hollow journal through stuffing box thereat, and communicating with spaces within cylinder.

GUIDE FOR SKIP CARS OR THE LIKE.—No. 793,102; R. Schneider, Sharon, Pa.



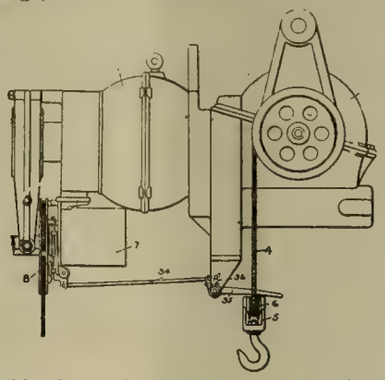
In combination with hopper of blast furnace or like, skip car having front and rear wheels and hoisting means for car, inclined track leading to top of hopper upon which wheels run, track portions curving inwardly at inner ends upon which forward wheels only run, when car reaches top of furnace, and having upwardly and rearwardly turned ends and other track portions on which rear wheels only run, and contact members on car for engaging upwardly turned ends when car is overhoisted.

ELECTRO-MAGNETIC ORE SEPARATOR.—No. 793,137; E. Langguth, Euskirchen, Germany.



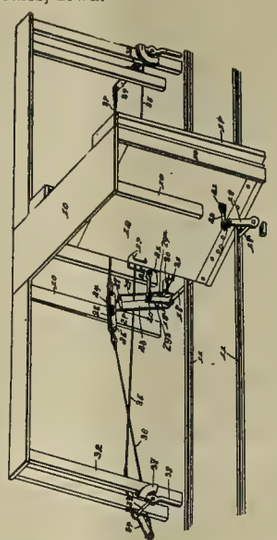
In magnetic separator, combination with primary pole piece, of rotary member provided with plurality of secondary pole pieces and arranged to rotate adjacent to and parallel with primary pole piece, part of path of rotary member being out of field of influence of primary pole piece, and casing of non-magnetic material between primary pole piece and rotary member.

ELECTRIC HOIST.—No. 793,626; P. J. Darlington, Glenridge, N. J.



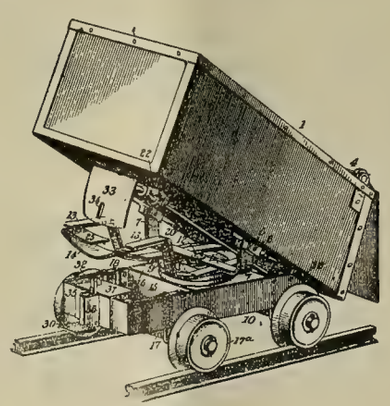
Combination with winding drum and pulley block to be operated thereby, of electric motor for operating drum, electric circuit including motor, controlling switch in circuit, operating member, means for locking member to movable contact carrying member of switch, means for returning contact carrying member to its "off" position when members are unlocked, and means controlled by pulley block for unlocking members and allowing switch to return to "off" position.

AUTOMATIC MINE DOOR.—No. 793,452; O. W. Lundholm, Des Moines, Iowa.



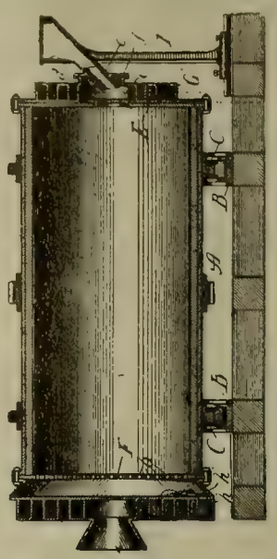
Combination of two door sections, in closed positions standing approximately at right angles to each other and means for pivotally supporting each of door sections at upper and lower ends at points between center and outer end, and stationary partitions arranged to engage outer ends of door sections when sections are in open positions.

DUMPING CAR.—No. 793,385; A. Mieden, Seattle, Wash.



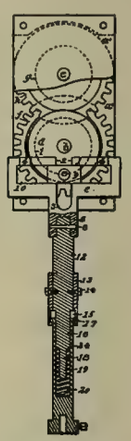
In device of class described, combination with dumping body having door, of plate or member mounted on door and beveled to form inclined and angularly disposed face, and shaft provided with V-shaped arm having inner portion disposed at obtuse angle to shaft, and outer portion arranged at inclination and presenting inclined face to door when in engagement with same, inclined face of catch co-operating with inclined and angularly disposed face of the plate or member.

PEBBLE MILL.—No. 792,778; W. A. Koneman, Chicago, Ill.



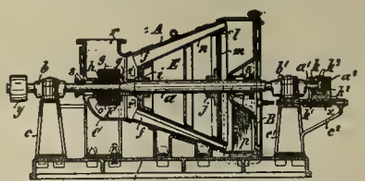
In pebble mill, combination of rotatably supported cylinder having feed opening in eccentric position in one end, central feed chamber on end with means for feeding thereto material to be ground in cylinder, spiral conduit on cylinder end extending from chamber to feed opening to discharge into latter, and centripetally acting discharging means for material on opposite end of cylinder.

HAND ROCK DRILL.—No. 793,319; C. F. Paul, Jr., Peekskill, N. Y.



In hand rock drill described drill spindle secured to operating yoke comprising main spindle with reduced ends to receive sleeve-drill holding spindle and spiral spring, sleeve-drill holding spindle with spring end of main spindle forming recess for spring, spring in recess, flange on sleeve end of drill-holding spindle inclosed within recess formed by reduced part of main spindle and recess in clamping sleeve.

APPARATUS FOR PURIFYING BLAST FURNACE GASES.—No. 793,544; W. Schwarz, Dortmund, Germany.



In apparatus for purifying blast furnace gases, combination with stationary casing, of rapidly rotating conical drum and dispersing member, both rotating within casing about common axis.

PROCESS OF TREATING THE METAL MIXTURES PRODUCED AS A BY-PRODUCT IN ELECTROLYTIC METAL REFINING.—No. 793,039; A. G. Betts, Troy, N. Y.

Process of treating anode slimes which consists in treatment with solution of ferric sulphate, and separating solution from insoluble material; dissolving copper in solution; electrolyzing solution with insoluble anodes for simultaneous production of ferric sulphate solution and deposition of copper; and in operation of extracting antimony from material undissolved by ferric sulphate solution, by treatment with solution containing hydrofluoric acid, and removing antimony therefrom by electrolysis with insoluble anode.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

F. H. Oliphant of the United States Geological Survey gives the following statement regarding the total quantity and value of crude petroleum produced in 1904:

State.	Quantity. Barrels	Value	Value per Barrel.
California	29,649,434	$ 8,265,434	$0.279
Colorado	501,763	578,035	1.152
Indiana	11,339,124	12,235,674	1.079
Indian Territory, Oklahoma Territory	1,366,748	5,447,622	0.969
Kansas	4,250,779		
Kentucky, Tennessee	998,284	984,938	0.9866
Louisiana (a)	2,941,419	1,068,605	0.3633
Michigan, Missouri	2,572	4,769	1.854
New York	938,234	1,526,976	1.6275
Ohio	18,876,031	23,730,515	1.257
Pennsylvania	11,300,792	18,507,103	1 6377
Texas	22,241,413	8,156,220	0.367
West Virginia	12,644,686	20,583,781	1.628
Wyoming	11,542	8 1.794	0:70
Totals	117.598,421	$101,170,466	.864

(a) In addition to this quantity 3,670,000 barrels were produced and unsold at close of 1904.

California, Utah and Virginia were the only States that produced manganese ore in 1904. The total production amounted to 3146 long tons, valued at $29,466, or $9.37 a ton. Of the total production, 3054 tons, or 97%, came from Virginia, 60 tons, or 2%, from California, and 32 tons, or 1%, from Utah. In addition to the true manganese ores, considerable quantities of manganiferous iron ore are obtained in Colorado, Arkansas and in the Lake Superior region. This amounted in 1904 to 383,246 long tons, which had a reported value at the mines of $691,677. Ore of this class carrying 28% of manganese and 10% to 14% iron was mined and used in the manufacture of pig iron, with 1% or over of manganese. The Colorado manganiferous iron ores are utilized primarily as flux by the precious metal smelters, the remainder being employed in the manufacture of spiegeleisen. In the Lake Superior region quantities of iron ore are mined which analyze from a fraction of 1% up to 20% of manganese. In mining silver ores in Colorado a considerable quantity of mineral is obtained which contains insufficient percentages of the precious metal to make it valuable on that account, but which is used as a flux by the smelters. In 1904 the production of manganiferous silver-iron ores in the United States amounted to 105,278 long tons, valued at $348,132. This is considerably less than the production of 1903, which amounted to 179,205 tons, worth $649,727. A by-product in the manufacture of zinc from ores mined in northern New Jersey, containing iron and manganese, is utilized in the production of spiegeleisen. In 1904, 68,189 long tons of this class of ore were obtained. The total quantity of manganese ore, manganiferous iron ore, argentiferous manganiferous ore and zinc residuum produced in the United States in 1904 amounted to 559,859 long tons, valued at $1,137,264.

ARIZONA.

Cochise County.

(Special Correspondence).—The Black Diamond Copper Co., whose mines and smelter are located near Pearce, in the Cochise mountains, has proved that its smelter has a capacity of 200 tons a day and that its ores are self-fluxing. A water plant has been put in. Its ¾-mile aerial tramway from the mouth of the tunnel to the smelter has proved efficient.

Pearce, July 2.

(Special Correspondence).—The Tombstone Con. Mines Co. are shipping regularly and expect to open up more of their mines. The new pump ordered will have a capacity of 2,500,000 gallons, which will increase the capacity of the pumping plant to 6,000,000 gallons a day. Work has been started remodeling the old 20-stamp Girard mill, which will be increased to a capacity of forty stamps. A concentrator will also be put up on the grounds, so that the ore can be concentrated and the waste removed and save considerable expense to the company in shipping ore.

Tombstone, July 1.

(Special Correspondence).—The Consolidated M. Co. has made a new strike on the Davis group in the Chirichuahua mountains, near Douglas. The ore is refractory, but the extraction problem has been solved in the arrangements to put in a concentrator of large capacity for testing the new ore.

Douglas, July 3.

It is reported that the Pittsburg & Hecla property at Bisbee has reverted to the original owners. Lands are the Gold Hill group in Solomon Springs district, 3½ miles southeast of Bisbee. Work for the present has been suspended.——The cyanide plant of the Fortuna mine, in the mountains south of Gila Bend, is being moved to Fairbanks. S. Anderson is superintending the moving of the plant.

Gila County.

The Arizona Commercial Copper Co. of Globe has made arrangements with the Old Dominion Co. whereby the fluxing ores of the former will be treated by the latter. A track will be laid from the Arizona Commercial to the Old Dominion. The excess supply of ore not sold to the Old Dominion will be sent to Douglas. The directors state that a reduction works, including a smelter for the handling of the ores, will be erected within a year. The ore now being sent to the Old Dominion smelter is of a quality that has previously been shipped into Globe from a distance. It is working excellently in the furnaces of the Old Dominion and will simplify another one of the problems of the company. Besides its workings on the Black Hawk property, the company has a 600-foot shaft on the Copper Hill property.

Graham County.

(Special Correspondence).—The superintendent of the Standard mines, near Metcalf, reports that the mine is doing well. A 20-inch streak of glance is being developed in the San Jose and shipments will be made this month, the first shipments from the San Jose since it was acquired by the Consolidated Co. At the Copper Center claims the main shaft is down 160 feet and three levels are being run.

Clifton, July 3.

It is reported that the Ash Peak mines, near Duncan, will begin operations under the direction of T. Larkin.

Maricopa County.

(Special Correspondence).—J. H. Strite has charge of building the mill near Wickenburg for the White G. M. Co. Twenty stamps are being put in, with provision for twenty more; the cyanide plant can handle tailings from a 40-stamp mill.

Wickenburg, July 3.

(Special Correspondence).—C. D. Pickering, superintendent of the Yucca Cyanide M. & M. Co. at Cedar, reports that work has been stopped on the shaft of the San Francisco mines on account of a larger flow of water than the pump could handle, but that as soon as the new pump is received work would be resumed. The shaft is down 570 feet and is in good ore. The mill is crushing twenty-five tons of ore daily and making a product of lead, silver and gold.

Kingman, July 3.

Superintendent G. Hamlin of the Relief G. M. Co.'s properties at Relief, 23 miles northwest of Phœnix, states that he is operating 500 feet west of the main shaft and is down 40 feet in a winze that he is running to the water level. Water has been secured by sinking a 500-foot shaft on the vein.

The Oro Grande mill at Wickenburg is operating ten stamps on ore taken out in development work.——It is reported that work has been resumed on the Goddard mine, near Wickenburg.

Mohave County.

The Monarch G. M. Co.'s property is being worked, with E. Hilty of Kingman as general manager.——The German-American mill, near Vivian, is working to its full capacity, and is said to be making a good saving of values. The mill is of ten stamps and will handle thirty-five tons of ore daily. O. F. Kuencer is in charge.——The 10-stamp mill of the Blue Ridge M. Co. is running full capacity. A cyanide plant for the handling of the tailings is contemplated.——T. Ewing is working four properties in the San Francisco district, within a radius of 6 miles of Vivian—the Vivian, Virgin & Victor, Hardy and Homestake.——W. A. Mensch of Kingman is putting hoisting machinery on the Enterprise mine.——T. R. Garnier, regarding the St. Louis mine at Cerbat, reports that the tunnel is in 375 feet on the vein.——The Treasure Hill mines are being unwatered to the 200-foot level, when crosscutting to the veins will be commenced. J. D. Jordan has charge.——E. M. Carson of San Francisco, Cal., proposes to build a 100-ton smelter at McConnico.

The Chloride G. M. Co. is planning putting in a second compressor and sinking the working shaft to a depth of 800 feet. Development of the Samoa group, near Chloride, has blocked out a large quantity of shipping ore.——The Pilgrim group, 12 miles west of Chloride, is being worked under bond by the Commonwealth M. Co.——The Azalia group, near the Pilgrim, has been bonded by the Commonwealth Co., and is being developed.

Pima County.

(Special Correspondence).—The double-compartment shaft at the Weeden mine at Pittsburg will be sunk 600 feet. The smelter is turning out ten tons of 75% copper matte daily. Each shaft is 5 feet in the clear and the work is proceeding at the rate of 3 feet per day.

Mellen, July 3.

Pinal County.

(Special Correspondence).—It is reported that Superintendent C. Brown of the Arizona-Hancock Co. has uncovered rich ore in the property, 1½ mile south of Superior.

Superior, July 3.

Yavapai County.

General Manager Campbell of the Richenbar M. Co. at Richenbar intends putting in a cyanide plant, enlarging the capacity of the mill, and putting in a new hoisting plant.——L. Walloth and D. Sinclair of Yarnell have shipped a carload of mica from the Monte Cristo mine, in the Peeples valley.——E. Block of Prescott has sent out a whim to his copper claims, 7 miles west of Jerome Junction, and has given J. F. Wright and P. Jasperson a contract to sink the main shaft, now 75 feet deep, 100 feet deeper.

C. K. Tibbets has bonded R. Lyon's claims, near Cherry, and is putting up a hoist and steam stamp mill capable of treating ten tons of ore a day.

CALIFORNIA.

During 1904 California produced, according to the U. S. Geological Survey reports, 29,649.434 barrels of crude petroleum, valued at $8,265,434, an average of $0.279 per barrel. In 1902 the production was 13,984,268 barrels, valued at $4,873,617, or $0.348 per barrel, and in 1903 the production was 24,382,472 barrels, valued at $7,399,349, or $0.303 per barrel. California now produces the greatest number of barrels of oil in the United States, Texas coming second, with 22,241,413 barrels, and Ohio third, with 18,876.631 barrels. The average value per barrel, $0.279, is lower than that obtained in any other State, Louisiana coming next, with $0.3633.

Amador County.

At the Climax mine, near Pine Grove, it is reported that they intend to put up a 20-stamp mill before winter.——Parties who have a bond on Dry creek, near Ione, have had a Keystone driller at work trying to determine its value for dredging purposes. They have found a deep soil ranging from 5 to 15 feet, and gravel from 5 to 25 feet thick.

Butte County.

H. Zilmer, manager of the Wyandotte M. Co., reports a rich strike in the mine near Wyandotte.

Calaveras County.

Prospecting the lands of the Calaveras river bottom at Petersburg, near Valley Spring, is being done, with a view to working the gravel by dredger.

Contra Costa County.

It is reported that the coal mines at Summerville will soon be in operation, after many months idleness. The Summerville mines closed down on account of the poor demand for coal, the river steamers and many manufacturing plants having changed their furnaces to oil burners. A new superintendent for the mine has been engaged and the work of retimbering has begun.

Del Norte County.

Superintendent Frank Rood, of the Big Bar mine, at the mouth of Slate creek, on the Klamath river, reports the mining season along the river at an end. It has been a very short season for the placer miners, on account of the light snowfall on the high mountains, but it proved to be a good one.

Inyo County.

It is reported that John Hays Hammond, acting with the Guggenheims, has purchased the Piper ranch, 23 miles from Tule canyon, and it is proposed to introduce gold dredging in Cottonwood creek.

Mariposa County.

The North Star silver mine at Bootjack, owned by D. McNally, is under bond to H. Dibble of San Francisco and F. D. Cochrane of Boston, and will be pumped out and sampled, and if found to be as represented, active development will be begun. A. C. Morrison of San Francisco is in charge.

Merced County.

The land north of the Merced river, between Snelling and the falls, has been bonded, and drilling machines will start prospecting the land as to its availability for dredging.

Nevada County.

The Pennsylvania mill, near Grass Valley, is being overhauled.——A. Richards of Washington, foreman of the Sixteen-to-One mine, reports that the 20-stamp mill is kept constantly running. The mine is worked through a tunnel 600 feet in length, and seventeen miners and eight surface hands are employed.——It is stated that A. H. Godbe of Salt Lake City will build a cyanide plant at the Excelsior mine, in Meadow Lake district.

As a result of a burst in the Mountaineer mine's power pipe line, near Nevada City, the mine was temporarily closed down.——The Gluyas shaft at the Home mine, near Grass Valley, is to be pumped out and work resumed. The Home at present is running thirty stamps.

Placer County.

The machinery installed at the Bellevue mine, near Auburn, is in place and work has been started.——At the Smith Point mine a drift is being run on the 200-foot level.——The Tadpole mine, 5 miles above Westville, is reported to be working four men, and ore will be crushed at the Alameda mill at Black Canyon until the mine is thoroughly tested and prospected.

Riverside County.

G. L. Leonard has charge of the work of the United States Tin Co. in reconcentrating tailings from the Temescal tin mines. At the same time the tin-bearing and copper-bearing deposits on the property will be developed.

Santa Barbara County.

The Standard Oil Co. announces a schedule on oil from Santa Barbara fields as follows: Oil of 24 to but exclusive of 25 gravity, 22½ cents; 25 to but exclusive of 26 gravity, 27½ cents; 26 to but exclusive of 27 gravity, 30 cents; 27 gravity or better, 35 cents. The prices quoted above are about 5 cents less for each grade than those proclaimed on January 1, which were in turn a cut of a larger figure from those prevailing prior to that date. Within the last year the quotation for Santa Maria oil has fallen nearly 100%, although development has only began, and little or no oil has been sold. The Union is, of course, independent of the Standard, and has its own pipe line, the Western Union and the Pinal having long-time contracts with the Standard.

Shasta County.

The Holt & Gregg Co. will build a rail tramway from its limerock quarries between Big and Little Backbone creeks, 2 miles west of Kennett, to carry rock from the quarry to the company's lime kilns at Kennett and to the main line of the Southern Pacific Co. at that point.

It is reported that the Balaklala copper mines, near Kennett, have been sold to the Western Exploration Co. for $2,000,000.——J. James and four other miners claim to have sunk 100 feet, from the No. 5 level to the No. 6 level in the Rising Star mine, near De Lamar, in thirty-seven days.

Sierra County.

Work is to be resumed at the Mabel Mertz mine at Forest City by the Forest City M. Co.

Sonoma County.

Rich cinnabar ore is being taken from the Culver-Baer quicksilver mine near Healdsburg.——The recent strike in the Sonoma mine has encouraged the owners of properties all along the quicksilver belt to action.——The Socrates Co. are working on the construction of their new furnace.

Tulare County.

Superintendent F. Marshal of the Ada Jewel mine at Fountain Springs, near White River, has started the new cyanide plant on ore on the dump.——In the upper Deer Creek district J. L. Showers is opening up the Royal Flush, 8 miles from Hot Springs.

Tuolumne County.

The Clio mine, near Jacksonville, is running steadily. The shaft is down 150 feet and is being sunk deeper. A slate vein on the hanging wall showed such values that the mill was started.——The Harvard mine at Whiskey Hill, near Sonora, is soon to resume operation.——Work has been started at the Mount Lily, near Columbia, with C. Grimm as superintendent.——Prospecting work has begun at the Water Lily gravel claim on the Stanislaus, near Sonora. It is owned by C. Durgan, Lyon Bros. et al.

COLORADO.

Boulder County.

The Inter-Ocean M. Co. will put in a complete roasting and cyanide plant near the Inter-Ocean mine at Sunshine.

Custer County.

The Bassick G. M. Co., which operates the Bassick mine at Querida, contemplate building another mill to treat the ores from the mine.

Clear Creek County

F. A. Maxwell of Georgetown has a three years lease and bond on the Colorado Central and Allundi properties on Leavenworth mountain and will develop them. ——Development has been retarded on the Waldorf properties, near Georgetown, because of putting in two new compressors. The erection of a mill to treat the low grade ores will be the next improvement.——An air compressor and an 80 H. P. boiler has been put in at the mouth of the Hoosac tunnel near Fall River.

Manager J. Broad of the La Plata group, on Democrat mountain, near Georgetown, has started a lower crosscut to catch the ore shoot of the La Plata vein. The main tunnel is in 1200 feet.——The Silver Glance, near Georgetown, is being developed by Clark & Co.——Work has been commenced on the Centennial property, on Leavenworth mountain, at Georgetown, under the management of D. Kennedy.——Work on the Pacific tunnel holdings is being done by the Pay Rock Extension M., M., T. & D. Co., of which J. H. Robeson is manager. The tunnel is in nearly 800 feet. The mill machinery is being overhauled.——Upon the return of J. J. White, a new contract is to be awarded for driving the Prudential tunnel, which is destined to open a lateral from Georgetown to Silver Plume, thus furnishing an outlet for the ores of Republican mountain. The bore has been driven 700 feet, and it is expected that within an additional 100 feet the Magenta-Turner vein will be cut. A power plant and heavy machinery are to be put in at the mouth of the tunnel.——A vein has been cut in the Blue Bird tunnel, owned and operated by W. Hunt of Georgetown and N. Frohm of Denver. This group consists of the Blue Bird, Jay Bird, Black Bird and Snow Bird and is in the gulch between Republican and Democrat mountains. The tunnel is in 800 feet.

Manager A. B. Montgomery has made arrangements for increased development work in the property of the Red Oak Co., on Democrat mountain, near Georgetown. ——The Democrat Mountain M. Co., operating the Edgar, Junction, Fred Rogers and Government lodes, under the management of J. Smith, has started work on the 300-foot raise from the Bonanza tunnel level. With this work completed, twenty-eight drifts will be started, and the pocket of ore recently opened through the shaft workings of the Edgar can then be taken out cheaply. ——On the West Griffith, recently purchased by the Independent M. Co., ten men are sinking the winze at the 1100-foot station of the Griffith tunnel. This work will make a connection with the East Griffith property, owned by W. D. Hoover of Denver. Manager J. Larson states that a wire tram will be built from the portals of both the Sonora and Griffith tunnels to the railroad tracks.——At the Mineral Chief of the Linn Con. M. Co. of Georgetown operations are being carried on through the Moline tunnel. Manager W. C. Hood expects to start regular shipments soon.——In the working of the East Argentine M., M., D. & T. Co., Manager M. Sidney is employing twenty men and working three shifts. The claims are on Pendleton mountain and seven tunnels are being driven. The Sidney tunnel is being driven to cut the Stevens mine at a depth of 1600 feet below the 14th level. It will also cut all properties along the line of the Wilcox tunnel, as well as the Santiago. It is the deepest tunnel proposition in upper Clear Creek.

Chaffee County.

The Boston-Colorado Copper Co. are developing the Evening Star copper claims, 9 miles southwest of Salida. It is the intention of the management to put in a concentrator of suitable capacity to suit the low-grade body.

Gilpin County.

A whim has been put on the Silver mine near Moon gulch, which has been leased by W. H. Knowles of Denver and W. G. Smith. The shaft is down 150 feet, and is being pumped out under charge of E. J. Stephenson. ——It is reported that machinery is to be put on the Jo He tunnel property of the Alice E. M. Co., on Buckeye mountain, in the Phœnix district.——The Star of Gilpin M. & P. Co. has leased and bonded the Victoria claims in Lump gulch of the Central district, and active operations are under way. The Victoria shaft is down 150 feet, and is being unwatered for the purpose of sinking it another lift of 75 feet. This mill is equipped with 15 stamps. The company has also started a new shaft, 400 feet south of the main shaft, for prospecting purposes, and the company will also continue the 40-foot shaft on the Tiger, a parallel vein.——Sinking operations at the Happy Hollow claims, between Rollinsville and Gambell gulch, are under the superintendency of G. E. Churchill. Machinery for deeper workings is to be put in later.—— It is reported that work is to be resumed on the John L. mines, at the head of Virginia canyon, in the Russell Gulch district. The property is owned by E. W. Williams of Denver.——Sinking at the After Supper mine of the Banzai M. Co. at Black Hawk is down 340 feet. The shaft will be carried on down to the 365-foot point, from where they will extend levels both ways.

Grand County.

J. A. Burns has struck good ore in the Bowen & Campbell mining district, 12 miles northwest of Grand lake, in the Rabbit Ear range.

Gunnison County.

Near White Pine, on upper Tomichi creek, the Tomichi valley smelter is running full blast, putting through sixty tons per day of slag from the dump, which carries 7% lead, besides silver and gold values. Galena-lead carbonate ores are purchased from the North Star and May Mazeppa mines. Leescamp & Ferguson have charge of the work.——On the May Mazeppa and North Star, A. Woodworth and T. Allen are shipping ore from development work and J. B. Turner says he has 20 feet of galena-lead carbonate in his Dividend shaft workings of the North Star.——The properties of the Comstock G. & S. M. Co., near White Pine, are equipped with a compressor plant and surface improvements. A new concentrating and electrical ore separating plant will be put in.

The Grand Prize mine, near Pitkin, is being unwatered and work will be resumed taking out ore.——J. Nelson has secured a lease on the Teller and Chief, near Pitkin, and has begun work.——A good strike has been made on the Granite Mountain group, in Jones gulch, near Pitkin.——C. Oliver and others have leased the Fairview and Cleopatra, north of Pitkin. Work will be driven from the Cleopatra tunnel, which is in 1600 feet.

H. C. Clark of the Gregor K. mines, in Paradise basin, near Crested Butte, will start work.——G. Russ has started work upon the Washington mine near Irwin, and after clearing the shaft of water expects to sink deeper. —— Operations have been resumed at the Augusta mine near Crested Butte.

The Lanyon Zinc Co is meeting with success in operating the Napoleon and Edna Dranie properties on Gold hill, in eastern Gunnison county. The wagon road to Quartz, on the Colorado & Southern, has been put in good condition, and several ore teams will soon be busy hauling to this point for shipment to the company's works. A large force is employed at the mine, and the Lanyon Zinc Co. expects to soon commence shipping 30 tons per day.——The Tontine lode, in the Elk Mountain district, owned by J. Fleischer of Denver, is to be developed.

Hinsdale County.

Development work has been started on the properties of the Handies Peak G. M. Co., near Lake City, by Manager Corwin.——W. G. Pitts, secretary and superintendent of the Pittsburg Metals M. & M. Co., operating the Wyoming mine on Engineer mountain, near Lake City, has commenced new work, as the tunnel has been cleaned and retimbered.

Lake County.

(Special Correspondence).—The output for Leadville during June amounted to 72,000 tons. Up to date this camp, in its 27 years of life, has produced $316,000,000 worth of mineral.

Leadville, July 3.

The new work that was mapped out for the Big Evans section is now being carried out, and very few properties in that section are idle near Leadville. The most extensive work is being carried on at the New Monarch group, including the New Monarch, Winnie and Cleveland. The Winnie is shipping 150 tons daily. The Cleveland is shipping 400 tons monthly of oxides and sulphides, and the New Monarch is sending out 50 tons daily. Shipments are regulated by the demand from the smelter at Salida. The east shaft of the New Monarch, which is down 950 feet, is being cleaned out and will be sunk deeper to get under the main ore shoot, and when this is completed shipments from the property will be increased. A tunnel has been driven into the Cleveland, and all ore from the property now finds its way to the cars by this outlet. It has materially reduced the cost of mining, as hoisting is done away with.——Sinking is going on at the Silent Friend, and at the Little Ella ore is being shipped regularly.——The Resurrection is pumping water from No. 2 shaft to relieve the pressure at No. 1. That property is shipping about 100 tons daily.——The Gold Basin, near Leadville, has resumed work and the lessees are hunting for the main ore shoot. ——The Brattleboro is shipping steadily from ore that comes from the lower drifts.——By the middle of July the Yak mill will be turning out 250 tons of concentrates daily.

A good body of carbonate ore is being developed on the Bessie Wilgus, on Rock hill, Leadville, under the direction of R. B. Estey.——H. Collins and associates are sinking a shaft on the Oscar placer, part of the Revenue ground, Leadville.——The Center M. Co. is sinking a shaft on Rock hill, Leadville, under the management of C. E. Majors.——The Ben Burb shaft on Rock hill, Leadville, is being sunk by J. Weir.

The copper vein recently opened in the St. Julia claim, Lake Park creek, holds out as development work proceeds.——Work has been resumed on the Golden Jim and Hiawatha claims in Big Frying Pan district. The claims are worked through tunnels, both being in 70 feet.

On Dyer mountain, at the head of Iowa gulch, near Leadville, low-grade ore has been located on the Greater New York, and a tunnel is being driven by Holden & Greenwalt to tap it.——Experimental work is being done at the Yak mill and a few changes will be made before the mill starts on its steady run.

San Juan County.

On the Animas river, above Eureka, the Astor M. Co. have cut their vein at a depth of 1200 feet with a 1523-foot crosscut tunnel upon which they are drifting with machine drills. An electric plant is being put in near the tunnel mouth. It is to be run with water from the Animas river. A mill building intended to cover a 100-ton concentrating plant is being put up, but the concentrators will not be put in until further development work has been done. E. C. Condit has charge of work. ——The Silver Wing, near Eureka, is being opened up by the Eureka Exploration Co., under the direction of P. Molan.

A rich strike has been reported from the Mayflower mine in Arrastra basin, near Silverton.

Summit County.

Widmar & Dean, lessees of the Silver King property on Nigger hill, near Breckenridge, have started a drift from near the bottom of the Sprague shaft to cut their new ore shoot. The surface water still interferes with the active operation of a number of mines on Nigger hill, but is gradually subsiding.——The Buckeye M. & M. Co., operating the Lucky mine and the Reviere M. & M. Co. property on Mineral hill, has cleared the long tunnel and has it in good condition to work through. Superintendent G. E. Moon is opening up new bodies of lead-silver ore from the levels of the shaft. In autumn, when sufficient ore is blocked out, the company's mill will be started up.——The Old Union property, near Breckenridge, is doing development work. Some heavy ground has been encountered in driving the big tunnel, and 10x10-inch timbers are being used as posts and caps. Superintendent G. C. Smith is satisfied that a portion of the sulphide contact of the Breckenridge gold belt underlies Mineral hill.

The Harrison mine, near Montezuma, has started up. ——C. S. Young is operating the Sarsfield mine, on Collier mountain, near Montezuma.——W. Young, operating the Santa Fe with four men, is making air connections.——Superintendent H. C. Crover of the Bear Mountain M. & M. Co. is building an ore house at the New York tunnel, on Collier mountain, near Montezuma.

The Breckenridge Bulletin reports that the Mary Verna and North American company's properties are having development work pushed ahead under Manager McAlister.——Work on the new Laurium mill is progressing satisfactorily.——The compressor plant at the King Solomon is complete and the rock drills are doing good work.——Mr. Keables has men working on the Masontown M. & M. Co.'s property, paying particular attention to the mill which is being finished so that milling and cyaniding operations can be instituted soon.——W. P. Condon and E. W. Shrock, who have a lease on the Morning Star mine on Mount Baldy and are operating same with a small force of men, are taking out an excellent quality of silver-lead ore carrying gold values and expect to make a carload shipment to the local sampler some time next week.——The Abundance M. & M. Co. is employing twelve men on its mine. The shaft is down 150 feet, at which level two crosscuts are being run. The S. crosscut is in 40 feet and shows up a large body of mineralized rock. A drift is being run west from this on a vein of zinc-lead ore carrying gold and silver values. The northeast crosscut is in 80 feet. J. G. Goodier has ordered a new hoisting engine.

Teller County.

The Cripple Creek output for June amounted to $1,-725,200, with a total tonnage of 58,500. The output remains practically stable, although June, with one less working day, is nearly $131,000 short of the production in May:

Mills—	Tons.	Average.	Gross.
U. S. S. & R. Co.	20,400	$ 8 00	$616,000
Smelters	9,000	65 00	595,000
Portland	7,500	28 00	210,000
Economic	7,500	28 00	154,000
Wild Horse	2,160	6 00	12,960
Anaconda	2,100	5 00	15,500
Dorcas	3,300	32 50	107 2 0
Santa Rita	480	6 00	2,880
Michorado	460	3 50	1,610
Others	6,000	2 50	15,000
Totals	58,500		$1,730 200

Exploration on Grouse mountain at the Sprague group has been resumed by H. M. Sprague.——The 600-foot shaft of the Christmas mine, on Bull hill, Cripple Creek, is to be deepened an additional 300 feet. The lessees are breaking ore in the third, fifth and sixth levels.——P. S. Penn, leasing the Red Spruce Co.'s property on Gold hill, Cripple Creek, is pushing operations in the bottom level at a depth of 360 feet.——J. J. Winter and associate have struck good ore at a depth of 90 feet on block 24 of the Anaconda, on Bull hill, Cripple Creek.——The King & Craig cyanide mill has started after a month's shut-down for repairs.——C. Harrison intends to put in a steam hoist at a shaft on the two upper blocks of the Pride of Cripple Creek.

The C. O. D. mine, in Poverty gulch, Cripple Creek, is furnishing ore from the tenth level at a depth of 800 feet upward.——The Milwaukee Mutual Co., leasing through the main shaft of the Gold Dollar Con. property, on Beacon hill, Cripple Creek, expects to put in a larger plant of machinery to increase their output.—— Good ore has been struck in the T. Merrit claim of the Arno Co., situated on Womack hill, Cripple Creek. This is the fourth discovery that has been made by O. D. Fogleman, lessee, within two months.——A lease on the Annie C. claim of Copper mountain, Cripple Creek, has been obtained by A. Watson and brother, who will begin work in a 200-foot shaft which they propose to retimber. ——The shaft on Cleverdon's lease on the Vindicator, at Cripple Creek, has been sunk 50 feet deeper to the 250-foot level and crosscutting commenced. ——J. Freshman, operating the Pharmacist property, Cripple Creek, and working through the Finch shaft of the Acacia Co., has put in a motor-driven compressor capable of running several drills.——On the Empire State a new hoist has been put in by Crowder and associates and a large compressor has been ordered.——The Gold Sovereign Co., at Cripple Creek, has completed the installation of a hoist in the bottom level.——Troutfetter and associates, on the Shurtloff No. 2 property, have put in machinery for sinking 100 feet and then driving over to the ore body.——H. E. Chamberlain, who is operating under lease a block of the Midget mine, Cripple Creek, is putting in a washing machine.——Shipments are leaving the La Bella mine, of Bull hill, Cripple Creek, which is being operated under the direction of Superintendent W. Wilson. The La Bella is part of the Golden Cycle property.

IDAHO.

Idaho County.

The Crooked River M. & M. Co.'s mill at Orogrande is milling 300 tons daily, and expect to increase their milling capacity. It is reported that they are mining and milling their ore for less than $1 per ton, and the ore is being mined and delivered to the mill for 15 cents per ton.——W. C. Brower has charge of work on the Umatilla, at Orogrande.

Nez Perces County.

H. Fair reports of the Pittsburg - Idaho M. Co., on the Clearwater river between Greer and Kamiah, that Laverty Bros. have financed their company and will work this summer, planning to put in air drills and other necessary machinery.

Shoshone County.

The Cedar Creek M. & D. Co. has been formed at Wallace by T. N. Barnard, E. J. Hunter, John Weir, J. H. Jackson and J. L. Dunn, to take over the St. John, Cedar Creek, Palace, Thomas, Sunnyside, Laura and Grace claims in the Summit mining district.

It is reported that a dredger is to be put on Snake creek, 15 miles from Pierce. The ground on Orofino creek, near Pierce, upon which M. H. Hare of Wallace has a bond, is being prospected to determine its value. ——The Pawhattan M. Co. will resume development work on the mine on Big creek.

MICHIGAN.

Houghton County.

The Quincy expects that connections will be made between the Mesnard or No. 8 shaft, north of the Franklin mine, and the northerly drifts from the main Quincy property in July. The shaft is down 3354 feet at the 24th level. The distance between the levels in the Mesnard shaft does not correspond with that in the main Quincy mine, the former being 125 feet apart, while the latter in the upper levels are 60 feet. Therefore, the workings with which the Mesnard shaft will connect a short distance below the 24th level of that shaft have been raised for 100 feet above the 45th level of the old mine, which is the first level passing beneath the Franklin corner. Probably within three months after the connection is made between the Mesnard shaft and the lower Quincy workings the permanent hoisting engine for the Mesnard will be in service. It is to be of the standard double conical-drum duplex-cylinder type. The cylinder will be 32 inches in diameter and the stroke will be 72 inches. The minimum diameter of the drum at each end will be 12½ feet, and the maximum diameter in the centre will be 18¾ feet. It will have a capacity of hoisting from a depth of 5000 feet. The Quincy is shipping from its Mesnard or No. 8 shaft 10,000 tons of rock per month.

MONTANA.

Fergus County.

Superintendent H. H. Lang of the Kendall mine, at Kendall, says that the company is employing 125 men, and satisfactory progress is being made in sinking the new compartment shaft in the new ground, where ore bodies were located last year by means of the diamond drills. The shaft is being sunk below the 400-foot level, and will be pushed to the 1200 foot. The development of the old workings is continuing as usual. The 150 H. P. electric hoist is in place. A 7-drill compressor has been put in. A pumping station has been cut in the 400-foot level, for the pumps. The shaft is in ore, and drifting will commence shortly, but not much ore will be raised from this ground until the shaft is completed down to the 1200 level.——Superintendent H. H. Lang of the Kendall mine; C. D. Allen, foreman, and W. C. Waldorff of Helena, have sold a half interest in the 1900 mine to A. S. Wright, and a company will be formed to develop the property.——The Moccasin Mountain Co., of Kendall, has purchased from C. M. Goodell a claim adjoining the company's property.

Granite County.

Manager L. U. Loomis, of the Gold Reef M. Co., has resumed work on the 10-stamp mill to treat the ores produced from the company's mines, at Gold Reef, on South Boulder creek, near Philipsburg.

Jefferson County.

G. Benjamin has leased the Black Diamond copper mine, north of Elkhorn, to A. A. Rend, M. Little and J. Crowthers of Butte, and the men have commenced work.

Silver Bow County.

(Special Correspondence).—B. B. Thayer, assistant to President H. H. Rogers of the Amalgamated Copper Co., has completed an exhaustive inspection of the company's mines and says the ore on the lower levels shows no signs of diminution. The shaft of the Anaconda has reached a depth of 2400 feet.——The North Butte Copper Co. has made a contract with the Washoe Copper Co. for the treatment of its ores by the latter for a long term. The output of the North Butte for June was 1,450,000 pounds of copper, being equal to the output of the United Copper mines.——The output of the Washoe smelter for June was 12,540,000 pounds of copper, and that of the Boston & Montana smelter at Great Falls 4,750,000.

Butte, July 3.

The County Assessor has increased the assessment on the machinery and supplies of the Amalgamated Copper Co. in Silver Bow county $1,013,560. The returns of valuation as made by the various companies were increased that amount, it being claimed by the assessor that the returns made were too low. The total returns upon mining machinery and supplies amounted to $403,790, and the valuations placed by the assessor amounted to $1,617,350, making an increase of $1,013,560.

Preparations for development work by the Reins C. Co. is progressing at the Combination mine in Meaderville. The large station at the 800-foot level has been completed and made ready for putting in a second big pump, which will be a duplicate of the one now in operation on that level. Excavation for a cement tank for water storage purposes has been begun, and as soon as the new pump arrives and is installed the company will be able to handle 1200 gallons of water per minute. When the new engine arrives and is put in place, sinking from the 800-foot level will begin. A foundation is being prepared for one of the old engines, so that operations in the shaft will not have to cease while the new engine is being installed.

NEVADA.

Humboldt County.

(Special Correspondence).—At Jackson creek, 50 miles north from Humboldt House and 60 miles west from Winnemucca, Darling & Malley are working the Nelson group.——Murray Bros. are working a group near Jackson creek.——T. Fox, working on the North Star group at Jackson creek, has struck a ledge 5 feet wide.——H. Bender is working claims on Deer creek.

Humboldt House, July 3.

The opal claims of the late G. W. Ladd, near Lovelock, are to be opened on a large scale. Many opals of rare flash and brilliancy have been taken from them since the find was made. The estate is in the hands of W. H. A. Pike, who will sink a 50-foot shaft and work the claim.

Lander County.

The Austin M. Co. has sold its holdings in Austin to the Austin Hanapah M. Co., who will commence work. C. B. McCornick of Salt Lake City, B. F. Moffit and J. M. Ford of Chicago are interested. A working capital of $500,000 has been placed in the treasury. Manager Edwards says work will be commenced on the Clifton tunnel, Union mine and the McHardy mine in Marshall canyon and at Yankee Blade.

Lincoln County.

The Nevada-Utah M. Co. at Pioche, E. Freudenthal superintendent, is to be developed through the old Meadow Valley No. 5 shaft. The old engine is being replaced by a smaller one, which will be used for all the preliminary work of retimbering and sinking to the 2000-foot level.——At the Abe Lincoln the mill is putting through twenty-five tons per day of $25 ore and making a high-grade concentrate for shipment, while the Holderman plant is successfully extracting the gold values from the tailings. —— On the North Pole property at Pioche men are running a 350-foot tunnel and the shaft is to be sunk to the 1000-foot level. This is the property of the new Boston–Pioche M. Co. that has been organized by Scott & Miller. —— The Mendha is being developed through a winze from the tunnel level. —— Bullionville is to be revived through the operations of the Godbes and J. L. Hackett of Louisville, Ky., who has purchased an interest in the tailings there. They will run through the big pile, which averages $16 per ton, by a new process, and expect to make a saving of $5 per ton on the 170,000 tons they have there. They will also work over the pile of tailings that still remain at the old millsite in Dry valley, east of Pioche.

NEW MEXICO.

Luna County.

The Phœnix Prospecting Co. has let a contract for a 250-foot tunnel on the Dewey and Olympia, at Cooks. The tunnel will tap the ore body at a depth bf 680 feet.

Otero County.

The Standard Lithographic Stone Co. has developed its quarries sufficiently at Highrolls to be in position to quarry solid stone in sufficiently large pieces to be of commercial value.

San Miguel County.

W. S. Standish is erecting a mill at Ribera, on the Santa Fe Railway, for the treatment of silver, gold, silver and copper ore from the Glorieta range.

Sierra County.

The Black Peak M. Co. has resumed work and will put in a 10-stamp mill, a 25 H. P. gasoline engine and a gasoline hoist, purchased by W. W. Williams, the manager.——The Union Esperanza mine, at Shandon, has received the piping for its hydraulic plant, and also some of the machinery.

OREGON.

Baker County.

The Oregon Dev. Co. has leased ten stamps of the Cracker Oregon mill at Bourne for treatment of ores from the Taber Fraction mine. It is the intention to haul the ores by wagon, and in the meantime surveys will be completed for an aerial tram from the mine to the mill.

At Cornucopia, in addition to the work of the Cornucopia Mines of Oregon Co., under Manager Humbert, the Queen of the West, under the management of C. F. Soderling, and the Mayflower, under the direction of G. W. Boggs, have ordered 10-stamp mills.

Grant County.

Jos. Waddell, manager Prairie Diggings mine, owned by the Jupiter G. M. & M. Co., states that since resuming work this season 200 feet of drifting has been done on the 175-foot level. Deep sinking has been resumed to extend the shaft to the 350-foot level.

The Blue Channel Placer Co. are working on Big creek, near Susanville, with J. K. Zimmerman as manager. A shaft has been sunk 125 feet and 600 feet of drifting done on the old channel. The gravel is washed in 150 feet of sluice boxes with Hungarian riffles.

Josephine County.

Early work at the Takilma smelter has been to the satisfaction of Manager Walters.——At Wolf creek the Martha mine, owned by the Greenback Co., work for which is being done on the Coyote side of the Coyote–Grave creek divide, has been equipped with a compressor, by means of which Manager R. N. Bishop is driving adit levels on the vein. The lower drift is in 1300 feet.

W. E. Williams, manager Buckeye M. Co., reports ore carrying gold, copper and nickel in the Buckeye mine, near Grants Pass.

O. A. Halladay is visiting the stamp mills of Grants Pass with a view of selecting the kind of a mill they will put at the Michigan mine. They intend to put in a 10-stamp mill.

Considerable dredger prospecting is being done near Grant's Pass. Several years ago a dredger was built on the China diggings, near Waldo, and run for a short time, but became involved in litigation and has since been idle. While in operation it was said to be a success. ——A Seattle company has been on Sucker creek, in the south end of Josephine county, for over a year prospecting a tract, and has gone over the ground for 4 miles. The work has been done by a series of open cuts or holes; a pump was used to keep water out while the men are at work. This company insists that drills do not give so fair a test of the ground as hand work. Recently a larger engine and pump were installed to continue prospecting.——T. W. M. Draper has had a drill at work for some time near Waldo, and is testing the gravel at the Reames & Wimer mine also.——J. T. Layton has bonded his placer mine on Farrin gulch to an Oroville, Cal., dredging company for $60,000. There are 400 acres of red gravel running up the creek, which is from 10 to 30 feet deep. The mine is operated with water from Williams creek, by means of two ditches, 13 and 22 miles, respectively, in length. It is also equipped with a large reservoir. This mine has been operated for the past thirty years and has been a heavy producer. The gold runs from $16 to $17 an ounce. The company has also secured a bond on the land of E. N. Provolt for $10,000, and the farm of L. C. Hyde has been bonded for $4000. ——On Evans creek, near Wimer, an Eastern company has secured a bond on several hundred acres of land and proposes to install a dredger. J. W. Boileau of Pittsburg and I. F. Peirsel of Brownsville, Penn., have inspected the property.

SOUTH DAKOTA.

Pennington County.

Geo. Bain has started unwatering the Dolcode shaft, near Hill City.——F. C. Crocker is putting in an air compressor, pump, etc., to develop his mine.——The Dakota–Calumet Co., near Sheridan, are putting in a new boiler and pump and will resume sinking.

Custer County.

The Interstate M. Co. has resumed work, 10 miles northwest of Custer, and will sink the main shaft to the 100-foot level.

Lawrence County.

The Homestake Extension Co. has put in a new air compressor at the property, near Deadwood. The company plans to run a crosscut tunnel 550 feet to cut a vein outcropping on the surface.——It is understood that Manager A. J. Simmons is to put in new machinery at the Echo mine, near Maitland.——The Golden Reward M. Co. have temporarily closed the mill at Deadwood, to put in a new ore dryer at the mill.

UTAH.

Garfield County.

Three miles from Salina two salt mines are in operation. At the Jennings mine a shaft, 6x9, has been sunk through a depth of 75 feet. A ditch has been constructed into which the water can be pumped and carried away, but this has been a laborious and unsatisfactory plan, and the intentions are to drain the quarry by running an incline drift from a sufficient depth into the adjacent shaft, where the water may find an outlet by seepage or be pumped to the surface. From 24,000 to 50,000 pounds of rock is shipped every day.

Grand County.

Near Basin, in the La Sal mountains, Wilson mesa is being prospected by companies headed by J. R. Emmett and M. Mason. Each company proposes to put in a cyanide plant to treat float ore.

Juab County

The shipments from the Tintic district for week ending June 30 amounted to 121 cars, distributed among the following shippers: Swansea, 8; Eagle & Blue Bell, 10; Yankee Con., 6; Victor, 10; Grand Central, 3; Carisa, 5; Mammoth, 11; Ajax, 2; Bullion–Beck, 6; Gemini, 14; Centennial–Eureka, 46. Total, 121.

Piute County.

(Special Correspondence).—The Sevier Con. G. M. & P. Co., 1½ mile from Kimberly, are preparing to erect a new 125-ton concentrating and cyanide mill. The old 10-stamp mill has been out of commission for some time. The present company has been operating the property for years through tunnels and open cut. No. 3 tunnel cuts the vein 960 feet below the surface. The directors of the company will hold a meeting July 5, and determine at that time the kind and size mill to be erected. R. W. Foster is manager and W. Christensen superintendent.——The No. 5 tunnel of the Annie Laurie M. Co. is in 3500 feet and connections made with the No. 4 tunnel 430 feet above. The mill of the company has a capacity of 250 tons per day. On account of the spring inflow of water in the chutes, it causes the ore to become wet and the capacity of the mill to be retarded. Within a short time they expect to have the mill handling the usual amount of ore. The company is putting in a steam plant at Sierra station, on the railroad, and stringing wires to the mine, and will operate with electric power. S. M. Levy is general manager, O. Wiser mill superintendent, D. C. Williams mine superintendent and A. W. Russell superintendent cyanide department. On account of this camp being so remote from other mining districts, it is hard to get good men in the mine.

Kimberly, Utah, July 3.

G. H. Pidd, who has the contract for driving the tunnel on the Golden Treasure M. & M. Co.'s property at Gold mountain, south of Kimberly, reports that the tunnel is in 300 feet and at a vertical depth of 150 feet. The company has over 5000 feet to run on the lead before reaching the claims included in the Golden Treasure.

Salt Lake County.

Manager Cates of the Boston Con., at Bingham, has started work on two new tunnels, designed to develop the porphyry ground. One of these is on the Metropolitan claim. On the Ben Hur another tunnel has been started. These tunnels, with the Teck tunnel and other workings, will prospect the porphyry at depth. The Teck tunnel is in 850 feet and is going forward at the rate of 180 feet a month.——At the Little Eddie Manager McCarrick has completed a raise to the hanging wall, a distance of 22 feet.

Utah County.

The activity in prospecting and opening up mineral claims in the mountains east of Provo continues. Woodward Bros., who have contracts on the Buckley mine, in Rock canyon, and the Tidal Wave, between Provo and Springville, are working both properties. In the Buckley mine the upper tunnel has passed through a 10-foot horse of lime and opened up chlorides and crystallized lead. The winze to connect the upper and lower tunnels is down 105 feet. When connection is made shipments will be resumed, the ore being dropped from the upper to the lower tunnel, in which manner it can be handled to much greater advantage than by taking it out through the upper tunnel.——The tunnel on the Tidal Wave claim is in 180 feet.——The Moore Bros. of Provo are opening up a vein of gray copper on the north of the Tidal Wave, and the Red Rose, on the south, has a showing of red oxide of copper.——B. F. Smith of Thistle reports work being done on a vein of low-grade ore on land belonging to him.

WASHINGTON.

Snohomish County.

Operations have been resumed at the Forty-five mine, near Silverton, after an idleness of four years because of litigation. It is stated that the Pinkhams of Boston have bonded the property to Eastern capitalists: that $50,000 is to be spent in improved equipment, including a compressor, and in development work, and that an electric line 24 miles in length, from Sultan on the Great Northern Railroad, and a large concentrator are to be built if conditions justify. Lee & Stoess of Seattle have charge.——The Packard M. Co. is putting a 2-drill compressor on its Rantoul property at Monte Cristo.——The first shipment of 40 tons from the Sidney mine, Monte Cristo, has arrived at the Everett smelter. F. W. Peabody has charge.

WYOMING.

Carbon County.

The smelter of the Penn-Wyoming Copper Co. at Encampment has been started after several months spent in overhauling the reduction works. There are forty-five men on the tramway, which has also been put in readiness for the delivery of 500 tons of ore per day. The capacity of the crushing department has been doubled by the addition of a new crusher, together with a new system of screens and classifiers. It is capable of crushing to a ⅜ inch mesh 500 tons of coarse ore per day. By means of elevators, the crushed ore is put through screens, oversize being taken up and returned to be recrushed. From the screens the ore is again elevated to the rolls floor, where it is put through four large sets of rolls and pulverized finer. This product is then elevated and passed into the new Hancock jig. This year the company intends to keep both furnaces in blast and the converters running at the same time, treating 500 tons of ore and making about 30,000 pounds of copper per day. In circulars the Penn-Wyoming Co. is sending out, the company outlines a plan for the erection of a concentrating plant capable of handling 1000 tons of ore daily at a point between Dillon and the Ferris-Haggarty.

FOREIGN.

AUSTRALIA.

Victoria.

In the Castlemaine district there are said to be twenty-four dredgers, employing between 500 and 600 men. At one place the orchardists are obtaining permission from a local company to run the slime from the settling pits over the gardens, it being found a very useful fertilizer. In the plant put up by the Yarronru Co. it is proposed to carry the dirt into a large box well by the ordinary sluicing process, after which it will be taken by buckets to a raised concentrating table. Before reaching the table the material is refined by a grizzly, together with a system of revolving screen and fine gratings. It is claimed that the system is rendered necessary by the amount of pyrites and concentrates in the material to be handled.

CANADA.

BRITISH COLUMBIA.

East Kootenay District.

The new 30-drill air compressor for the St. Eugene, at Moyie, has been put in.——The Aurora mine, near Moyie, has been bonded to W. Mackay and R. Wilson of Portland. John Sullivan of Portland will be the manager.

Boundary District.

For the week ending July 1 the Boundary ore shipments were: Granby mines to Granby smelter, 12,680 tons; Mother Lode to British Columbia copper smelter, 2200 tons: Mountain Rose to British Columbia copper smelter, 358 tons; Emma to Nelson smelter, 187 tons; Oro Denoro to Granby smelter, 132 tons; Skylark to Granby smelter, 30 tons; total for week, 16,578 tons; for year, 459,421 tons. Boundary smelters treated the following tonnage this week: Granby smelter, 12,940 tons; British Columbia copper smelter, 3965 tons; total for week, 16,905 tons; for the year, 470,850 tons.

Granby's two new furnaces at Greenwood are expected to be ready for service soon. When they are blown in they will enlarge the capacity of the plant 40%, and the management believes that they will make possible an increase of 50% in the company's copper production and net earnings. At present Granby is making an average of 1,300,000 pounds of copper and earning $80,000 net monthly. Its copper is costing, all expenses of refining, selling, management, taxes, etc., included, between 8 and 9 cents per pound. One month recently the cost figured 8.03 cents per pound. It is the intention of the management to ultimately increase Granby's production to 5000 tons of ore daily. The Granby vein is 700 feet wide, and is a self-fluxing smelting ore. The ability to handle this ore — including mining, transportation, smelting, converting, refining, selling and management — for $3.50 to $3.75 per ton has already been demonstrated. As the ore yields about twenty-six pounds of fine copper and $1.75 in gold and silver to the ton, it has a present average value of about $5.50 per ton.

Slocan District.

In the Ainsworth district, at the Krao, Manager Wheeler has increased the force at the mine and is putting up buildings.——The United mine, near Ainsworth, has been pumped out by zinc-ore men, and sampling and analysis is now in progress.——The returns from a recent shipment of 21½ tons of silver-lead ore from the Whitewater, at Whitewater, averaged 110 ounces silver and 45% lead.——The Slocan Star mill, near Sandon, is crushing 25 tons of zinc ore daily. Good progress is being made at the mine, and the mill is working smoothly. Water is plentiful, and the large tonnage of concentrating ores on hand will keep the mill working to its full capacity. The Slocan Star is owned and operated by the Byron N. White Co. of Milwaukee, Wis., with O. V. White manager at Sandon. The mine has been opened up by five levels, all entered by crosscut tunnels. Chas. Culver has charge of the mill.

Vancouver Island.

It is reported that all the mines of the Western Fuel Co. on Vancouver island will be closed down. The issue between the miners and company has been shifted and from now on it will be a fight for recognition of the union. Owing to the refusal of Superintendent Stockett to receive a committee from the union, the workers in the company's mine at Brechin laid down their tools and walked out June 30.

CENTRAL AMERICA.

Panama.

Consul-General Lee, at Panama, has notified the State Department of the passage of a resolution by the council of Republic of Panama, holding that all mines, whether found under the surface of private property or not, belonged to the government of the Republic.

MEXICO.

Zinc ores are but little known in Mexico; at least, in the shape of calamine, though blende abounds in all the mining region; but the heavy expense necessary for its exploitation has thus far prevented the extraction of the metal on any considerable scale. In the mining districts of Xochiapulco and Xochitlan, in the State of Puebla, blende is often found. Taxco, in Guerrero, contains blende in large quantities, mixed with argentiferous ores, which compound also occurs in Mazapil, Sombrerete, and Plateros, in Zacatecas, whose rich deposits justify the working for zinc, apart from the silver contained in them. In the Remedios, Jalisco, there are beds that might be profitably worked, and in Comanja, of the same State, blende forms the main component of argentiferous lodes.

Chihuahua.

(Special Correspondence).—The Sierra de Almoloya, half way between Jimenez and Parral, are a Cretaceous limestone, with a northeast and southwest trend. The faulting and fracturing of the range have produced large caves, in which the ores are found, the values apparently having been leached out higher up in the mountain by the continual seepage of water through the lime, and redeposited in their concentrated form below. On the largest fault plane which passes through the mountain are the San Enrique, Cigarrero and Iguana mines. The ores are similar to those of Santa Eulalia, but carry a larger quantity of iron and are much richer in silver and gold.

While the output of the Sierra de Almoloya is comparatively recent, yet in the early seventies the old Spanish adobe smelters, in treating the lead-silver ores of Parral and Santa Barbara, found in this range low-grade surface ores containing a high percentage of iron and manganese, which they used for fluxing, transporting the ore over 40 miles on burros. With the passing of these primitive smelters the range was neglected until recently a 300-foot shaft has been sunk on the Cigarrero and crosscut run, which has opened up lead carbonate carrying silver and gold. East of the Cigarrero, and on the same fault plane, the San Enrique mine contains outcrop of copper, iron and galena. There are two shafts and four tunnels. West of the Cigarrero, and under the same management as the San Enrique, is the Perro Colorado, upon which six shafts have been sunk and one tunnel run. East of the Perro Colorado the Iguana is shipping two carloads of high-grade ore daily. Three shafts are being sunk on the Baja California mine, at the western end of the range, and at a depth of 15 meters ore has been struck carrying silver, gold and 30% lead. Ore has been shipped from the Hercules, Huerfano, Zacatecas, Mina de Agua and Chihuahua mines, while the development of the San Juan and Nicolas Bravo properties, at the western end of the range, shows that with depth the value and quantity of ore increase. On the southern side of the mountain the Julietta mine is shipping ore containing neither lead nor silver, but which averages three ounces gold to the ton. The La Fragua has shipped high grade ore. The copper in the deeper workings indicate that with depth the Sierra de Almoloya will develop into a great copper producer.

Baca, July 1.

B. W. Bourne of Los Otates has sold the La Cruz and Santa Nino gold-silver mines at Los Otates to Boston people, represented by J. Swayne.

Durango.

The most important Mexican tin mines are in the Coneto region, 36 miles south of Inde, near the Sierra of San Francisco. The predominating formation is calcareous trachyte, and the beds, which are of vast extent, if properly worked, could not fail to give large returns, the ores yielding 35% to 75% of metal, most of them in the form of oxides. In the Sierra Bacaria is found, also in trachytic rock, tin ore associated with arsenic, bismuth, iron and tungsten, carrying from 18% to 23% of metal.

Guanajuato.

Tin is found in the Guanajuato district, at Mesa de Moreno, Cacachilas, Cerro Macho, Estanera, Rancho, Estrada, Mesa Encina, and Presa Arroyo in Allende, and in Jaralillo and Estancia in the district of San Felipe. Most of the metal found in Guanajuato is rarely appearing in veins.

Jalisco.

The tunnel to cut the veins of the mines of the San Pedro Analco M. Co., 20 miles from Hostotipaquillo, has been commenced. It will be 11,375 feet in length, and will be 10 feet high and 6½ feet wide. The veins will be cut at a depth of 2000 feet, and the tunnel will provide drainage as well as transportation facilities.

Sonora.

The San Rafael C. M. Co. has been formed to work the San Rafael mines, 16 miles northeast of Hermosillo. T. E. Monteverde Jr. of Hermosillo is president; H. J. Smith, cashier of the Banco de Sonora, is secretary and treasurer. A. H. McKay of Santa Barbara, Cal., is interested. It is stated that the concern will build two reverberatory furnaces at the mines.

The chief coal region of Sonora is 100 miles from the River Yaqui, and forms an oblong basin surrounded by mountains, in which devonian and silurian formations predominate. This basin has neither valley nor plains within it, but the ground presents elevations, within which the coal layers overlay a stretch of country nearly 7000 square miles in extent. The first of these layers appears on the Soyapa river stretching toward the south, to the left margin of the Yaqua river, which cuts it in its course; it then traverses Tomichi, Oantos and Moba, running to the southwest as far as Buenavista. Coal beds succeeding each other are visible in all the glens near La Barranca, overlaying the fells as far as the town of Cuaqui. The eastern brows of the Pilares ridge show coal measures of different dimensions, more or less decomposed in the exterior. Within the carboniferous belt there are deposits of gold, silver, copper, iron and other metals. The metalliferous formations reach to a depth of from 200 to 600 feet, where the primitive carboniferous layers appear, which, as a formation anterior to the rocks carrying the ores, cause all traces of the latter to be entirely lost. The coal in this part of Sonora is known as anthracite, but noted for the absence of sulphides and such other minerals as detract from the quality of the Pennsylvania coal fields, iron and lime being the only foreign substances which it contains. Coal has been known to exist in these regions for thirty years.

At the Chicago mine, between San Javier and San Antonio de la Auerta, the Chicago & Sonora M. Co. are working forty men and operating their 4-stamp mill upon high-grade gold ore.

Tepic.

J. B. Mulhall and R. C. Hawley are developing mines near Amatlan de Canas, and are shipping ore to the smelters. A tramway is to be built from the mines to the Mexican Central Railway in San Marcos, Jalisco.

Vera Cruz.

Platinum is said to be found in Zorra, Ixtatetla and Huastequillo.

Personal.

B. S. REVETT has returned to Denver, Colo.

J. P. CHANNING is examining mines at Ely, Nev.

J. NAGLE is superintendent Vega M. Co., near Gabilan, Sonora, Mexico.

J. A. CLARKE of Keystone, S. D., has been on a business trip to Michigan.

W. V. RICE has returned to Salt Lake City, Utah, from a visit to Montreal, Canada.

E. A. WEINBERG is examining tin mines at Herberton and Irvinebank, North Queensland.

A. F. WUENSCH has resumed his practice as mining engineer at 414 Exchange Bldg., Denver, Colo.

F. J. TOUSSAINT has returned to La Chumata mine, Arizpe district, Sonora, Mexico, from Milwaukee.

O. B. AMSDEN, superintendent Clover Leaf mine, has returned to Roubaix, S. D., from an Eastern trip.

W. M. LEWIS has been appointed resident manager St. Paul & Colorado M. Co., near Georgetown, Colo.

RHOADES FISHER, JR., has been appointed a member of the engineering staff of the Juragua M. Co., Fersneza, Cuba.

CHAS. LAWTON has resigned as superintendent Bingham Con. mines, at Bingham, Utah, to return to Michigan.

M. G. ESTABROOK of Boston, Mass., has been at Joplin, Mo., looking after the interests of the Amalgamated Zinc & Lead Co.

W. F. SNYDER has returned to Salt Lake City, Utah, after examining the Western Exploration Co.'s mines in Shasta county, Cal.

WM. DAVEY, formerly superintendent Yampa mines, near Bingham, Utah, is practicing as mining engineer at Salt Lake City, Utah.

HERBERT HAAS has resigned as superintendent Great Western Gold Co., Shasta county, Cal., and will open offices in San Francisco.

J. K. BRUNNER, vice-president and general manager Golfo de Oro G. M. Co., has returned from Colorado Springs to La Dura, Sonora, Mexico.

W. F. V. YOUNG of England has succeeded Thomas Clearage as manager of the dredger on Gold creek, Mont., 30 miles northwest of Basin.

H. H. NICHOLSON has resigned as professor of chemistry and director of the School of Mines and Metallurgy, University of Nebraska, and will, henceforth, devote his entire time to his mining business.

VICTOR G. HILLS has been appointed consulting engineer and general manager of the Colorado Tungsten Corporation, a Pittsburg, Pa., company, operating wolframite veins in Boulder county, Colo., mines at Nederland, Colo., and mill at Boulder, Colo. Charles P. Oliver, former superintendent of Dead Pine mine at Cripple Creek, goes as superintendent of the mine at Nederland. D. J. Badger, formerly in charge of the concentration tables department of the Standard mill at Colorado City, Colo., becomes superintendent of the mill at Boulder.

W. A. STADELMAN, Eastern agent Wellman-Seaver-Morgan Co., and who has been in charge of the Eastern office at 42 Broadway, New York City, has been appointed general sales agent of the same company, with headquarters at Cleveland, O., taking effect July 1. Fred Stadelman has been appointed assistant manager of the New York office Wellman-Seaver-Morgan Co. Harry V. Croll, M. E., formerly with E. P. Allis Co. and their successors, Allis-Chalmers Co., of Chicago, has resigned and accepted a position with Wellman-Seaver-Morgan Co. of Cleveland, O.

Books Received.

"Forest Conditions in the Gila River Forest Reserve, New Mexico," by T. F. Rixon, are described in Professional Paper No. 39.

Professional Paper No. 35 of the United States Geological Survey gives the "Geology of the Perry Basin in Southeastern Maine," by G. O. Smith and D. White.

As extracts from "Mineral Resources of the United States for 1904," the United States Geological Survey has issued, "The Production of Bismuth in 1904" and "The Production of Fluorspar and Cryolite in 1904."

"The Copper Mines of Lake Superior," 160 pages, 8vo., is an intelligent and interesting discussion and description of mining methods in northern Michigan copper mines. Its author is T. A. Rickard, late editor of the Engineering and Mining Journal, a writer who apparently never touched a subject that he did not adorn, and whose printed words are no less noticeable for their technical accuracy than for the charming literary style that is the delight of his readers. This fine book will add to his reputation in both regards. It is to be considered the latest word on the several subjects of which it treats, and as such deserves cordial commendation.

"Transactions of the Australian Institute of Mining Engineers," Vol. X, edited by A. S. Kenyon, secretary, Melbourne, Australia. J. W. Gregory has contributed a masterly paper on "The Mount Lyell Mining Field, Tasmania, with Some Account of the Geology of Other Pyritic Ore Bodies." Other papers are: "Prospectuses," by President F. D. Powers; "Concentration of Lead Silver Ores," by V. F. S. Low; "Phosphate Deposits of Ocean and Pleasant Islands," by F. D. Powers; "Coal and Coal Mining in New South Wales," by Thomas Parton; "Method of Timbering at the Mount Rex Tin Mine, Ben Lomond, Tasmania," by Mark Ireland; "Peck's Centrifugal Elevator," by W. Peck; "A Portable Assay Furnace," by J. J. Gillio; "Notes on Sampling," by A. C. Thomas; "The Career of the Gold Dredge in New South Wales," by D. K. Blair; "The Transmission of Power by Compressed Air in Mines," by R. W. Chapman; "The Misplacement of Mining Shafts and Adits in Victoria," "The Indicators of the Daylesford Gold Mines, Victoria," "Mining Accounts," by R. N. Kirk.

Commercial Paragraphs.

THE S. H. Supply Co., Denver, Colo., report sales of American air compressors, for which they are the Western agents, to the Bleak House M. & Dev. Co., Eagle county, Colo., a company in Clear Creek county, Colo., and another to Idaho. With each of the above machines was furnished all additional necessary machinery.

THE Santa Fe, Prescott & Phœnix Railroad will become part of a trunk line of the Santa Fe systsm. A line is being constructed from Wickenburg, Ariz., to the Colorado river and will be extended to the present main line of the Santa Fe at Daggett, Cal. The Phœnix & Eastern Railroad is being extended eastwardly across Arizona to unite with the Santa Fe line at Silver City, N. M. Another line will be built at Rincon, N. M., to San Angelo, Tex., connecting with the Santa Fe line at Pecos, Tex.

SMOOTH-ON ELASTIC CEMENT is the latest preparation of the Smooth-On Mfg. Co. This is an iron elastic cement prepared in paste form, ready for use. Its advantages are, that it is metallic and can also be applied to hot iron, the heat causing it to metallize instantly, making it invaluable for stopping leaks. Their new Smooth-On elastic cement instruction book will be sent free of charge by addressing Smooth-On Mfg. Co., Jersey City, N. J.

SEVERAL changes have been recently made in the engineering staff of the Colorado Iron Works Co. of Denver, Colo., a notable one being the transfer of John E. Rothwell from the main office at 33rd and Wynkoop streets to the city sales office at 515 17th street, at which latter place he will have charge. Mr. Rothwell is well known to the profession through his writings in the technical press and his work as a mechanical engineer and metallurgist, chiefly in connection with the barrel chlorination process. With an experience of over twenty years in milling and metallurgical operations, during which time he has designed and built a number of successful plants in various parts of the country, he is qualified for the position to which he has been appointed. The company states that Mr. Rothwell will be at the service of all who may desire advice or suggestions on milling and metallurgical subjects.

Obituary.

J. WATERS, a prominent Morenci miner, died June 27th at Morenci, Ariz., from miners' consumption.

F. H. DAVIS, superintendent Midvale Steel Co. of Germantown, Pa., died suddenly June 22nd, at Great Barrington, Mass.

J. E. DOOLITTLE of San Francisco, Cal., died on July 4th, at the Union League Club, in San Francisco, of heart failure. He was an extensive mine owner and operator in California, and was a trustee of the California State Mining Bureau.

FRED ZEITLER, a prominent mining man of Nevada county, Cal., has been missing for ten days under circumstances that make it manifest that he is dead. Searching parties have traversed the entire county with no result and it is now almost certain that he has perished. Mr. Zeitler was formerly manager Champion mine, Nevada City, Cal., first vice-president California Miners' association and superintendent Ziebright mine.

Trade Treatises.

Form 73 A, "Air Lift Pumping," from the Ingersoll-Sergeant Co., 26 Cortlandt St., New York, has some happy hints on that subject.

Latest Market Reports.

SAN FRANCISCO, July 7, 1905.

METALS.

SILVER.—Per oz., Troy: London, 27d (standard ounce, 925 fine); New York, bar silver, 58⅝c, refined (1000 fine); San Francisco, 58¾c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, $15.00; Lake, 1 to 3 casks, $15.00@15.25; Electrolytic, 1 to 3 casks, $15.25; Casting, 1 to 3 casks, $14.50@14.75. San Francisco: $16.00. Mill copper plates, $17.00; bars, 18@24c. London: £66 spot per ton.

The demand for copper from Asiatic points is reported dull, but large future purchases are anticipated. The market remains firm, with no notable change in quotations. The war in the Orient has been a factor in the copper market, but it is not nearly so important as the demand for the metal due to the expansion of industrial activity due to peace and prosperity in other countries.

LEAD.—New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.12½; San Francisco, $3.70, carload lots; 4¼c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £13 8s 9d ℔ long ton.

SPELTER.—New York, $5.30; St. Louis, $5.70; London, £23 17s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $30.65@31.00; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, ℔ lb., 35@37½c. London, £140 2s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.50 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER.—New York, $39.00@$40.00, large lots; London, £7 7s 6d; San Francisco, local, $38.00@38.00 ℔ flask of 75 lbs.; Denver, $45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20.75c; San Francisco, Plumbers', 100-lb. lots, 17.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.60; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3¼c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@$23.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7¼c; San Francisco, 1000-lb. lots, 9c; 300@500-lbs. 9¼c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17¼c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ℔ set; 14 oz., 40s., 9¾c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3¼c ℔ lb.; caustic soda, in drums, 3@3¼c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 62c; cs., 67c; raw, bbl., 60c; cs., 65c; Lucol oil, boiled, bbl., 54c; cs., 59c; raw-bbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

MOLYBDENUM.—Best, $2.75 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

URANIUM.—Oxide, ℔ lb., $3.50.

MERCURY.—Bichloride, ℔ lb., 77c.

TUNGSTEN.—Best, ℔ lb., $1.25.

PHOSPHORUS.—American, ℔ lb., 70c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¾c; less than 500 lbs., 8c.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MAGNESIUM.—Pure, N. Y., $1.60.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JUNE 27, 1905.

793,171.—CHAIR—A. A. Bartlett, San Francisco.
793,541.—PUMPING APPARATUS—W. W. Belknap, Stockton, Cal.
793 502.—SPRING MOTOR—W. J. Bell, Los Angeles, Cal.
793,342.—TROUSERS CREASER—O. Bernard, San Francisco.
793,275.—SOLAR GERMICIDE—L. A. Cain, Lompoc, Cal.
793,419.—VALVE HOLDER—C O Cole, Bellingham, Wash.
793,421.—DOOR OPENER—E. E Combs, San Francisco.
793,284.—ROLL PAPER PRINTER—J. D. Donovan, San Francisco.
793,126.—STAMP AFFIXER—S. Farmer, Portland, Or.
793,280 —UNDER REAMER—R. S Futhey, Los Angeles, Cal.
793,522.—WRENCH—L. G. Heal, John Day, Or.
793,372.—VEHICLE AXLE—C. Heilrath, Sacramento, Cal.
793,587.—POLISHING MACHINE—A. C. Johnson, Baker City, Or.
793,528.—INDICATOR - H. Kirch, Santa Rosa, Cal.
793,381.—SNAP HOOK—J. C Kortick, San Francisco.
793,451.—DISPLAY RACK—Lindsay & Burch, Seattle, Wash
793,141.—SHOE POLISHER—F. E. Marshall, Porterville, Cal.
793,207.—ROTARY ENGINE—L. A. Miley, Seattle, Wash.
793,209.—HOSE COUPLING—W. C. C. Miller, Vacaville, Cal.
793,385.—DUMP CAR—A. Mieden, Seattle, Wash.
793,312.—TROLLEY POLE—A. W. Morgan, Long Beach, Cal.
793,225.—VEHICLE—A. Perisch, Stockton, Cal.
793,400.—RIFLE CLEANER—G. A. Sachs, Eugene, Or.
793,161.—SEWING MACHINE—A. Sandmeyer, Yakima, Wash.
793,236.—AMUSEMENT DEVICE—M. L. Schlueter, Oakland, Cal.
793,103.—PIPE COUPLING—J. Scholtz, San Francisco.
793 240.—DISK PLOW—G Spaulding, San Francisco.
793,473.—CHECK REGISTER—D. W. Thornton, Sumpter, Or.
793,248.—NUT LOCK—Thrift & Louttit, Stockton, Cal.
793,118.—WATER HEATER—Wright & Sager, Seattle, Wash

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

PUMPING APPARATUS.—No. 793,341. June 27, 1905. William W. Belknap, Stockton, California. This invention relates to a pumping apparatus which is especially designed for raising quantities of water to a comparatively low elevation and a means for connecting a horse power with such an apparatus, so that the power may be applied in a substantially equalized manner to produce a continuous flow of water. The apparatus consists of the combination of horizontally disposed pump cylinders, a compartment valve chamber for each cylinder located at one side thereof, and pipes connecting the separate compartments of the chamber with opposite ends of the cylinder, a supporting frame, a vertical crank-shaft located on the frame essentially midway between the cylinders, pistons operab e in the cylinders and provided with rods, pitmen connecting said rods with the cranks of the shaft, a socket at the upper end of the shaft, said socket having an extension or hub portion adapted to receive the upper end of the shaft and having its opposite portion adapted to receive the sweep.

SNAP HOOK.—No. 793,381. June 27, 1905. John C. Kortick, San Francisco. This invention relates to an improvement in hooks of that class known as "snap-hooks," and it consists in a novel construction and operation of a tongue or keeper in connection with the hook. Its object is to provide a hook through which detachable connections are made with harness or other parts, and which it is desired to engage or disengage. It comprises a shank having a rectangular opening, a spring fitting said opening, a keeper having downturned sides inclosing said opening in the shank, a fulcrum pin connecting the keeper with the inner side of the shank, said shank having a portion of its edge curved in an arc concentric with the pin, and said keeper having its back adapted to move in contact with said arc when the keeper is opened or closed, and a second pin carried by the keeper and passing transversely through the shank and said opening for engaging the spring.

MINING AND SCIENTIFIC PRESS.

Whole No. 2347.—VOLUME XCI. Number 3. SAN FRANCISCO, CAL., SATURDAY, JULY 15, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Deep Mines vs. Superficial Deposits.

The term "true fissure vein" has come to be regarded by many as the synonym of permanency and richness when speaking of a mine. Notwithstanding the fact that fissure veins do not always continue uninterruptedly to depths which are readily reached by mining operations, and that they are not always large and rich, still the average miner delights to believe his vein is a "true fissure," and usually persuades himself that it is really such. Many fissures are of great continuity, width and richness. Some of the veins of the California Mother Lode are excellent types of fissures—rich, large and of great depth. A notable example is the Eureka vein, at Sutter Creek, worked to a depth of about 2200 feet and having produced $18,000,000 in gold. Another is the Idaho–Maryland vein, at Grass Valley, worked to a depth of nearly 2000 feet vertical and which produced over $25,000,000. The Smuggler – Union of Telluride, Colo., is another example, and these may be multiplied many times by others equally characteristic. The Comstock, Nevada, is a series of complex fissures. The Homestake and Treadwell are not fissures, but zones of fracture and impregnation; and of this type there are examples innumerable, showing that the fissure vein alone is not the only type of vein that pays. The banket on the Rand, in South Africa, is neither a fissure nor a zone of fracture, but rather a bed of more or less porous rock fragments, water-worn and angular, in which mineral solutions have deposited their gold values.

Without doubt the preference for the fissure vein arises from the idea of great permanency in longitudinal extent and depth, but more particularly the latter, and the noted examples are pointed out as indicating the possibilities of all fissure veins.

The question arises: "Are fissure veins the most profitable?" The answer is each mine must be considered separately, independent of all others, no two being just alike.

There is no reasoning by analogy when contemplating a vein. A fissure vein may possess every geological characteristic considered essential to the ideal vein of this type and still lack that most necessary feature—value. On the other the hand, ordinarily despised "deposit" may be limited in extent, wholly superficial and yet immensely profitable while it lasts. Surely, a flat sheet of ore of definite length, width and depth, the tonnage of which may be estimated to within a few carloads, and which pays a handsome profit on each ton, is vastly to be preferred to the "true fissure vein," with banded structure, clay selvages and smooth striated walls, but without sufficient value to be profitably worked.

The fissure type of vein must have either a tunnel for drainage and ore passage or a shaft which renders the ore bodies readily accessible. Capital must be put into a hoisting plant and into the shaft itself, which alone involves the expenditure of a greater or less amount of money.

The superficial deposit escapes all this expense. It may be necessary to strip a quantity of waste which covers the ore; but generally this undertaking is not expensive. Mining is carried on in the open air and little capital is invested in the enterprise, unless operations are carried on on a very large scale and steam shovels are used. When the latter is the case, the magnitude of the operations usually justifies the expense and mining is consequently cheapened. The accompanying illustration is that of a flat sheet of ore being mined in the Black Hills of South Dakota. The ore occurs in bedded deposits lying upon or in quartzite, and there are many such ore deposits there. The formation in which these deposits are found—the Cambrian chiefly—has been extensively eroded, and canyons have been cut down through the flat, once continuous sedimentary beds, leaving remnants of beds containing the ore, as flat deposits on the hill tops, between the gulches. In some cases the ore is covered by superficial debris, due to disintegration of neighboring higher rocks; in others there lies on the ore a few feet of sedimentary beds, or a sheet of intrusive rock. In still other cases the ore deposits extend down under mountain masses of rock which have escaped erosion. In these underground mining is carried on in the usual manner.

The superficial deposits, however, are mostly readily accessible and are mined as shown in the accompanying illustration, or operations are conducted on a larger scale by the benching system—thousands of tons of ore being blasted down by one series of holes, and the broken ore lifted into cars by means of steam shovels. By this latter method the cost of mining and handling is reduced to a minimum, and a profit is made on ores containing less than $5 per ton.

The Machine Drill in Mining. (See page 38.)

Open Cut Mining in Flat Veins, Black Hills, S. D.

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DRILLING contests have been held recently—mostly at Fourth of July celebrations—throughout the mining regions of the West, and some very good work done by the expert steel polishers. A review of these performances shows in some instances a surprising discrepancy in the inches drilled in the time—fifteen minutes. This certainly must represent something more than the difference in skill between the men. Ordinarily the drilling is done on a raised platform, the material being some firm and homogeneous rock from the immediate vicinity, granite, if available, being generally chosen as being the least likely to present irregularities in structure and hardness; but there is a considerable difference in granite from various places. Some granite contains a larger proportion of quartz than others, and generally the more quartz the greater the hardness. Even solid quartz is often spoken of as "soft quartz," "hard quartz," etc., showing that the miner recognizes the varying degree of facility with which the rock may be drilled. It is not that the quartz of one mass is really softer than that of another, but that the variable structure of the rock is such that some kinds may be much more readily cut than others, and so with almost every kind of rock.

ATTENTION was called last week in these columns to the very low grade of ore being successfully mined and smelted by the Granby Company at their property in British Columbia, where labor is paid at about the same rate as in the United States. Elsewhere herein will be found some interesting data on the operations of copper mines at Mount Lyell, Tasmania, where the conditions are somewhat less favorable than in the western United States. The low grade of some of the ore treated there is interesting as showing what may be accomplished in America with low-grade ores. Some of the ore was so low in grade that hydraulic concentration was impracticable and financially a failure, yet this ore was available in the smelter because it carried the very necessary silica, which the main masses of ore of the Mount Lyell mine lack. The description of the ores and methods of treatment are interesting to all interested in copper problems, and doubtless many others otherwise engaged can find much of interest in a perusal of what is being accomplished in distant regions where there are many disadvantages to overcome.

Hobbies of the Miner.

There are many prospectors and miners who place undue importance upon the value of the presence of some particular rock or mineral. Rich ores of gold, silver, copper and other metals occur under such a variety of geological conditions and in or associated with so many different kinds of rocks and minerals that it is misleading to place too great dependence on any particular sort of geological condition or on the occurrence of any definite mineral. Just at present fluorite is eagerly sought, as it is believed by many to be almost as good as the gold itself. In Cripple Creek district, Colo., associated with the rich telluride ores, fluorite is more or less abundant. So it is in some of the telluride ores of the Black Hills of South Dakota, and more recently it was found to be associated with the gold ores of Bullfrog and Goldfield districts of southern Nevada. The lead fields of southern Illinois and of Missouri, as well as those of England and many other places, abound in fluorite. Fluor is not an uncommon mineral, by any means, and yet it is to-day receiving more attention than ever before, not because of its intrinsic value, but because of its supposed association with gold. A few months ago "luminescent zincblende" had the call, as it was supposed to contain large quantities of radium—a new element of which very little is known as yet, but which is greatly to be desired, as it is at present said to be worth several millions of dollars per pound. Ten years ago the prospector who could find phonolite considered his fortune assured, simply because phonolite was found to occur in Cripple Creek and in the Black Hills associated with gold ores. There are mountains of phonolite in Wyoming and in various other places, and with no trace of gold; but the prospector did not know this, so he earnestly looked for a dark-colored, hard, fine-grained rock, which would "give out a ringing sound when struck." As a result, fifty different kinds of rock were found to possess this peculiarly valuable property, and claims were promptly staked on these numerous "phonolite belts." In most instances the rocks were siliceous slates or other dense metamorphic rocks, any of which would "ring" according to description, but the gold necessary to complete the prescribed conditions failed to appear.

The miner, it seems, must needs have a hobby, or some definite object, to stimulate him to activity, and it might as well be fluorite or radium as anything else. His eager quest usually results in his finding something—gold, silver, copper, borax, or some other valuable mineral—which he can turn to good account. He should investigate every rock, every formation and every possibility. It is a great mistake to search for something "just like was found in some other place," for its duplicate may not exist. There is such great variation in ore deposits, their appearance and surrounding conditions, that the prospector who seeks for a repetition of conditions in any certain place that he may become familiar with in another is almost certain to be doomed to disappointment. Some have a strong predilection for some particular rock or formation, and others have equally strong prejudices against the occurrence of certain minerals or geological conditions. The prejudice against glassy quartz is almost world wide, and yet some very rich gold mines have been developed on veins of quartz almost limpid in its clearness. Much of the gold-bearing quartz from La Fortuna mine, in Yuma county, Arizona, was of glassy, transparent character. On Kinkead Flat, near Sonora, Cal., a vein of almost transparent quartz was rich in free gold. In mica schist the granular, glassy quartz, characteristic of the lenses in that kind of formation, are often rich in gold. Some miners look with suspicion upon a copper mine where garnet occurs with the ore. As against this, some of the most noted and profitable copper mines in the world have abundance of garnet. Others have "no use" for a mine or ore deposit capped by basalt or other late lava. The ore deposit in most cases was formed ages before the flow of lava covered it, and which may have come from a vent many miles distant, and has no connection with the ore deposit whatever.

Great outcrops of milky white quartz are seldom valuable for their mineral contents, though miles of such croppings have been located and industriously developed, but usually without success, and yet there are exceptions worthy of note. In California there have been a number of white quartz veins which were rich in free gold on the surface. The Hite mine, in Mariposa county, was one of these. There a shoot of white quartz, 600 feet long and about 4 feet wide, contained a great deal of visible gold.

To accomplish the best results the prospecting miner must disabuse his mind of all prejudice, and search like an inexperienced "tenderfoot" for mineral deposits. Perhaps this indiscrimination is the reason why so many valuable mines have been found by inexperienced persons. One of the greatest gold mines of the Southwest was discovered a few years ago by prospectors who were operating a dry washer. At noon times they went to the quartz ledge a short distance above where they were engaged to eat their lunch. For two weeks or more they daily sat on the great fortune that awaited them before they realized what it was. The prospecting miner must be a careful observer. Every reef of rocks, hard or soft; every mineral stain; every condition, either strange or ordinary, should be investigated and carefully tested before deciding that it is worthless. All mines do not crop up out of the ground like a great wall; many deposits are in depressions, or in a saddle in the range of hills. Mineral veins usually carry more or less sulphides, and these on decomposing usually cause the country rock to become altered and softened, and as a result both the vein and the walls being softer are more easily eroded than the rock at a distance from the vein, hence the depression. It may be well to have a hobby, but, while pursuing this fancy, do not neglect to observe everything that comes within the range of possible investigation.

A CONTEMPORARY announces the discovery of a valuable ore deposit through the medium of the national game, baseball, in an instance where a player stooped to pick up a ball and discovered a piece of rich ore. On this discovery he later located a claim. This is not the first instance where baseball figured in the discovery of rich ore. On the Iron Hill mine, at Carbonate, South Dakota, some years ago, in preparing the ground for baseball, in setting the home plate, rich chloride ore was found. A shaft was sunk and a rich though small chimney of ore was developed. Strangely, although this shoot of ore went down 300 feet or more, it scarcely extended beyond the limits of the shaft, being an excellent example of the pipe or chimney form of ore deposit. The discovery of the noted Hidden Fortune mine, near Lead, South Dakota, was made on a ball field. The spectators of the miners' games used for years to gather on Otto Grantz' $200,000 worth of gold slugs and watch the progress of the play, though it is needless to say no one had a suspicion of the wealth lying a foot or two beneath them.

THERE still exists in the Black Hills of South Dakota an unsolved metallurgical problem, which, as yet, the skill, experience and technical knowledge of the numerous operators there have been unable to solve—the treatment of the unoxidized or so-called blue ores of the Cambrian beds. Years ago these ores in the oxidized zone presented a most perplexing metallurgical proposition. This was successfully met by the introduction of the chlorination and cyanide processes, but the "blue ore" still resists attempts to gain satisfactory results on the raw ore. Smelting, of course, treats the ore readily enough, but as the ore is highly siliceous it is necessary to associate with it large amounts of pyritic iron or copper ores. The owners of these ore bodies are still working and experimenting with a view to finding a cheap method of recovering the values from these unoxidized ores, and it is not unreasonable to expect that they may yet be successful in their efforts.

GOLDFIELD, the new mining camp which has grown up in southern Nevada within the past year, has not escaped the fate which appears to be the lot of almost every camp of consequence sooner or later. Some of the business center of the town was destroyed by fire a few days since. Houses, tents, merchandise and everything else combustible within reach of the flames quickly disappeared. The usual result follows, and the burned district will be rebuilt with a more substantial class of structures. In a region where water is so scarce, fire-proof buildings are about the best protection against the fires for which Western mining camps are famous.

CONCENTRATES.

BORIC ACID has the composition $B(OH)_3$. This salt forms with sodium hydroxide the borax of commerce. It is obtained from colemanite and other borax-bearing minerals.

♣♣♣♣

WHEN acidulated water or other corrosive liquid must be raised, but which is destructive to metal pumps, an air lift can be installed which will raise the liquid, in the same manner as water.

♣♣♣♣

PLATINA is chemically the same as platinum, although the name platina was also applied years ago to what is now known as Britannia ware, an alloy of tin with varying proportions of antimony and copper.

♣♣♣♣

BY resistance, electrically speaking, is meant something placed in a circuit for the purpose of opposing or resisting the passage or flow of the current in the circuit or branches of the circuit in which it is placed.

♣♣♣♣

UNDOUBTEDLY an air compressor can be operated in a mine on the level where the drills are used, running the compressor by an electric motor. The idea is not altogether new, but it is not in general use as yet.

♣♣♣♣

WHERE tail ropes are used in hoisting, as in the Whiting system, the tail rope is of the same size and weight for given length as the hoisting rope. It permits a constant weight of load at the winding drum.

♣♣♣♣

WHERE lead is present with gold in the solution in a chlorination vat, the lead may be first precipitated by means of sulphuric acid, the lead going down as a sulphate. The solution is then drawn off and the gold precipitated separately.

♣♣♣♣

ONLY coal and iron are not reserved from railroad grants. If land within the zone of the railroad grant can be proven to be mineral before the railroad company secures patent to the land, it may be set aside for settlement by citizens of the United States.

♣♣♣♣

THE new reef of rich gold ore recently discovered at a depth of 2200 feet in the Catherine mine, at Bendigo, Australia, is in old grounds where mines had been worked since 1861 and which were very rich on the surface. The new strike mills over an ounce to the ton.

♣♣♣♣

COPPER ores occur in Triassic and Permian rocks in the form of nodular masses. In most instances, these ore deposits are not connected in any way with dikes, or with notable geological disturbances. Copper ores of this character are found in Utah and Arizona on both sides of the Grand canyon of the Colorado river.

♣♣♣♣

BOTH turntables and turnplates are used underground. The former is more likely to become clogged with debris and cause trouble. A good plate is usually satisfactory, and, if properly laid and provided with guide corners, will answer every purpose. In dry mines a good turntable will work better probably than in a wet level.

♣♣♣♣

IT is not always necessary to have a constant maximum supply of fresh water for milling operations, as where a limited supply is available the water may be settled and reused in the mill. The loss from evaporation, absorption, and that carried away in pulp or concentrates, is usually between 25% and 50%, the loss being proportionally greater where the operations are on a small scale.

♣♣♣♣

AN element of danger in working ore deposits by the room and pillar method is in leaving the same size of pillars in a large deposit as were found to be satisfactory and safe in a small deposit. A vein 15 feet thick may be safely worked by leaving pillars of a stated size, but pillars of this size would not, perhaps, sustain the roof of a deposit 30 feet or more in thickness. The pillar must be increased in size.

♣♣♣♣

IN the application of the cyanide process it is often economy to provide a large tankage facility and to increase the time of contact in percolation treatment, thus getting a higher percentage of extraction at expense of capital in plant and time of operation. The latter is rendered inconsiderable by increase of plant, which makes greater capacity possible. This reduces the cost of labor, which is not idle.

♣♣♣♣

HERBERT LANG says the use of too light and fragile a fuel, in copper smelting, which is consumed high up in the furnace, will in every case give rise to a cooling of the hearth and the formation of incrustations, which defeat the intentions of the smelter. Then is required the application of greater heat to rectify the disturbance. This may be done by increasing the percentage of fuel, more particularly of coke.

♣♣♣♣

CRUSHING ROLLS of given size are supposed to have a definite capacity for crushing ores to a stated size; but to secure this capacity the rolls must be in charge of an experienced operator. The most important factor is the speed of revolution. There is much theoretical data on the speed of rolls and their work on the same material at different speeds; but experience shows some of the conclusions to be at fault. The capacity of wet crushing rolls is greater than dry crushing. The proper speed for rolls of ordinary size (24-inch diameter) is ninety revolutions per minute to crush coarse—to ¾-inch mesh—and 100 to 160 for finer crushing. Rolls of larger diameter should be run somewhat slower, so as to give the rolls about the same peripheral speed, which should be for coarse crushing about 565 feet per minute and for fine crushing from 650 to 1000 feet per minute.

♣♣♣♣

IT is needless to throw away old boiler tubes, for in most cases they are sufficiently good, if the ends be cut off, to rethread and use for air or water pipe where the pressure is not too high—say, 100 pounds per square inch. Much of the scrap iron and waste usually seen about mines can be utilized in some way if proper care be given to it. The "graveyard," as such a dump is called, often has within it hundreds, if not thousands, of dollars worth of good material, such as axles, iron and steel plates, old cars and a great variety of odds and ends cast temporarily aside and often forgotten.

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ANEROID barometers may be used in measuring the depth of mine workings, if a number of trips are made and the readings taken both going down and coming up. The average of the readings on several trips will give approximately the depth of the workings, or the distance between levels. When using the barometer in this manner the trips should be made without stoppages between the points where the distance is desired. Where the mine workings extend below the level of the sea a special instrument should be used to measure these minus elevations. Barometers are manufactured which will measure to 3000 feet below the level of the sea and read to 1 foot.

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THE California Code of Civil Procedure, Sec. 1192, says: "Every building or other improvement * * * * constructed upon any lands with the knowledge of the owner, or the person having or claiming any interest therein, shall be held to have been constructed at the instance of such owner, or person having or claiming any interest therein, and the interest claimed or owned shall be subject to any lien filed in accordance with the provisions of this character, unless such owner or person having or claiming an interest therein, shall, within three days after he shall have obtained knowledge of the construction, alteration or repair, or the intended construction, alteration or repair, give notice that he will not be responsible for the same by posting a notice in writing to that effect, in some conspicuous place upon said land, or upon the building, or other improvement situated thereon."

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SOME engineers think the size of hoisting ropes generally used in mines is unnecessarily large, and that smaller ropes would answer as well. For instance it is claimed that a rope of ⅞ inch diameter has a breaking strain of 50,000 pounds, while a rope of 1 inch diameter, costing 70% more, has a breaking strain of 88,000 pounds, and that under ordinary conditions the weight raised in mine skips, etc., not over 1500 feet in depth, does not usually exceed five tons, including rope, skip and load, which is a factor of 5 for safety. The smaller rope, moreover, admits the employment of smaller sheaves and drums, being 3½ feet diameter for the ⅞ inch rope and 4½ feet for the inch rope. The argument is not unreasonable, but the factor for safety should never be lower than 5, and a higher factor is preferable. It is not the usual practice, however, to raise 5-ton loads with ⅞-inch ropes. Ordinarily the skips do not weigh above one ton with a load of two tons, and in such cases the ⅞-inch rope is heavy enough for the work.

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THE amount of air consumed by a machine drill varies greatly. Large machines use much more than small ones, and the speed with which they are operated is also an important factor. There is usually more or less unavoidable leakage on the air line, and also at the cocks, all of which must be compensated for by the compressor. It has been theoretically calculated that a drill uses about 100 cubic feet of free air per minute, but some use more and others less than this amount. In figuring the consumption of air by the drills, the compressor must be taken into consideration, for some compressors have a much higher efficiency than others. Small air compressors are not nearly so efficient and economical comparatively as larger compressors. A small compressor taking 300 cubic feet of air per minute will not run more than two drills, while one having a capacity of 3000 cubic feet of air per minute will keep thirty or more drills supplied with air. This is due to relatively greater losses from leakage and friction in the smaller plant.

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GOLD may be precipitated from the terchloride solution by means of copper sulphide, the gold going down in metallic form. For ordinary conditions iron sulphate solution is as good a precipitant as can be found. It is easily made, inexpensive, and its application is simple. Hydrogen sulphide (H_2S) is also an excellent precipitant, but precipitates the gold as sulphide (it also precipitates copper, which is often present in the solution), while the $FeSO_4$ precipitates metallic gold. The sulphide precipitate settles more quickly than the metallic gold. Hydrogen sulphide requires considerable apparatus for its manufacture and application, and the ferrous sulphate solution requires neither. It may be kept in a wooden tank having no metal parts or nails. The tank is made of carefully planed lumber, and is bound together by ties of wood, tenons and mortises fitting nicely, the whole being tightened and kept tight by means of wedges. Generally there is no machinery whatever in a vat chlorination works where the Plattner process is in use. Where the material to be treated can be quickly gassed, and leached, this old-time process is superior to any other.

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PITCHBLENDE is an ore of uranium and pitchstone is a volcanic glass. The two terms are not infrequently confused. Other instances of this confusing similarity of names is found in chlorite (a magnesium silicate) and chloride (a union of chlorine, with a base); cyanide (a combination of cyanogen with an alkali), kyanite (an aluminous silicate) and syenite (a rock, composed of orthoclase and hornblende); lazulite (an aluminous phosphate) and lazurite (a sodium-aluminum silicate); alaskite (a siliceous aplite) and alaskaite (an argentiferous lead-bismuth sulphide); argentite is silver sulphide (silver glance) and argentine is lamellar calcite, having a pearly luster; chrysotile is a fibrous, silky serpentine, and chrysolite is olivine; chalcodite is a micaceous iron silicate, incrusting some iron ores, and chalcocite is copper sulphide (copper glance); dioptase is a copper ore and diopside is calcium-magnesium pyroxene. Many more examples might be added, but they are not necessary to show how confusing these names of minerals often are.

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THE discoloration of the mill plates may not be due to the ore at all, if it contains only iron sulphide and gold in a quartz gangue. Sometimes the spots on mill plates are due to the water used in the batteries and not to the ore. An ore may give no particular trouble in amalgamation, the percentage of saving being so high as to entitle it to be considered a free-milling ore, but the water from the mine may contain sufficient arsenic or some other mineral in solution to give a great deal of trouble to the mill man. An ore occurring on Osborne hill, Nevada county, Cal., was found very difficult to treat by the ordinary mill process, at the company's mill near the mine, and several tons were sent to a mill in another part of the district, and a high saving was made by the ordinary methods of amalgamation and concentration. This led to an investigation, and it was learned that the water from the mine had been used in the test of the company's mill, but that ditch water from the mountain snows and springs were used at the other mill. This experience proved that ore may be free milling while the mine water is detrimental to amalgamation.

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THE grade usually adopted for their sluices by placer miners is about 6 to 6½ inches to the 12-foot box, regardless of the width of the sluice. Where there is much clay the grade is often increased to 8 or 9 inches. The miner should experiment with the grade of his boxes, which should be suited to the material. If the grade be too heavy, not only will the greater amount of debris be carried out, but also often some gold. Light gravel can be more readily moved than that in which occurs abundance of iron and heavy basic rocks. It is best not to use too much water, as it has a tendency to pack the sand tightly in the riffles, allowing the gold to pass over and escape. Where there is a large amount of cobbles, the quantity of water should be sufficient to cover the largest of these that are shoveled into the sluice box. If only light grade is obtainable for the boxes, a greater amount of water is admissible, and vice versa, a heavy grade may be used where the water supply is scant. Twenty miners' inches (30 cubic feet per minute) is generally considered a sluice head under ordinary conditions, but, as indicated above, this amount varies with the change in conditions of grade and character of gravel.

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A LACCOLITH is a mass of igneous rock thrust upward into sedimentary beds, the force of the intrusion raising the beds in the form of a flattened dome. Usually the beds are split at several of their planes of sedimentation and the molten magma is thrust into these opened spaces, forming sills or sheets of injected rock. The first laccoliths to be described extensively were those of the Henry mountains, in southern Utah, by G. K. Gilbert. Laccoliths are not of uncommon occurrence; but much geological importance can be attached to them generally, as they are very often associated with valuable ore deposits. The ore deposits of Leadville, Colo., are directly associated with laccolithic intrusions; so also are those of Aspen and several other Colorado mining districts. Eureka, Nev., affords another example, and all of the ore deposits in the Cambrian and Carboniferous beds in the northern Black Hills of South Dakota occur in association with laccoliths. Other intrusive masses are variously known as stocks, dikes, plugs, etc. A dike is an elongated mass of igneous rock thrust into any kind of rock which has a dip nearer the vertical than horizontal. The dike may conform to the dip of the strata or may cut across them. It may vary from less than 1 inch to over 1000 feet or more in width; but its length must greatly exceed its width, or it will be known as a plug or stock. Where an igneous mass is intruded into sedimentary rocks and lies conformable to them, but is subsequently lifted by some force, the intruded mass is still a sill, as it would be called had it remained horizontal. A stock is a mass of irregular form, but approximately circular, as distinguished from the elongated intrusion or dike.

The Machine Drill in Mining.*

Written for the MINING AND SCIENTIFIC PRESS.

No one thing has contributed more largely to the reduction of mining costs than the machine drill. After centuries of mining by primitive methods, when the only tools were of wood and stone, iron, and finally steel, was introduced into mining practice, and each in its time at once raised the standard of measure of the miners' capacity to bore into the mountain side, or to sink far below the surface. The barbarous method of firing a rock face, and then dashing cold water upon it, to cause disintegration of the rock, and the final beating of the shattered rock with stone hammers has long since been a thing of the past, and the hammer, drill and pick have succeeded the ancient methods, but the advent of the machine drill marked the beginning of a new era, almost as important as the introduction of steel in mining.

Machine drills were first made and used in the United States, the first machine being introduced in 1838. In that year J. M. and John N. Singer made some experiments with a machine drill in the Illinois and Michigan canal, near Chicago. The drill was patented the following year, and a number of machines, made under this patent, were used on that work for about 3 years, so that the first machine drill to be made and actually operated in the world was the Singer. Other machines of this make were used on various large rock excavations in the Eastern and Middle United States.

From this date forward numerous types of machine drills made their appearance. One of the first and most notable departures from the form of the Singer drill was in the machine made by Couch & Fowle, who produced a steam-operated drill in which the drill bar passed through the piston, and which was alternately drawn backward and thrown forward against the rock. This machine was not a success, but it was one of the important steps toward the successful machine drill of the day. Messrs. Couch & Fowle did not agree upon what each considered the proper construction of a machine drill, and from the date of the failure of their machine each worked along the line of his own ideas. One thought the hollow piston drill the proper form of machine, the other clung to the idea of a drill solidly fixed to the reciprocating piston of the machine. Fowle made a number of machines, but none of them was a success, as compared with modern machines.

In the work of driving the Mont Cenis tunnel under the Alps and connecting France and Italy, compressed air was first introduced in the operation of a machine drill, which was constructed after the ideas of Fowle, but on somewhat different lines.

When the Hoosac tunnel in Massachusetts was under construction strenuous efforts were made to produce a machine drill which would hasten and cheapen the work. The drill employed in the work at Mont Cenis was considered, but finally rejected as being unsuited to the work on the Hoosac. The patents of Couch were bought and endeavors made to produce a satisfactory machine having a hollow piston. The result was known as the Hanson drill. This drill is described as having a hollow piston through which the drill bar passed, and which moved backward and forward with the piston. It was fitted with a valve motion similar to that of a steam engine. The rotation of the drill was accomplished by means of a ratchet and pawl, worked by a spiral device in the shell of the machine. The machine was very complex and contained 120 pieces. Fully assembled it weighed nearly 600 pounds. This machine worked "after a fashion," but was far from satisfactory.

The next important improvement came in the creation known as the Brooks, Burleigh & Gates machine. This machine also had a hollow piston, the drill bar being held in place by a threaded arrangement. The drill had the reciprocal motion of the piston. The feed was controlled by means of a nut on the end of the piston rod secured by a union or coupling device, which was screwed on the piston rod. One remarkable feature of this drill was that the area back of the piston was greater than that in front of it, so that the forward stroke was much more forcible than the back stroke. In this machine the piston head had a diameter of 4⅝ inches, and the diameter of the piston rod was 4 inches at the large end and 2¼ inches at the small end, the areas being 12.87 and 4.23 square inches respectively, with a difference in area of 8.64 square inches. The pressure at the forward end was not removed, as the pressure was applied at the rearward end, and the force of the blow was represented by the difference in area pressure. The machine worked automatically, and it ran usually until something broke or became disarranged, when it had to be taken apart. As the material from which the machines were made was not of the best, repairs were needed frequently.

The device ready to run weighed 240 pounds and cost $400. It operated at 200 strokes per minute. One of these machines performed the unusual feat (at that time) of running five days without breaking down. A two days' run without mishap was considered extraordinary. About forty of these machines were used on the Hoosac tunnel work at one time, but it required a procession of workmen to carry away broken drills and parts of the machine and to replace them with others. The average life of this machine is stated to have been about eighty hours. The machine was finally abandoned as too expensive and altogether unsatisfactory.

The next machine to claim attention was the Burleigh. This machine, designed by Chas. Burleigh, was after the Fowle idea, the maker buying the Fowle patents. In it the idea of the hollow piston was rejected and the Fowle scheme of a drill attached directly to the piston head was substituted. The machine was greatly simplified, the number of parts reduced, and the best material obtainable was put into it. So satisfactory did this machine prove upon trial that for years—from about 1867—the Burleigh was the principal rock drill in America, and so familiar did the name "Burleigh" become that it clings to the machine drill of to-day, and it is no uncommon thing to hear any kind of a machine percussion drill referred to as a "Burleigh." The old Burleigh machine still embodied some of the original ideas, which have long since been abandoned in machine drill construction.

The machine drill has been further improved from time to time, and there are now numerous makes of machine on the market, all of which are good, and it may be said of this class of mining machinery, as of some others, that it is difficult to say which is the best. If the miner—the man behind the machine—is appealed to for an opinion, he will invariably speak in favor of the machine with which he is most familiar, and which he has found, by practice, to give him satisfaction. The next man, while perhaps not decrying the merits of the machine favored by the first, will speak of his pet machine in terms as strong as the other. The fact is that all machine drills now on the market are good machines, for the simple reason that a poor machine cannot find ready sale, or use, by practical men who know what a good machine should be. There is possibly more difference in the ideas of miners as to the proper size of machine to use than in the make of machine itself; but here, again, comes the personal equation. Undoubtedly there is a place for the machines of small piston area, as well as for those of large area. And if this be true, then there must also be proper places for machines of intermediate area.

There are those who believe that hand work is superior to machine drill work. In driving tunnels, in stoping large ore bodies and in sinking in very hard ground the machine drill is superior to hand work, and machine work per foot or ton is generally far less expensive than hand work. Of course, there is not much advantage to be gained in using machine drills in soft ground, or even in that that is fairly easy, for under such circumstances there is likely to be much time lost.

Where ground is not very hard, the smaller machines will generally give better satisfaction, for they are cheaper in first cost, require less air to operate, and, as the drill bits are generally smaller, should, if properly handled, cut as fast as the large machines. Moreover, drill holes of large diameter are not required in "easy" ground, as sufficient powder can be tamped into a hole of small bore to break the rock.

In stoping small veins, where the walls are not firm and much waste is consequently made, the matter requires good judgment. If the ore and walls are both soft and break down together under machine drill work, it would probably be advisable to stope by hand; but this need not influence the use of the drill in development work, in crosscutting, etc. If the ore is firm and the walls soft, it may be the better plan to stope with small machines, and, if the ores does not make too much fines, the fine waste can be screened out by passing the broken rock over a grizzly or through a trommel. If both walls and ore are hard, the machine drill should prove more economical than hand work. In large mines there are levels which justify the use of hand drilling, and other usually lower levels where the machines can be used to better advantage.

There are many engineers who do not agree upon the general use of machines in shaft sinking, the advocates of the machine claiming that the speed of sinking can be increased by using machines and, therefore, are advisable. Those of contrary opinion usually admit that the rate of sinking can be increased by employing machines, but that it is at the same time more expensive than hand sinking. Here again it is almost entirely a matter for the exercise of good judgment. In most cases the use of machines in shaft sinking will be found to possess advantages over hand sinking.

The relative advisability or advantage of hand and machine sinking can not always be determined from a consideration of the actual cost of labor performed and supplies used per foot of shaft sunk. It is acknowledged that in good hands machines make greater speed than when the work is done by hand. It is often the case that large capital is invested in surface plant and in the purchase of the property itself, while production can not be commenced until the shaft is sunk to the ore body and several levels opened up in order that extraction may be carried on upon a scale commensurate with the extent of the property and capital invested. If this outlay of capital be no more than half a million dollars, and not infrequently it is more, the interest on this sum would be figured at $25,000, at least, per annum, which, when shaft sinking was progressing at the rate of 100 feet per month by hand work, would mean an interest charge of $20 per foot. In such a case it would without doubt be less expensive to use machines to put the shaft down in as short a time as possible.

Under ordinary conditions the cost per foot for drilling by hand will range from 30 to 75 cents, while with machines it is from 5 to 25 cents, averaging probably 15 cents (including every expense incident to the work).

In the operation of a machine drill one of the most important items of expense is that of repairs, and the extent to which this feature of the expense account is swelled depends in a large degree upon the drill runner—on his ability, carefulness and experience and in no small degree on his temper. If he is painstaking and understands that his machine is an engine and not a mere mass of metal, he will run up a smaller bill for repairs than the careless, irascible fellow who thinks the proper thing to do, when the machine fails to operate to suit him, is to strike it viciously with a sledge or heavy wrench, or to permit his assistant to do so. In the first place fitchered holes are largely the result of careless starting of the hole, or the machine is not clamped sufficiently tight upon the bar. Often a fitchered drill will work all right if the machine runner loosens the clamp bolts a little, so as to shift the machine slightly, and loosen the drill. All of these things are learned by experience.

When about to start to drill a round of holes, the machine runner should choose a position for his bar which will admit of drilling as many holes in the proper places as possible with the one "set up," for this requires time. The footing and overhead rock, (or the rock sides) should be as firm as possible, for if they are not, there will be danger of the machine loosening the ground by its heavy vibrations. If the space from head to foot is very much greater than the length of the bar, a broad, substantial crib of timbers should be constructed for the foot and a heavy block put in over head, and the bar tightly screwed up, when additional security is gained by driving wedges between the head block and the roof —or the side walls, as the case may be. For the safety of the miners, and for the accomplishment of good work, the bar must be so firmly fixed that there is no danger whatever of its shifting after drilling has commenced.

The next thing is to mount the drill on the bar, (either horizontal or upright). Many miners clamp the machine directly on the bar. This holds the machine rigidly in place, but a little more latitude to operations is afforded by the use of the projecting arm supplied by the drill manufacturers, and which is securely clamped to the bar. The arm is mostly used when the bar is set upright. Bars are fitted with single or double screws at the foot, for the purpose of tightening the bar. The double screw is preferable where the bar is long. Bars are made of various lengths, to be suited to the mine workings. They range from 5 feet or less to a length of 9 feet. A bar of more than 9 feet is subjected to too much vibration for satisfactory work, and if the distance between rock faces exceeds this greatly, a crib should be built and a shorter bar used.

In shaft sinking horizontal bars are used—usually the single screw. In drifting a similar bar is employed, but most miners prefer the double screw in large tunnel work, though in railroad tunnels, quarries and similar large rock excavations, where much benching is done, the tripod is commonly substituted for the bar. The machine may be operated in any position, above or under the bar—the position is not so material as absolute rigidity, and this is imperative, for if the machine shifts after getting well started the hole may be lost.

In drifting it is not uncommon to place the bar in a horizontal position near the roof above the dirt broken down from the last round of holes. This permits the shovelers to remove a large portion of the broken rock while the upper holes of the next round are being put in. When the broken rock is all out, the bar may be shifted to the bottom and the lower holes drilled. This is only advisable where work on the drift is being rushed. It is more satisfactory to have two places on a level where the machine may be used, so that while the muckers are engaged in one face the drillers may work in the other. To get value out of the machine it should be kept employed, as well as the men who manipulate it. Machine miners should not be required to muck dirt. It is cheaper to hire unskilled laborers for this work, as the machine man usually receives from 25% to 50% more pay than the mucker.

The rate of progress is something that is carefully watched by the management, and, as this is the most essential thing, the conditions under which the machine is run should be made as favorable as the situation will admit. If the working place is wet, the miners and the machine should be protected from falling water as much as possible. Good air should be supplied in addition to that coming from the exhaust of the machine, for the exhaust air is not always pure, by any means, and is occasionally poisonous, being charged with carbon dioxide, due to combustion of oil and dust in the cylinders of the compressor. Conveniences for mucking should be provided, such as laying a shoveling floor before blasting, and every-

*See illustration front page.

thing reasonable done to advance the progress of the work by making the labor as easy for the workmen as the circumstances will allow.

Another important factor in the economy of operations is in the drill bits. Nothing but good steel should be provided and the bits should be carefully and thoroughly made, and gauged so that there will be no difficulty about the several sizes following each other. In very long holes—over 7 feet—it is not bad practice to substitute chisel bits for the ordinary cross (+) bit generally used in machines. Where the ground is not too badly fissured they will be found an advantage in finishing a long hole. The temper of the drills is of equal importance, and this is a matter for the drill sharpener to decide. All rock does not work equally well with the same temper. A drill tempered bright straw color may be too hard for very hard rock, the edges of the bits, and sometimes good-sized pieces of steel chipping off, giving much trouble in proceeding with the hole. A slightly darker color may be found to work to better advantage, even if the drills are more quickly dulled. There will be less loss of steel and less loss of time. The tempering of machine drills is a matter which requires experience and good judgment. The drills should be made as hard as the material in which they are working will admit without chipping. If the steel in heating is burned, it is economy to cut off the burned end at once, as it will only give trouble in the mine. The drill bits should be so forged that immediately back of the cutting edge they have a slope backward toward the shank of the drill—this to avoid the drill sticking in the hole. There is a great difference in the rate of progress between drills that are properly forged and tempered and those that are not. Another thing, the drill sharpener should see to it that every drill that leaves his hands is perfectly straight (a condition in which they are not always returned from the mine). If a shank be slightly bent it causes the bit to rotate in a small circle, cutting a larger hole than necessary, and consequently making slower progress than it should, and, moreover, there is greater danger of getting the drill stuck in the hole when it is well advanced. Sometimes the bit is bent by the heavy blows of the chuck tender, when the same thing is likely to occur. If a hole that has been drilled over 4 feet gives much trouble, and a smaller chisel bit cannot advance it, it had better be discontinued and loaded with the remainder of the series, and if the drill cannot be withdrawn with a reasonable amount of pounding and other effort, the drill had better be left in the hole, to be recovered after the round is fired, for it is an easy matter to lose from thirty minutes to an hour in the endeavor to recover a tightly fitchered drill. This means the time of two men, usually, and costs more to bother with than the cutting of a new hole.

The machine drill sharpener is a new and very important factor in the use of the machine drill in mines and has done much toward cheapening the cost of work with machines. A large amount of work can be accomplished with them and there is more uniformity in the shape of bits, as well as in the gauges, so that there is no trouble in the bits following.

The Mint and the Miner.

As the information published in the issue of June 24th last under this caption resulted in some correspondence, and as there are those apparently who do not fully understand the rules of the mint at San Francisco concerning the purchase of bullion, the following from Superintendent Frank A. Leach of that mint in response to an inquiry will be of further interest in the matter:

TO THE EDITOR:—Your letter of the 3d inst. relative to the character of bullion subject to refusal for deposit in the United States Mint received. I think your correspondent is laboring under a misapprehension of facts. Possibly the paragraph quoted is susceptible to the inference made by him, and if so it is inconsistent with paragraph 2 of section 1, article 1 of the "General Instructions and Regulations of the United States Mints and Assay Offices," which says:

"If the bullion appears to be of less value than $100, or so base as to be unsuitable for the operations of the mint, it may be legally refused."

From which you will observe that the matter of rejecting bullion is discretionary. We do accept very low-grade bullion when all the base is copper, and we reject bullion of much higher fineness when the base is composed of antimony, zinc, bismuth, arsenic or iron. Then again we are more particular as to the amount of troublesome base in a large deposit than in a very small one. Then again we are not so particular in discriminating against base deposits if we only have a small amount of that character of bullion on hand, but if, on the other hand, there should be quite a large run of base bullion, we would be inclined to look after the character with more care. We endeavor to accept all offerings of bullion brought to the mint, so as to put the depositors to as little trouble as possible, but there are times when it is against the interest of the mint to accept further amounts of exceedingly base deposit. You can readily understand why this is so when we recall to you that in our parting work the process will tolerate a certain percentage of base. Now the greater amount of high-grade bullion we have to refine, the greater amount of base bullion we can receive to go along with the high grade.

However, the rejection I think your correspondent refers to was for a different reason. You are probably aware that we are not allowed to purchase silver bullion—only such silver as may be associated with the gold in gold bullion. Gold bullion is designated as such only when there is a greater amount of gold than silver, and silver bullion is designated as such when the silver predominates. Thus, a bar might be a little under 500 fine gold, and would still be classed as silver bullion if the remaining parts were all silver, though the gold values were many times more than the silver.

FRANK A. LEACH, Superintendent.

San Francisco, July 5.

Ore Deposits of the Cœur d'Alene, Idaho.

NUMBER II.

Written by F. L. RANSOME.

HISTORY OF MINING DEVELOPMENT.—The story of the opening of the Cœur d'Alene region to mining enterprise goes back to the year 1842, when a mission was established by the Jesuits in the beautiful valley of the St. Joseph river, a navigable stream which empties into the head of Cœur d'Alene lake about 5 miles south of the embouchure of the Cœur d'Alene river. In 1846, however, the mission was moved to its present site on the latter stream, about 25 miles from the lake, and for many years Father J. Joset and missionaries associated with him were the only white inhabitants in this whole region. The Cœur d'Alene Indians, about 300 in number, lived chiefly in the vicinity of the mission.

In 1854 Lieutenant John Mullan, acting under instructions from the War Department, began explorations for a wagon road over the Cœur d'Alene mountains to connect Fort Benton with Fort Walla Walla. These preparations aroused the hostility of the Indians, who, after defeating a small force of regular troops, were subjugated in 1858. In the following year work on the proposed road was begun under a congressional appropriation, and the task seems to have been finished in 1861. The new road crossed from the mouth of the St. Joseph river to the mission on the Cœur d'Alene river. Thence it followed the main stream and south fork to a point about 3 miles east of the present town of Mullan. Here it turned south, crossed the divide through the Sohon or St. Regis Pass, and continued down the St. Regis de Borgia river, following the route later taken by the railroad to Missoula.

Roughly constructed as it was, this road, now familiarly known as the "Old Mullan road," was for many years the only line of travel into the region to whose early development it substantially contributed. It traversed what afterwards proved to be the most productive part of the district, but the discovery of the lead-silver deposits was reserved for a later date.

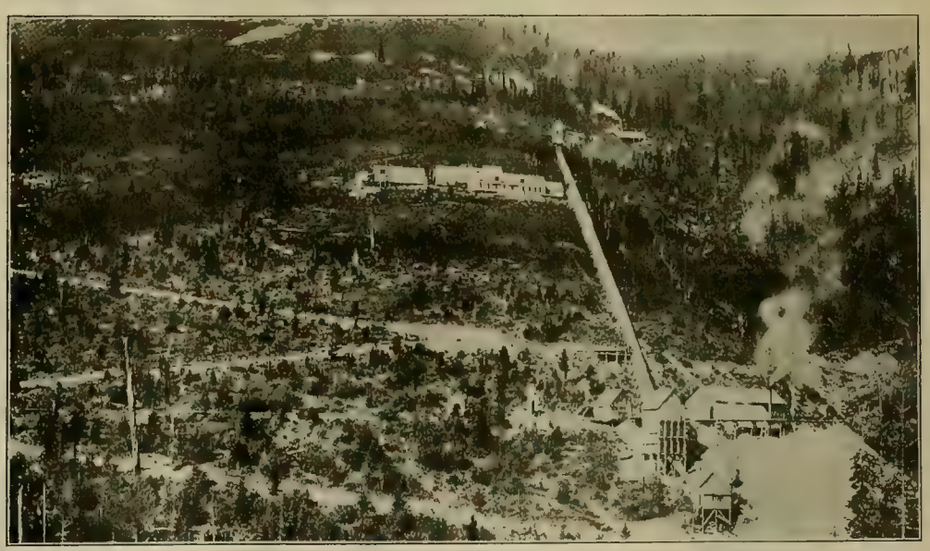
The first prospecting in the region appears to have been by Thomas Irwin, who in 1878 located a quartz claim near the Mullan road, apparently on Elk creek. In the summer of 1879 a party, including A. J. Prichard, moving northward from the Mullan road over the Evolution trail, discovered Prichard creek. In 1882 Gellett, another member of the party, found placer gold and located a claim on Prichard creek. The first quartz claim on Prichard creek was the Paymaster, near Littlefield, located by Patrick Flynn on September 21, 1883.

The discoveries of Prichard and Gillett were followed by a rush of prospectors to the North Fork early in 1884, and in May, Eagle City, at the junction of Eagle and Prichard creeks, had become a bustling town connected by trail and telegraph with Belknap, 32 miles away, on the Northern Pacific Railway. It was soon found, however, that the richest placers lay higher up Prichard creek, particularly in Dream, Buckskin and Alder gulches, and the center of population soon shifted to the new town of Murray.

Although the chief excitement at this time centered in the rich gold placers near Murray, the lead-silver veins of the South Fork were beginning to attract attention. In 1884 Col. N. R. Wallace had a cabin and store in the dense grove of cedars that covered the future site of the town now bearing his name. His settlement was then known as Placer Center. At the same time W. B. Heyburn began work on the Polaris mine, in Polaris gulch. The Tiger claim, on Canyon creek, was also located in 1884 by John Carton and Almeda Seymour, who bonded it to John M. Burke. In 1885 the Tiger mine, in spite of its comparatively inaccessible position, had been opened by three tunnels and had about 3000 tons of lead-silver ore on the dump. Other mines located in 1884 were the Gold Hunter, Morning and You Like, near Mullan, and the Black Bear, San Francisco and Gem of the Mountains (now comprised in the Helena-Frisco mine), near Gem.

The discovery of the Bunker Hill mine by Philip O'Rourke and N. S. Kellogg in 1885, and of the Sullivan mine by C. Sullivan and J. Goetz, and the evident existence of large bodies of rich ore in the Tiger, Poorman, Granite, San Francisco, Morning and other mines, removed all doubts of the future importance of the South Fork mines. The opening of the year 1886 was marked by a decided rush from the outside and from the waning placers of Murray into this new field, particularly to the settlements of Milo and Kentucky, now parts of Wardner and Kellogg. Tri-weekly stages ran from Mission to Wardner.

In 1886 ore from the Bunker Hill and Sullivan mines was hauled by wagons to Mission, carried by boat to the outlet of the lake and thence shipped to Helena, Mont. The ore from Last Chance, Tyler and Sierra Nevada mines was treated in a new smelter at Milo. This early attempt at local smelting was soon abandoned.



The Hercules Mine, Near Burke, Idaho.

In the following year a narrow gauge railroad was completed by the Cœur d'Alene Railway & Navigation Co. from Mission to Wardner Junction, at the mouth of Milo creek. Wardner had now become a town of 1500 people, while the population of Murray had fallen to about 1000. There were about 500 inhabitants at Wallace, and Burke and Mullan were growing settlements. Probably 100,000 tons of ore were piled on the dumps of the Canyon creek mines awaiting means of transportation. The Oregon Railway & Navigation Co. and the Northern Pacific Railway were both striving at this time to secure entrance to the district.

In April, 1887, the Bunker Hill and Sullivan mines were sold to S. G. Reed, and in August the Bunker Hill & Sullivan Mining & Concentrating Co. was organized. The Poorman, Granite and Morning mines were also sold at about this time. The completion of the narrow gauge railroad to Burke in this year enabled the Canyon creek mines to ship their ore. Probably over 50,000 tons of lead-silver ore was mined in 1887, the principal producers being the Tiger, Bunker Hill & Sullivan, Tyler and Stemwinder, Last Chance, Sierra Nevada, Poorman and Granite. The Mammoth and Standard veins were as yet merely good prospects.

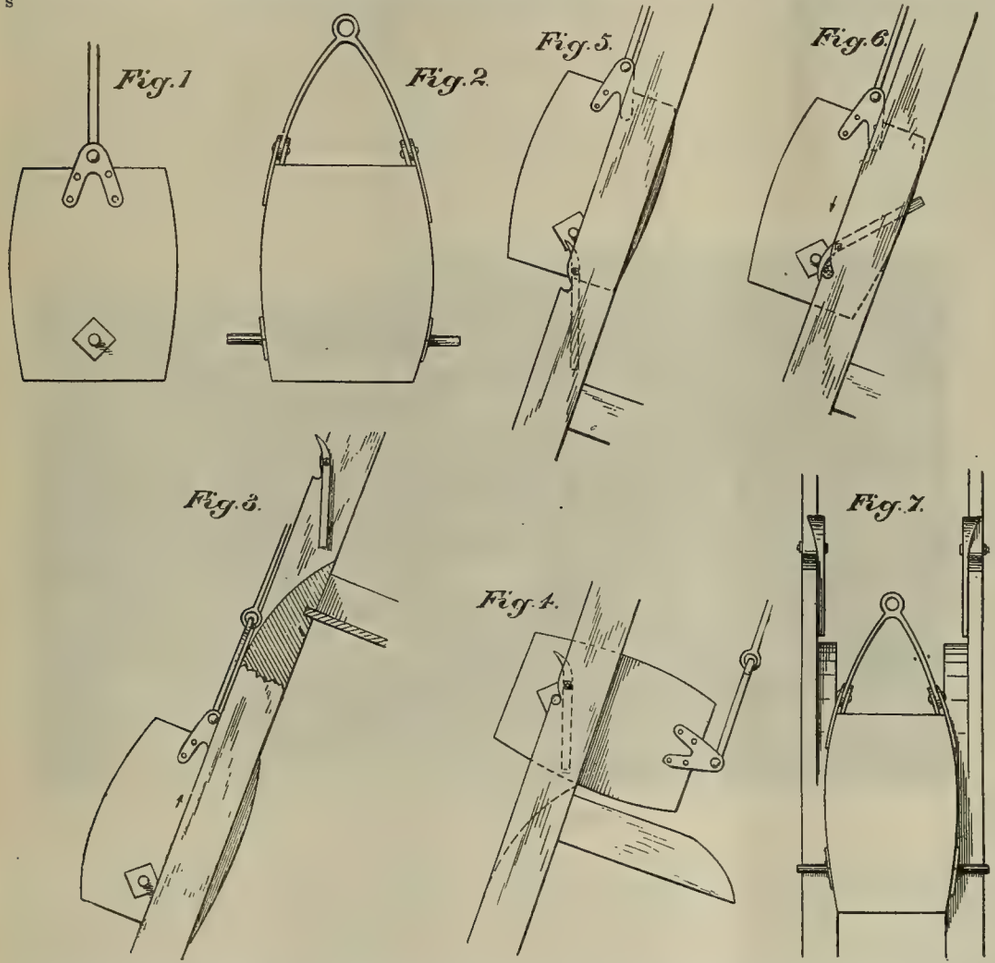
The principal events in 1890 were the completion into the district of the tracks of the Northern Pacific Railway and Oregon Railway & Navigation Co., the partial destruction by fire of Wallace and Wardner, and the first shipment of rich ore from the Mammoth mine. The old narrow gauge line was absorbed by the Oregon Railway & Navigation Co. and its tracks were replaced by those of standard gauge. Most of the larger mines were by this time equipped with concentrating mills.

(TO BE CONTINUED.)

Automatic Bucket Dumping Devices.

The employment of automatic dumping skips has led to various more or less successful attempts to introduce automatic water and ore-dumping devices where buckets are used. These devices are used in both vertical and inclined shafts, and are various in form, some being simple in construction and operation and others more or less complicated. In a contrivance of this character simplicity of construction and ease in operation should not be sacrificed to elaborate design. Two of the automatic devices are here shown in a series of sketches. One is for application in inclined shafts, the other is for use at a vertical shaft.

Of the first a description is scarcely necessary, the several figures showing the method of operating. Figs. 1 and 2 show the form of bucket or kibble used in this instance, though a straight bucket would probably work as well. Buckets which are smaller top and bottom than at the middle, like the Cornish kibble here illustrated, or those which are crimped to maller diameter at the top, in place of a band riveted s



on to give strength to the bucket, frequently give trouble in dumping by the rock jamming in the mouth of the bucket. It will be noticed that heavy lugs are provided on this bucket and placed near the bottom. This lug does not touch the skids during the passage up the shaft.

Fig. 3 shows in the shaded portion where the inner side of the skids are cut away to allow the bucket to settle lower on the track. When being hoisted higher the lug drops into the notch provided for it, which should be of iron, and then, upon the rope being slacked, the bucket dumps automatically by gravity. The engineer hoists, the lug rises out of the notch, pushes the latch aside, and when the rope is slacked the bucket descends, the lug being carried over the notch by the latch, as shown in the sketch Fig. 6.

In Fig. 7 is seen the arrangement of inside skids, the latches and lugs. This device is simple of construction and if properly made operates as satisfactorily as any device used for this purpose in inclined shafts. This arrangement would not be satisfactory at a vertical shaft.

Fig. 8 shows an automatic dumping device at a vertical shaft. In this instance a bucket having straight sides with heavy chimes top and bottom is used. The lower chime extends 1 inch below the bottom of the bucket, which is concaved somewhat upward to give it additional strength. The bucket has no lugs and requires none. A door is constructed, hinged at one side of the shaft, which when closed will drop across the shaft at an angle of about 45°. This door is controlled by a rope which passes over a wheel to the engine house, where it is within easy reach of the engineer. A counterweight is attached to the rope, so that it may be readily handled. A vigorous pull on the rope causes the door to assume an upright position, when the bucket may be lowered into the shaft. When the bucket is hoisted above the top of the door, a jerk on the rope will cause the door to spring outward over the shaft and to drop upon the support on the opposite side. The bucket is then lowered. When sliding downward, the chime at the bottom catches upon an iron projection placed on the door and the bucket is overturned into a chute or bin.

Another arrangement, quite as good as this, if not better, is in a door which operates in the same manner as that described, but in which the door is provided with a slot about 3 inches wide. Beneath the bucket is a short rope or chain attached to the ring and having a block of wood, about 6x4x8 inches, secured to the end of the rope or chain. When the bucket has been raised above the door, a jerk on the rope in the engine house causes the door to drop across the shaft, the slot in the door straddling the short rope. When the cable is slacked the bucket slides down the door until the block is caught by the door, being unable to come through the slot. The bucket overturns and dumps its contents into the bin or chute. This latter has the advantage of dumping any shape of bucket and the additional advantage of permitting the door to be dropped across the shaft, if desired, when the bucket is below, the rope passing through the slot in the door.

THE PROSPECTOR.

The "gem" from Baker City, Or., is opal. It is very ordinary and without value. Opal to command a good price must be full of fire, of the green, blue, orange and red tints.

The black specimen from Baker City, Or., is clay containing a large amount of carbon which burns out on the application of high heat, leaving a whitish gray earthy mass which fuses slightly on the edges.

The rocks from Lamar, Colo., are: No. 1 (white with black spots), a friable sandstone in which the grains are all of quartz, some of which are angular with crystal faces, others rounded and water worn, and still others are sub-angular. The rock presents the appearance of having been originally cemented by some easily soluble material, probably calcium carbonate, but which has since been leached out. The black spots are apparently manganese and iron oxide. No. 2 is a fossiliferous limestone. The fossils are indistinct and can not be determined.

The Ore Deposits of Mount Lyell.*

Written by J. W. GREGORY.

THE FAHLBANDS.—The ore deposits of Mount Lyell consist of two types—(1) mineralized bands of schist, and (2) great lens-shaped masses of very pure sulphide ores. Bands of pyritiferous quartzite also occur in the conglomerate series, and may be regarded as of similar origin to the bands of mineralized schist; but only the latter contain sufficient ore to be of any economic importance.

The minerals which occur in the bands of mineralized schist are chiefly iron pyrites and fahlore, associated with copper pyrites and bornite. These minerals are in places loosely disseminated through the ordinary schist; elsewhere they occur in the siliceous schists, forming acid copper ores, and some bands of low-grade material that has hitherto only proved of value as a flux in smelting the pure pyritic ores of the great ore bodies.

The mineralized bands are widely spread through the schists of the Mount Lyell field. Their interest was recognized by Haber, who identified them as fahlbands, the most appropriate name for them. That the term is well applied to them may be seen by reference to any recent definition. Thus J. F. Kemp of Columbia University defines fahlbands as "belts of schists which are impregnated with sulphides, but not in sufficient amount in the locality where the name was first applied (Kongsberg, Norway) to be available for ores." The fahlbands of Mount Lyell are widely distributed through the schists, but occur especially along the course of the chief transverse

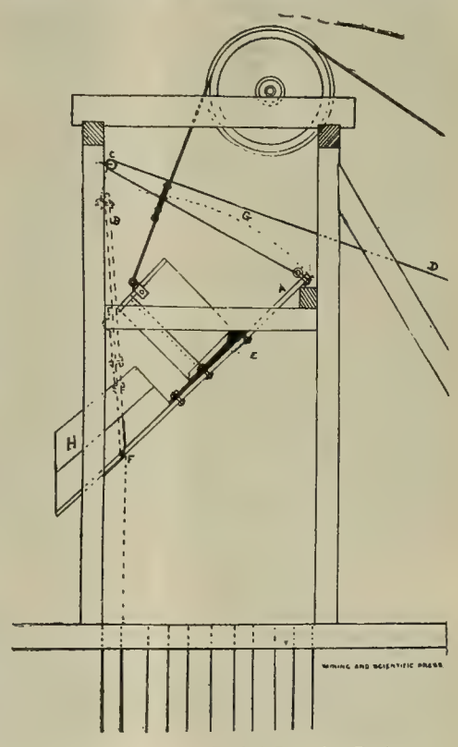


Fig. 8. Automatic Bucket Dumping Device.

faults. As examples may be quoted some bands of mineralized schist along the North Lyell road to the west of the North Lyell gap; there is a good representative in the ground held by the copper mines of Mount Lyell West, and near by, on the boundary between the lease of the same company and the West Lyell Extended, the strike of the rocks is extremely confused, probably owing to movements along the continuation of the fault, which runs along the southern scarp of the North Lyell spur. Another illustration of the fahlbands occurs south of the haulage, on the ridge overhanging the Gormanston road, where some works have been opened in mineralized schists, in the western end of the lease. The strike of the rocks immediately to the north of this band is extremely confused, probably owing to the westward continuation of the fault, which runs along the northern face of Mount Owen and on the southern bank of the Linda valley.

The foliation of the schists strikes N. 40° W. The ore is in bunches, which vary in thickness from 4 feet down to 1 foot. The bunches are about 6 feet in length, and they are separated from one another by several feet of barren country, composed of crushed and brecciated schist. The ore bunches were traced, during some prospecting work, 80 feet downward and 30 feet upward; they appear to have been a series of chimney-like shoots along a fault plane running parallel to the country rock. At the upper tunnel the rocks are the ordinary Lyell schist, separated by

*Abstract Trans. Aus. Ins. Min. Engrs.

bands of quartzitic schist, with a strike of N. 35° W. At the mouth of the tunnel is a mass of iron pyrites, separated from the schist by a fault which dips to the west.

The ore from these workings consists mainly of pyrites and fahlore; and the average of all the daily assays taken in the rise along the ore shoot was :

Copper, per cent	6 96
Silver, ounce per ton	0 36
Gold, ounce per ton	0 008

In the ore of further workings the copper averaged 6.02% and 7.34%. The ore is, therefore, for this district, high grade, but its small amount and erratic distribution deprive it of any economic value.

In the next lease to the south, on the hill slope above the Gormanston road, is a seam of barite in quartzose schist, the foliation of which trends N. 40° E. and dips to the northwest. The schists are traversed by thin lines of pyrites, resembling the pyritic "indicators" of Ballarat. In the same lease there is a large deposit of mineralized schist well exposed in a tunnel, going at 55° into the hill at right angles to the foliation of the schist. The schists here are very siliceous and contain abundant seams of quartz and lines of pyrites. At this point there were no bunches of ore or shoots as at the Reserve tunnel; but the schists are traversed by many seams and bands of pyrites. The tunnel was driven 100 feet in length, and according to Mr. Aaron White, the foreman in charge of the work, it did not pass half way through the pyritized rock, which can be traced on the surface for a greater thickness.

The tunnel of the Mount Lyell Reserve Co. on the left bank of Conglomerate creek, close to the stream, was begun at the outcrop of another fahlband. The tunnel was driven for more than 60 feet, through dark-green schists with a strike of N. 30° W. A thin band of ore was passed through at the mouth of the tunnel; but no more ore was found within it; and no effort was made to follow the deposit along the strike, probably from absence of any sign of its extension in that direction. The ore is said to have yielded 4% of copper.

The fahlbands, which are mere pyritized bands of schist, have so far proved of more scientific and historic interest than of economic importance. Their discovery in so many localities encouraged the hope that many great pyrites bodies existed in the district. They thus led to the belief that copper ores are deposited in a series of lodes running continuously north and south across the field. Hitherto the attempts to work these pyritized seams have been unprofitable; but there is a more important series of fahlbands, which have been successfully worked by the Mount Lyell Mining & Railway Co. as metal-bearing fluxes. The basic pyritic ores of the Mount Lyell mine require a siliceous flux, and the acid ores of the larger fahlbands serve this purpose and contribute their own copper contents at the same time.

THE SOUTH THARSIS MINE.—The South Tharsis mine is situated three-quarters of a mile to the north of the Mount Lyell mine, and one-quarter of a mile to the southwest of the North Lyell. It contains a band of pyritized schist, which was worked by an open cut, developed on three benches; and its subterranean extension has been explored by a diamond drill bore put down to the west of the outcrop. The mine was worked by a company in 1899, which began the open cut and erected concentrating works on the slope below the mine, on one of the tributaries of Glover creek. The process, however, was not a success, for the brittle copper pyrites was crushed to a slime and much of it was lost, while too much of the iron pyrites remained in the concentrates. The property of the company was acquired in 1900 by the Mount Lyell Mining & Railway Co., which could profitably smelt the material as a siliceous flux in conjunction with its own basic ores.

The metalliferous material is developed as a fahlband, and is well shown in the open cut. Its well-defined western wall trends north 25° west, and is parallel to the strike of the adjacent schists. The fahlband is continued below by a band which dips to the west at an angle of 1 in 2, and was pierced by a bore put down from a point in the hill slope at the level of 1482 feet above the sea. The geological relations of this body have been proved by a tunnel below the open cut, which has been driven eastward till it ended against the vertical fault face of the conglomerate, which is almost vertical, but has a slight dip to the west.

An underground extension of the Royal Tharsis ore body in the lease of the South Tharsis mine has been proved by a series of drives. The southeastern "hanging wall drive" followed the hanging wall of the fahlband for 146 feet, and proved the occurrence of the metal-bearing flux all along it; and the No. 4 crosscut from this drive passed through 65 feet of the metal-bearing schist, which is of a satisfactory grade for that thickness.

The southeastern hanging wall drive, No. 2, from the Royal Tharsis mine, explored a separate belt of mineralized schist, which is to the east of the main belt. This drive crosses the northern boundary of the South Tharsis lease, and crosses the strike of the metal-bearing schist obliquely for 197 feet.

The South Tharsis, to the end of September, 1902, yielded 49,287 tons, with an average assay value of copper, 1.64%; silver, 0.22 ounce, and gold, 0.022 ounce. The variations in the yield may be illustrated by the figures for the material worked for the half-years ending March 31, 1901, March 31, 1902, and Sept. 30,, 1902, in which the amounts yielded were, respectively, 8353 tons, 12,779 tons and 17,666 tons, giving an assay value of :

Copper, per cent	1.54	1.67	1.68
Silver, ounce	0.19	0.24	0.24
Gold, ounce	0.019	0.019	0.026

The average composition of the South Tharsis flux includes :

	Per Cent.
Silica	62 67
Iron	8 05
Alumina	12.17

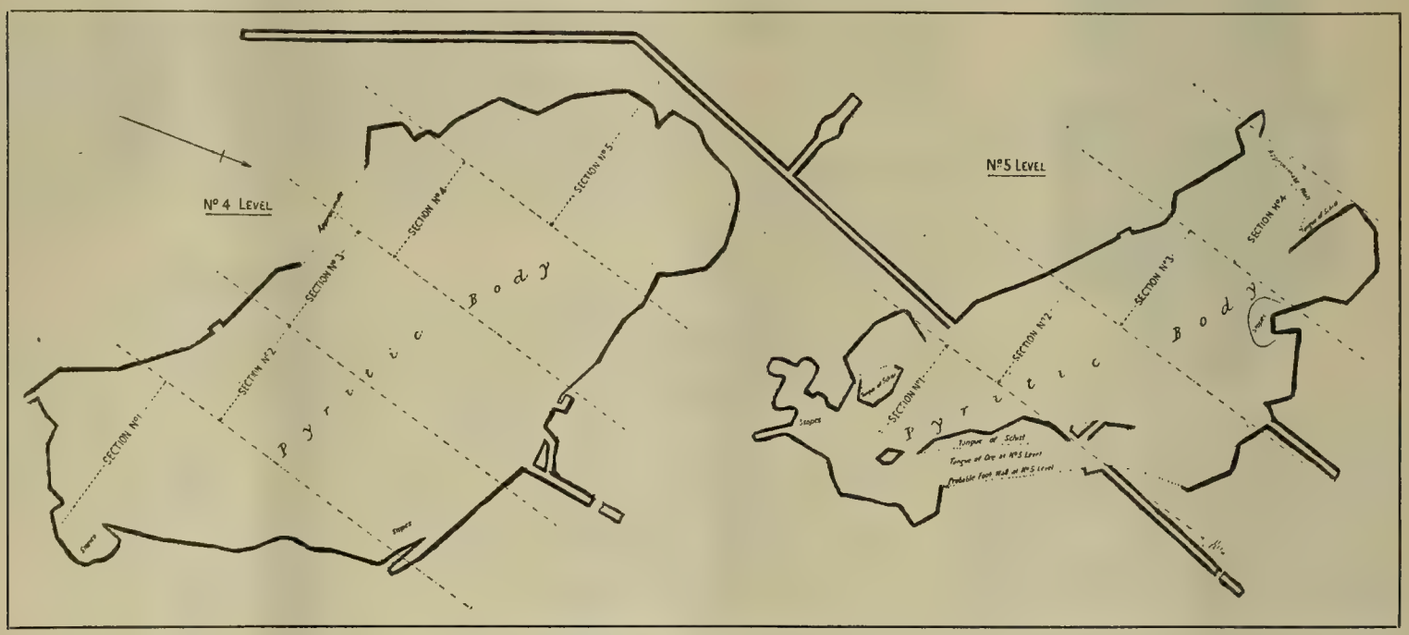
THE ROYAL THARSIS MINE.—The lease of the Royal Tharsis mine is immediately to the north of that of the South Tharsis, and contains an extension of the same belt of mineralized schist. As, however, the material has to be obtained by underground workings, it is more expensive to work than that of the South Tharsis mine. Therefore, though its grade is somewhat higher, it has been less worked. The property was acquired by the Mount Lyell Mining & Railway Co. early in 1901, and is developed by three underground levels.

The Royal Tharsis mine yields a siliceous flux of schist containing pyrites and chalcopyrite. The mine yielded up to September, 1902, a total of 2274 tons of ore, of an assay value of copper, 2 11%; silver, .24 ounce, and gold, 0.23 ounce. For the following half year before March 31, 1902, it yielded 1403 tons, with an assay value of copper, 2.04%; silver, .22 ounce, and gold, .021 ounce. For the following half year it yielded 871 tons, with an assay value of copper, 2.21%; silver, .27 ounce, and gold, .027 ounce. The average composition of the metal-bearing flux of the Royal Tharsis includes :

	Per Cent.
Silica	61 17
Iron	9.94
Alumina	10.44

THE LYELL THARSIS MINE.—The Lyell Tharsis mine lies in the lease adjacent to the North Lyell mine. The ore body extends into the North Lyell area, and is now being worked by the amalgamated company. The mine contains a body of siliceous ore, which is lenticular in shape, and was about 20 feet wide in the best part.

THE ORE MASSES IN THE MOUNT LYELL MINE.—The great masses of sulphide ores are the source of the wealth of the Mount Lyell field. There are two main ore bodies. The largest is that of the Mount Lyell Mining & Railway Co., known as the Big mine and as the Iron Blow. The mine is situated at the height of 1415 feet above sea level, on the eastern flank of the ridge of schists which connects the western end of Mount Lyell to Mount Owen, across the head of the Linda valley. It is situated to the south of the eastern end of the haulage, and to the north of the town of Gormanston. When first discovered most of the surface of the ore body was covered by a deposit of gravel and soil from 12 to 20 feet thick, and supporting a growth of button grass. In places, especially toward the northern end, the soil was very shallow and the water courses had cut down to the ore body, exposing the fresh, unoxidized pyrites. At the southern end of the ore body, between it and the country rocks, was a thick ironstone gossan and the hematite



Plan of Mount Lyell Mine, N. S. W., Showing Shape of Pyritic Ore Bodies.

of the iron blow. The gossan was composed mainly of silica, barite and iron oxide, which contained also 15 ounces of silver and 15 dwts. of gold. The pyrites had been decomposed, and all the copper and most of the iron removed by leaching. This deposit was long since removed, and all sign of the surface outcrop is now destoyed. The ore body trends northwest by west, and its length on the surface was 800 feet and its width 200 feet. It is worked by an open cut, by a series of nine terraces or benches. The present floor of the excavation, No. 4 bench, is 272 feet below the original top of the deposit. The ore has now all been removed above the four uppermost benches. The excavation at the end of 1901 was oval shaped, 800 feet long, 630 feet wide and 272 feet deep. Beneath the open cut is a series of underground works, including levels Nos. 5–8, by which some masses of rich ore have been mined, and the size of the ore mass determined at the successive levels; the further extension has been tested by diamond drill boring.

The chief facts as to the size and shape of the Mount Lyell ore mass have been definitely determined. It is irregularly boat shaped in form, consisting of an elliptical mass, which tapers gradually downward, and is then cut off below with a rounded base. Horizontal sections across the ore mass (see accompanying sketch) are irregularly elliptical, and the major axis of this ellipse at the various levels is not always in the same direction. The ore body, in fact, has undergone an apparent torsion, which is shown by the table showing the trend of the major axis at the successive levels :

No.	Length, Feet.	Width, Feet.	Trend of Major Axis.
3	..	...	N. 50 W.
4	660	270	N. 43 W.
5	510	210	N. 45 W.
6	510	270	N. 64 W.
8	280	...	N. 88 W.

(TO BE CONTINUED.)

Mining and Metallurgical Patents.

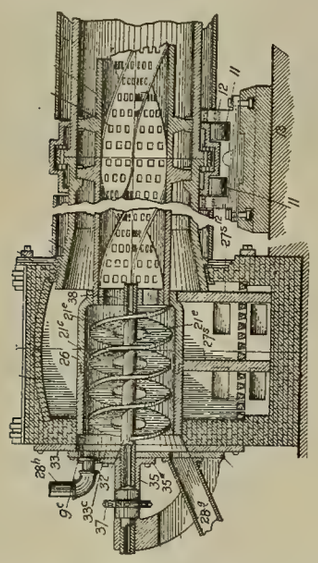
PATENTS ISSUED JULY 4, 1905.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PROCESS OF EXTRACTING COPPER FROM ITS ORES.—No. 793,186; G. Gin, Paris, France.

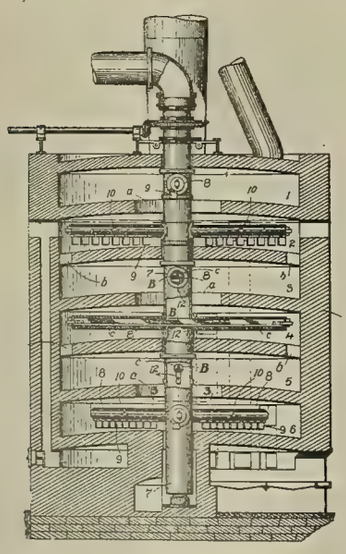
Herein described process of treating copper ore containing iron, consisting in roasting ore, lixiviating roasted ore with solution of sulphurous acid, heating resulting solution to temperature sufficiently high to precipitate iron sulphite and sulphate and decompose cuprosocupric sulphite contained in solution, then filtering solution, washing precipitate with water, permitting oxidation of residual sulphate to form sulphate of iron, and rewashing residue to remove such iron sulphate.

ORE TREATING FURNACE.—No. 793,816; A. M. Beam, Denver, Colo.



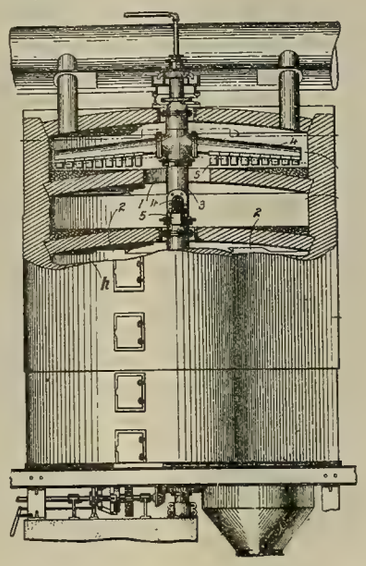
In ore treating furnace rotary flue cylinder, connected with stack at one end, other extremity extending into combustion chamber, circular, stationary conduit, extending through combustion chamber in concentric relation to flue cylinder, one end of conduit extending into discharge opening in side of combustion chamber, suitable means for supporting conduit, ore cylinder, concentrically located inside and attached to flue cylinder and projecting into stationary conduit, means for conveying ore through ore cylinder and into conduit, second flue cylinder concentrically located inside and attached to ore cylinder and extending through conduit, its ends projecting into second combustion chamber and into smoke chamber, and series of helicoidally arranged wings secured to portion of central cylinder extending through conduit.

ROASTING FURNACE.—No. 794,118; C. H. Repath, Anaconda, Mont.



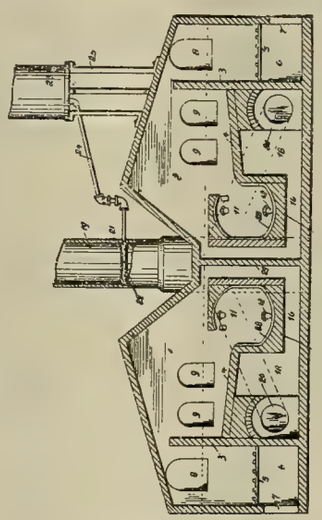
In furnace having one or more hearths, central hollow shaft passing through hearths, structural members radiating from and passing through walls of shaft into several hearths, and hollow rabble arms passed over structural members and supported thereby.

ROASTING FURNACE.—No. 793,939; F. Klepetko, New York, N. Y.



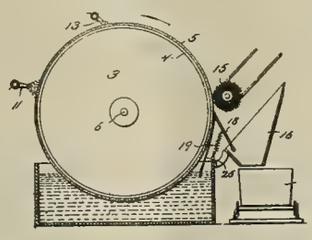
Rabble arm adapted to rotate about fixed axis, having series of rakes whose depth increases as they approach axis.

FURNACE.—No. 793,938; J. Kirby, Pittsburg, Pa.



Furnace comprising firebox, ore smelting hearth located adjacent to firebox, collecting basin constructed below hearth and having top, means for removing products from basin, means for conveying waste products of combustion from furnace over top down rear end and under bottom of basin and in direct contact with top, rear wall and bottom of basin.

APPARATUS FOR SEPARATING SLIMES, ETC., FROM METAL-BEARING SOLUTIONS. — No. 793,720; E. L. Godbe, Salt Lake City, Utah.

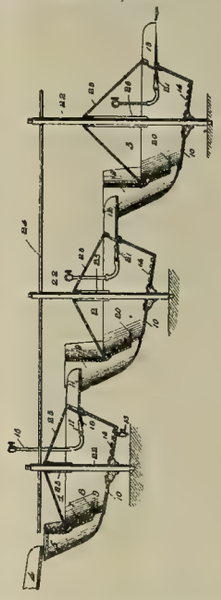


Apparatus of class described comprising tank, revoluble drum working therein, filtering medium fixed to periphery of drum, suction mechanism coacting with interior of drum, scraping device coacting with its exterior, and apron depending from scraper adjacent to face of filtering medium and entering tank to maintain vacuum within drum.

UTILIZATION OF FLUE DUST. — No. 794,153; C. S. Price, Westmont, Pa.

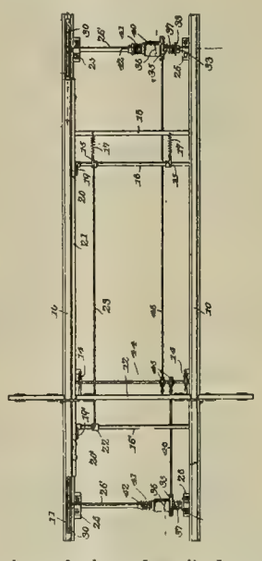
Process of utilizing finely divided ore or flue dust which consists in mixing approximately four parts of same with one part of clay, sufficient water to make stiff mass, forming same into plastic and coherent masses or plastic lumps, and charging lumps into blast furnace.

GOLD SEPARATOR AND CONCENTRATOR.—No. 793,945; R. T. Marshall, Merion Station, Pa.



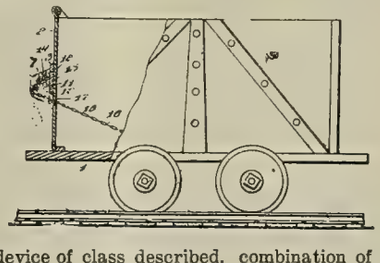
Machine of class described comprising plurality of pans, each of which is provided with inclined bottom, with semicircular hopper discharging onto bottom, and with spout projecting into hopper of next adjacent pan, lip projecting inward from hopper, and spout, and amalgam plates carried by hopper lip and first pan of series.

MINE DOOR OPERATING DEVICE —No. 793,813; S. T. Bailey, Mount Hope, W. Va.

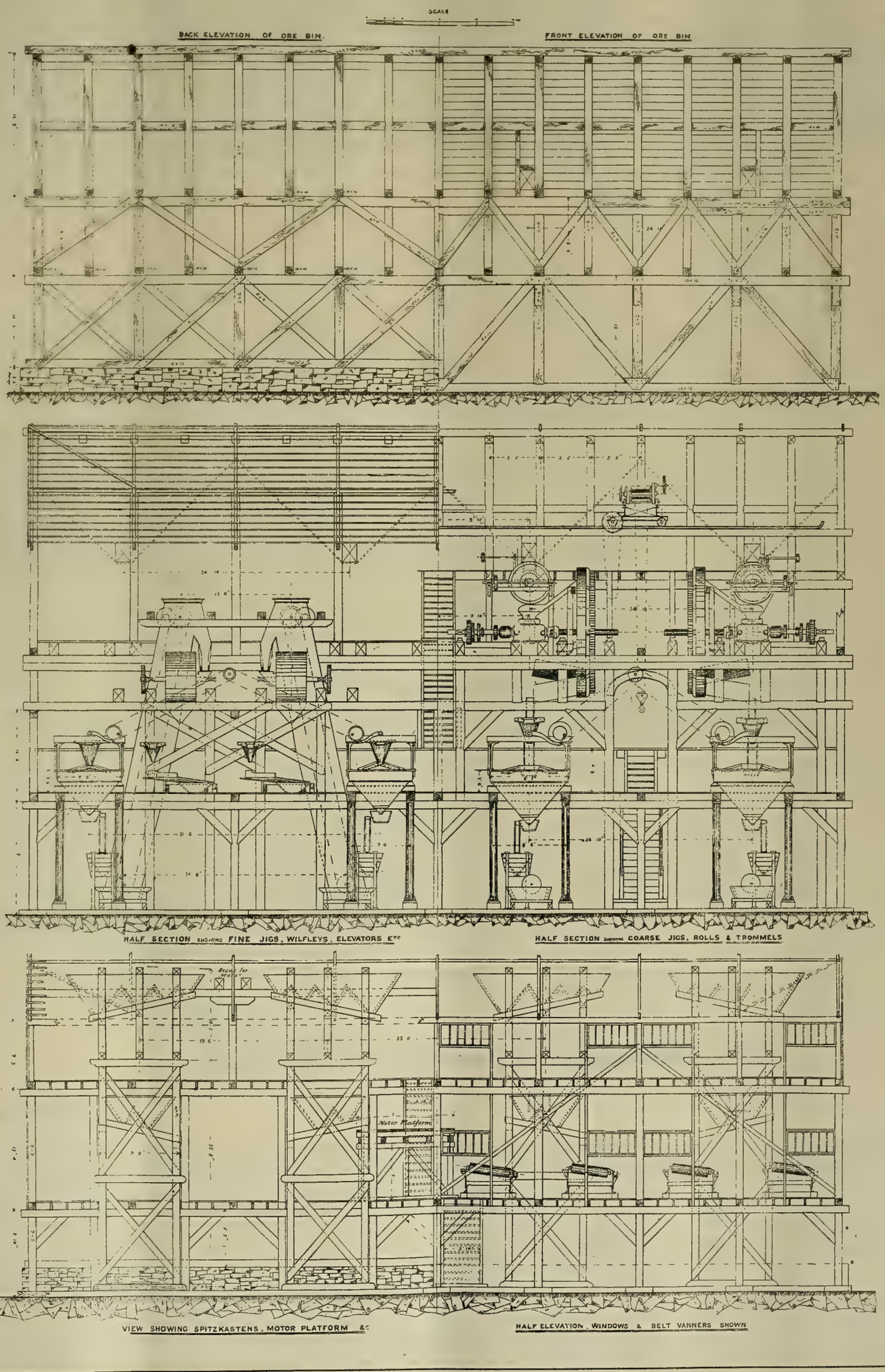


Mechanism of class described, combination with door, of train-operated members arranged on opposite sides of door, means for transmitting movement from both members to door, and means for holding door in open position and rendering both transmitting means inoperative after door opening movement of either member until entire car or train has passed beyond operating means.

CAR DOOR LOCK.—No. 793,663; C. O. Johnson, Lanse, Pa.



In device of class described, combination of movable car body, door therefor, lock means for door comprising catch pivoted thereto, extension projected from catch, pivoted hook engaging extension, tail extending from hook, pivoted gravity bar provided with loop receiving tail aforesaid, weight at one end of bar, and connection secured at one end to car body and passed through door and connected with catch.


SCALE
BACK ELEVATION OF ORE BIN.
FRONT ELEVATION OF ORE BIN
HALF SECTION SHOWING FINE JIGS, WILFLEYS, ELEVATORS Etc
HALF SECTION SHOWING COARSE JIGS, ROLLS & TROMMELS
Motor Platform
VIEW SHOWING SPITZKASTENS, MOTOR PLATFORM &c
HALF ELEVATION, WINDOWS & BELT VANNERS SHOWN

Front Elevation of Concentrating Mill. (See Next Page.)

Concentration of Silver-Lead Ores.*

Written by V. F. S. Low.

The following paper is intended to apply to the concentration of the silver-lead ores at Broken Hill, New South Wales, generally, but more particularly to the process as applied to the ores in the Block 10 mine.

It is the writer's object to give a few figures which he found difficult to obtain when first engaging in practical work. At that time no text-books were at hand from which it was possible to get sufficient details for practical working purposes.

It is first supposed that the mine has been thoroughly explored and has been found to contain a lode sufficient in size and quality to warrant the erection of a concentrating plant. The points then to determine are:

1. The quantity and cost of water available for steam making and ore dressing purposes.
2. The most convenient site for the mill.

The capacity of the mill, supposing that the necessary capital is available, will be governed mainly by—

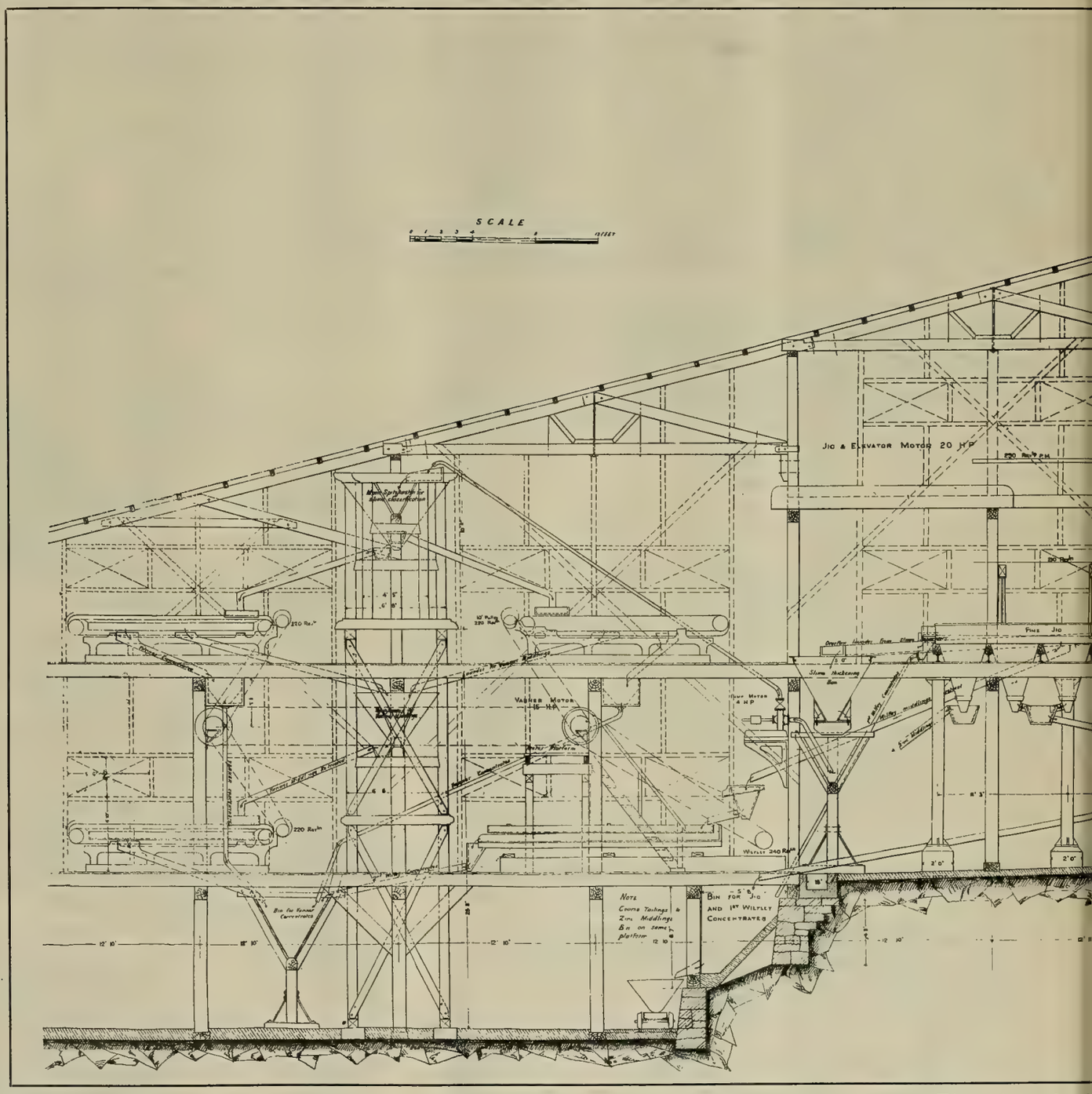
(a) The amount of water obtainable at a reasonable cost.
(b) The size of the ore body.
(c) The rate at which the ore may be mined.

In the generality of cases the water pumped from the underground workings may be used for ore dressing purposes, but it may be necessary to augment the quantity from other sources. Generally speaking, the daily consumption of water for steam and ore dressing purposes may be taken at 100 to 120 gallons per ton ore treated. Much of the water is used over again several times, but there is considerable loss owing to the amount of water that goes away in the tailings, slimes, concentrates, etc.

Having satisfactorily arranged the magnitude of operations to be carried on, the next move is to select the millsite. The first point to be borne in mind is that the mill must not be situated on top of the lode, or in such a position that it will be affected by the extraction of the ore from below. This is a point of vital interest, as more than one case may now be instanced on the Broken Hill field where the placing of plant on the surface above or near the lode has led to most disastrous consequences. Even though there should be a site on the outcrop ideal in all other respects, it should be rejected solely on account of its insecurity.

Having fully determined that the mill must be situated away from the lode and be out of all danger of depressions of the surface; surface cracks, or creeps, the most suitable hill should be selected. In some cases this may be situated some distance from the hauling shaft, but it is not advisable to go to a very great distance. A hill is chosen for the location of the contemplated mill in order that there shall be no further lifting of material after the crude ore has once been placed in the mill bins. If a good site be obtainable, matters can be so arranged that the work of transporting all material from one stage in the dressing to the next, until it finally leaves the mill in the form of concentrates, slimes, or tailings, can be done by gravitation. The only materials then to be elevated are the re-treatment returns. The return water, of course, must be pumped up again.

Having chosen the millsite, it will next be necessary to determine the position of the storage bins for crude ore. On the Broken Hill field the crude ore is generally broken underground to such a size—about 10x8 inches—as can be fed into a No. 5 Gates breaker. The breaker is sometimes placed at or near the brace, and here the first reduction takes place, but the breakers are often contained in the mill building itself. Where the mill is situated at any distance from the shaft, the first reduction should take place at the brace, and care should be taken to have matters so arranged that the breaker is placed below the first storage bin instead of above it, as is occasionally the case.


SCALE
Jig & Elevator Motor 20 H.P.
Varner Motor 15 H.P.
Note
Coarse Tailings & Zinc Middlings Bin on same platform
Bin for Jig and 1st Wilfley Concentrates

Side Elevation of 36

By tipping directly from the landing brace into the first bin, the Gates breaker is to a great extent independent of any temporary stoppages in the hauling arrangements, and the hauling need not necessarily stop on account of any slight derangement of the Gates breaker. At the foot of these bins, which should hold at least eight hours' ore supply, there should be at least one spare breaker beyond actual requirements, for, if the mill is to be run continuously day and night, repairs must be made from time to time to the reducing machinery during working hours. By having one spare breaker this could be done without hindrance to the mill supplies.

After the ore has been reduced, by passing through the Gates breakers, to a size sufficiently small to go to the rolls, it should pass into small bins of a few tons capacity from which to be taken and placed in the mill storage bins at the top of the mill building. The mill bins should be capable of storing sixteen hours of ore supplies at the least.

*Abstract Trans. Aus. Inst. Min. Engrs.

Many different classes of rotary breakers are now in the market, some of which are of good and others of inferior design. It is unnecessary to go into any details of these machines, as full information can be obtained from trade catalogues. The main features to be observed when ordering a breaker are:

(1.) That the bearings are well protected from dust.

(2.) That where hard material, such as rhodonite, has to be crushed, it is best to use a solid brass eccentric. The eccentric usually supplied is made of steel or cast iron with babbitted wearing faces and is unsuitable for crushing the hardest materials.

With regard to the crushing of ore, the mill engineer should lay down for himself the following rule: "Never feed into a crushing machine material which is already small enough to pass through it without further reduction." If this matter is not attended to extra work is given to the rolls and crushers, thereby causing unnecessary wear, tear, delays and excessive sliming. In order to separate the coarse from the fines, the ore is first of all tipped over a "grizzly" or grid of inclined steel bars placed over the first bin. The ore delivered from the brace having been tipped on to the grizzly, the material already fine enough to go to the rolls passes between the bars, and the large material passes to the bins in readiness for the breakers. The fine material which has passed through the grizzly goes either into a separate bin ready for removal to the mill, or else runs into the same bin as the crushed product issuing from the breakers.

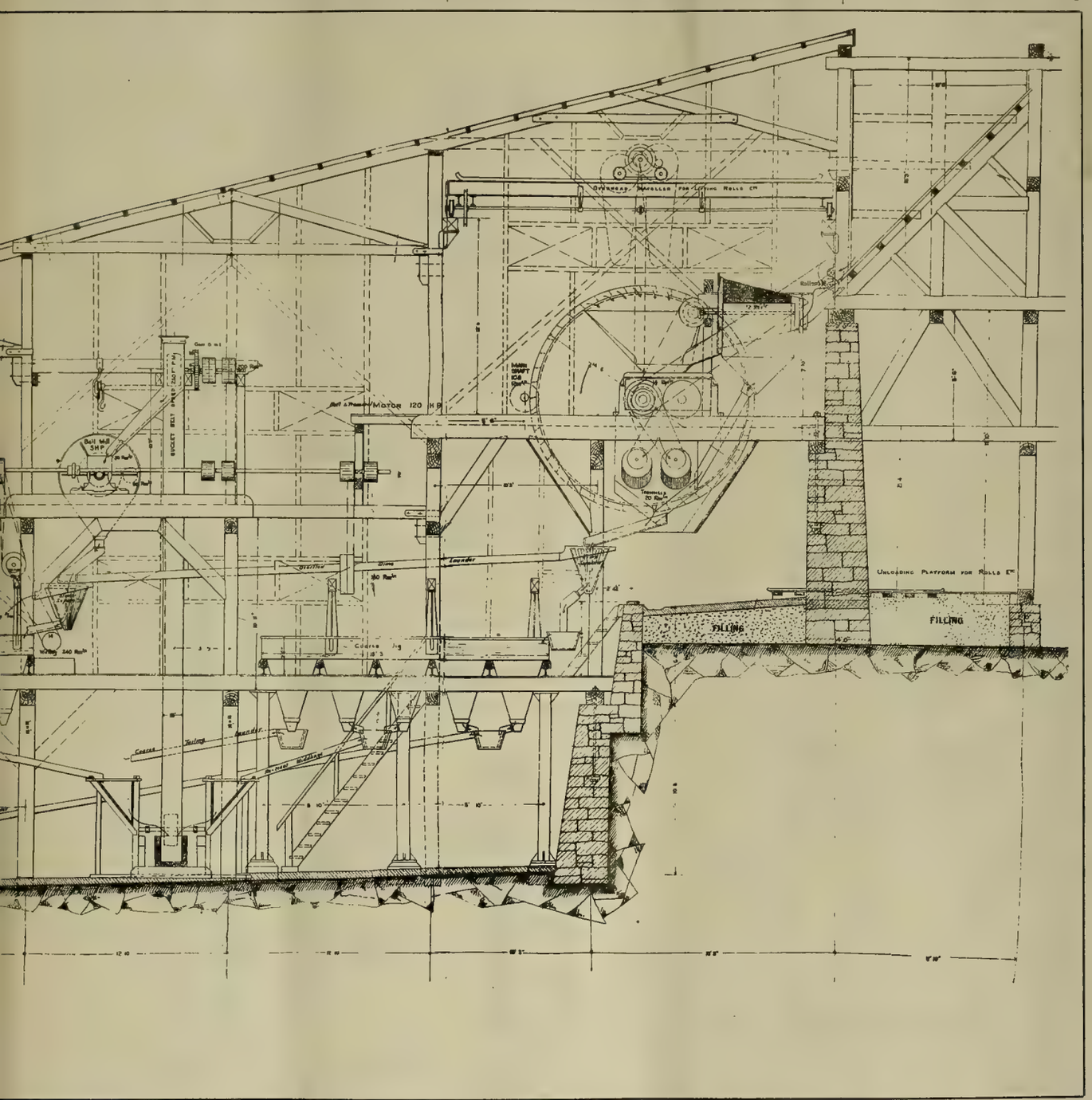
The ore, having been placed in the mill bins, is now ready for further reduction and subsequent concentration. An up-to-date mill will be so arranged in sections that each section is totally independent of the others. By this means it is possible for the whole process of concentration to go on in one part of the mill while the rest of the mill is idle. In the older form of mill, in which this used not to be the case, much loss was sustained, as an interruption to one part of the mill often meant the stopping of all machinery for a considerable period.

Where the mill is arranged in sections, each section will probably consist of rolls, trommels, coarse jigs, fine jigs, ball mill, slime tables, vanners, spitzkasten, and the necessary elevators, pumps, etc. On leaving the bins the ore for each section passes through a conical trommel about 6 feet long and 3 feet in diameter at the large end and 2 feet in diameter at the small, having a cover made of 14-gauge iron punched with round holes ½-inch diameter. The trommel, supported on external rollers, makes twelve revolutions per minute, and about ½ H. P. is required to drive it. The oversize from the trommel is fed to the rolls, the trommelled material going towards the jigs.

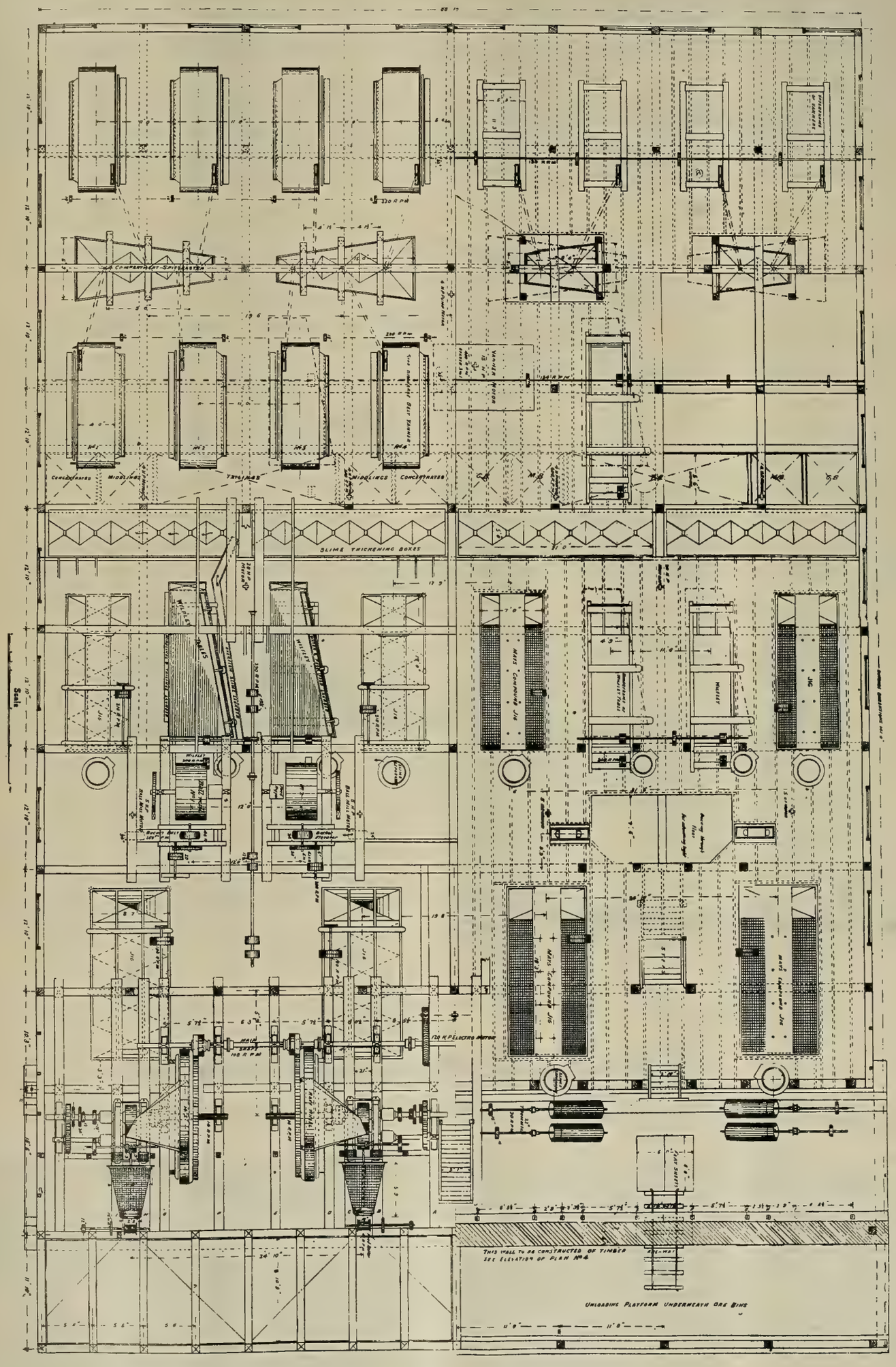
Many kinds of rolls are in use at the different mills, but those constructed for the present plant are of the Cornish type, driven by gear wheels, the gear being 7 to 1. The shells for these rolls are 2 feet 6 inches in external diameter and have coned centers, bolted together in such a way that the shells when worn may be expeditiously removed. Each pair consists of a plain roll and a flanged roll into which the plain one fits. Either manganese or toughened steel is used for making these shells, which work at the rate of fifteen revolutions per minute, are capable of crushing 1000 tons per week from 1½-inch to ¾-inch mesh for average material, and require a driving force of 25 H. P. Such material as has passed through each set of rolls goes to two parallel trommels, 6 feet in length and 22 inches in diameter. These trommels make twenty revolutions per minute, are set in an inclination of 1 inch to 1 foot and have screens composed of 14-gauge iron punched with round holes 2½ millimeters in diameter. Such material as is too large to pass through the mesh of the screen is returned again to the same set of rolls, while the trommeled material, meeting with the trommelings from the conical machine, passes to the hydraulic classifier at the head of the coarse jig.

The hydraulic classifier is a cone-shaped hollow casting of iron ⅜-inch thick, is 2 feet in diameter at the base and 2 feet 6 inches deep. The apex of the cone is placed downwards, and is perforated by two holes, ⅜-inch diameter, for water inlet, and by one discharge hole, the stream entering by the inlets being so regulated that there is always a slight overflow at the upper edge of the cone. The feed then coming in at the top of the classifier meets the rising flow of water from the inlets; the slimes are then carried away with the overflow water, the heavier particles falling into the bottom and finding their way through the discharge opening on to the head of the coarse jig.

The jigs are divided into two classes—coarse and fine. Each coarse jig consists of eight working and two tailings compartments or divisions—five on each side—and each working compartment consists of a hopper with a hutch and separate plunger at the top. Each hutch is 3 feet 6 inches by 2 feet 6 inches and has a bottom composed of 6-mesh woven brass wire screening, which rests on cross bars of iron, and is kept in position by iron grids placed on



Concentrating Mill.



Plan of Concentrating Mill.

top and bolted through to the crossbars. Each plunger is 3 feet 6 inches long and 14 inches wide, and has a clack opening in it 2 feet 6 inches by 6 inches.

The plunger and hutch being in the same hopper, which is kept filled with water, and being separated at the top only by a wooden partition, any motion given to the water by the plunger is communicated to the material resting on the sieve. The object in having a clack and clackway in the plunger, instead of having the plunger solid, is that there shall be as little downward suction in the hutches as possible, and that the water shall have, as far as possible, a quick upward motion and a slow return. In this way ore particles are allowed to settle, more or less, according to their specific gravities, the denser particles passing through the ragging and sieve into the hopper below, the less dense being carried forward on to the next hutch. In this way the gangue eventually finds its way over the end of the fourth hutch and is removed to the tailings dump. The plunger clack is a pine board loosely bolted to the bottom of the plunger, from which it has a clearance of ⅛ inch on the upward stroke. The use of a clack on the plunger does away with much of the classification which would otherwise be necessary before jigging. Each plunger of the coarse jigs makes 180 pulsations per minute, and each jig, requiring 2 H. P. driving force, is capable of treating 6 or 7 tons of ore per hour. The discharge of products from the hoppers goes on continuously, material Nos. 1 and 2 being carried away to bins for final shipping to the smelters, that from Nos. 3 and 4 to undergo further crushing and re-treatment in the fine jigs. No. 5 is taken to the tailings dump.

The re-crushing of material from the last two hutches of the coarse jigs to 20 to 25 mesh is done in Krupp ball mills which make 30 revolutions per minute and require 8 to 10 H. P. for motive force. The material leaving the ball mill passes through a system of classification at the head of the fine jigs similar to that which took place at the head of the coarse jigs.

The fine jigs are the same in principle as the coarse, but are run at a speed of 200 vibrations or strokes per minute. The hutches and plungers are smaller—3 feet 4 inches by 24 inches and 3 feet 4 inches by 12 inches respectively—but their number is the same, viz., 5 of each on each side of the jig. About 1½ H. P. is required to drive each jig having a capacity of about 4.5 tons per hour. Each fine jig has to deal with about 60% of the crude material which had, in the first place, been sent to the coarse jigs. The material discharged from the first two hoppers of the fine jigs, i. e., from hutches 1 and 2 on each side, is sent to the shipping product bins, while that from hoppers 3 and 4 is returned to the jig after having again passed through the ball mills. The material from the fifth compartment is sent to the zinc middlings dump.

The fines and slimes from the classifiers at the heads of the coarse and fine jigs are settled in spitzkasten, the coarser material being treated on Wilfley tables, the finer flowing away, and, after further classification, being treated on belt vanners.

In the mill under consideration no middle product is returned to any table over which it has already passed, and, therefore, the return launder and elevator on the Wilfley table have been dispensed with. The Wilfley table is run at a speed of 220 to 240 vibrations per minute and has a capacity of about 1 ton per hour for material up to 30-mesh. If, however, the material is from 30 mesh down to slimes, the capacity is lessened to about ½ ton per hour. About ¾ H. P. is required for driving a fully loaded Wilfley. Krupp tables, very similar in action to the Wilfleys, are also to be used, but all the finer slime work is to be done on belt vanners.

The spitzkasten used for classifying the slimes are generally made of timber planks about 2 inches thick, and have dimensions after the following proportions:

Length, top 15 feet, bottom 10 feet.

Depth, 2 feet 1 inch at head, sloping to 4 feet 8 inches.

Breadth, 2 feet 8 inches at top, widening to 7 feet 1 inch at the end.

Two different kinds of elevators are used for elevating returned material, viz., raff wheels and elevators. The raff wheels are 14 feet in diameter and make fifteen revolutions per minute. A good form of elevator is one having buckets 7x5x5 inches bolted to a belt 8 inches wide at a distance 15 inches from each other. The driving is done from above by cog wheels geared at 3 to 1, the bucket belt passing around drums 2 feet in diameter, top and bottom, and having a speed of 250 feet per minute. A good slope for elevators is about 80°.

As regards the quantity of water in circulation, it is estimated that for every ton undergoing treatment 1500 gallons of water are in use in the mill at the same time. The loss of water, as has already been stated, is estimated at 100 to 120 gallons per ton of ore treated. The mill circulating tanks, which are placed at sufficient height for all mill purposes, are generally made cylindrical in form, and composed of iron, the thickness of which, of course, is in proportion to the depth of the tank. Other separate sets of tanks are used for settling the slime from the water before the latter is pumped back to the mill circulating tanks. The slime settlers are generally rectangular in plan and have a sloping bottom. They may be made of iron, timber or masonry. The tanks are fitted on the lower side with suitable discharging doors and launders for periodically carrying away the slimes.

For a mill capable of treating 4000 tons per week, and laid out in four independent sections, the following horse power would be required:

2 Gates breakers	40	H. P. each—total	80 H. P.
4 feed rolls.			
4 Cornish rolls			
4 trommels	30	H. P.	120 H. P.
8 parallel trommels			
4 coarse jigs	2	H. P. each—total	8 H. P.
4 fine jigs	1½	H. P. each—total	6 H. P.
4 Wilfley tables	¾	H. P. each—total	3 H. P.
4 ball mills	10	H. P. each—total	40 H. P.
2 Krupp tables and 24 vanners			15 H. P.
4 elevators	5	H. P. each—total	20 H. P.
5 slime pumps	2	H. P. each—total	10 H. P.
1 water circulating pump			25 H. P.
1 water circulating pump			10 H. P.
1 water circulating pump			1 H. P.

The above list corresponds closely in most respects with that of the machinery to be installed in the new Block 10 ore dressing mill, the motive power of which will be electricity throughout, thus making a new departure as far as the Broken Hill field is concerned.

A mill arranged as above will probably give from each ton of crude ore 20% of concentrates, 20% of jig tailings, 7% of fine slimes, 7% of vanner tailings and 45% of zinc middlings.

A most important and yet very difficult matter in connection with milling operations is the sampling of the crude ore and mill products and by-products. The practice of "working back" for assay values is one which should be discountenanced in all milling operations. By "working back" is meant the calculation of the assay value of the crude ore from the values of the mill products which have been obtained by sampling and subsequent assay. For instance, the weight of the crude ore is known, as are also the weight and assay of the concentrates, middlings and tailings. The assay value of the slimes is known and the weight calculated. From these figures an assay value is calculated for the crude ore, and from this assumed assay value the recovery of metal contents is calculated, much, as a rule, to the apparent advantage of the concentrator. The only true and correct way to calculate the recovery is to take a proper sample of the crude ore after the first crushing, and before the ore has in any way come in contact with the mill water; then, having its correct weight and the correct weight and assay of all other material, a very close approximation of the true state of affairs can be arrived at. It is true that the recovery as calculated from week to week varies from the theoretical amount, being sometimes above and sometimes below, but this can only be expected, where large and varying quantities of material are continuously in transit. When averaged over a considerable period—say three months—the quantities come out very closely if due care has been observed in the sampling.

(TO BE CONTINUED.)

Personal.

R. W. PURDUM, manager Sunnyside mine, is at Roosevelt, Idaho.

A. C. CARSON has charge North Butte Copper Co. at Butte, Mont.

T. R. HENAHEN is superintendent Silverton M. Co., Silverton, Colo.

R. C. GEMMELL is sampling the Utah copper mine at Bingham, Utah.

ANDREW NOCE has resigned as foreman Oneida mine, near Jackson, Cal.

R. C. CORBUS has taken charge Oregon mine, near Orogrande, Idaho.

J. H. SCONT has been appointed manager Bassick mine at Querida, Colo.

C. L. TEWKSBURY is superintendent Wyoming M. Co., near Kirwin, Wyo.

ADOLPH RIEGELS is superintendent American Nettie mine, near Ouray, Colo.

JOHN H. MACKENZIE AND M. L. REQUA are at their mines at Ely, Nev.

C. C. BARKE is manager Rattler mine, near Centerville, Shasta county, Cal.

FRED. G. FARISH has gone to Parral, Chihuahua, Mexico, on professional business.

C. V. TURNER of Nevada City, Cal., is examining mines at Bishop, Inyo county, Cal.

G. MCM. ROSS is in San Francisco from the Union copper mines at Copperopolis, Cal.

RICH. TREVARTHEN has been appointed manager Old Gold mine, Cripple Creek, Colo.

H. C. BELLINGER, manager Yampa smelter at Bingham, Utah, has been visiting Butte, Mont.

H. V. WALLACE has been appointed manager Sombreretillo M. Co., near Saric, Sonora, Mex.

W. S. KEITH has returned to the Takilma smelter at Waldo, Oregon, as assistant superintendent.

M. L. HEWITT, manager Cataract Copper M. Co., has returned to Basin, Mont., from a trip abroad.

M. B. KERR, E. M. of San Francisco, Cal., has gone to Inyo county, Cal., to make mine examinations.

SAML. JAMES is superintendent Arcos smelter recently started at Sultepec, State of Mexico, Mex.

ARTHUR DAY of Butte, Mont., has been appointed superintendent Yampa smelter at Bingham, Utah.

C. P. OLIVER has been appointed superintendent Colorado Tungsten Corporation at Nederland, Colo.

A. H. ELFTMAN of Minneapolis, Minn., has been visiting Thunder Mt., Idaho, and is now at Goldfield, Nev.

T. R. BROOKS succeeds F. M. Leland as manager mining department Risdon Iron Works, San Francisco Cal.

D. J. BADGER has been appointed superintendent Colorado Tungsten Corporation's mill at Boulder, Colo.

A. H. CARPENTER of Denver, Colo., has been appointed manager Takilma smelter at Waldo, Oregon.

J. E. BAMBERGER, president Daly-West M. Co., has returned to Salt Lake City, Utah, from an Eastern trip.

NATHAN BURLINGHAM of Glendale, Cal., has been examining mines at Mineral Park, near Chloride, Ariz.

B. W. PAXTON of Santa Rosa, Cal., is examining the Texada island iron properties in the Nanaimo district, B. C.

F. M. SMITH has been appointed manager East Helena smelter, American S. & D. Co., at East Helena, Mont.

A. J. MULLER is again manager Ayeinm mine, Ashanti Goldfields Co., in the Gold Coast colony, West Africa.

LOUIS DAHL of Lewiston, Idaho, has left to take charge Bangor-Alaska placer mine, Alaska, for the summer.

WM. BALL, superintendent Lower Mammoth mine at Eureka, Utah, has returned to the mine from a trip through Idaho.

J. R. YEARDSLEY has been appointed superintendent milling department Pfau Gold M. & R. Co.'s plant at Cherry, Ariz.

V. G. HILLS has been appointed consulting engineer Colorado Tungsten Corp., operating wolframite mines at Nederland, Colo.

H. P. LITTLE of Sandon, B. C., has charge construction of a concentrator for the East Pacific M. & M. Co. at Helena, Mont.

J. L. SNYDER, who is developing a copper property at Oro Grande, in the Altar district, Sonora, Mex., is visiting in Los Angeles, Cal.

W. J. DEEGAN, formerly of Red Lodge, Mont., is superintendent Galena Ridge M. Co. and Shoshone Mountain M. Co. at Kirwin, Wyo.

ROBT. M. RAYMOND, manager El Oro M. & R. Co., has returned to El Oro, State of Mexico, Mex., from a trip to Boston and New York.

J. H. MCCLARREN of Pittsburg, Pa., controlling the Pittsburg Lead M. Co., is at Wallace, Idaho, superintending mining operations on Nine Mile.

W. C. MILLER has been appointed general manager of all the mines operated by the Federal M. Co. at Wardner, Mace and Burke, Idaho, succeeding E. J. Roberts.

H. C. WHIPPLE has completed the cyanide plant for the El Oro M. & M. Co., and is now constructing the 120-stamp mill and cyanide plant for the Black Mount M. Co., Magdalena, Mexico.

H. S. NULLIKEN has resigned as superintendent Monterey plant of the American S. & R. Co. to become metallurgical engineer for the Cia Minera de Penoles, at Mapimi, Durango, Mex.

E. B. BRADEN, manager East Helena smelter of the American S. & R. Co., has been appointed a member of the executive board of the American Smelters Security Co. and will be in charge of the Tacoma and the Everett smelters, and the Selby smelter at San Francisco.

Books Received.

"Official Proceedings of the Twelfth National Irrigation Congress" held at El Paso, Tex., November, 1904, compiled by G. E. Mitchell.

Part IV of "Report of Progress of Stream Measurements for 1904," by M. R. Hall and J. C. Hoyt, gives data on the Santee, Savannah, Ogeechee and Altamaha rivers and eastern Gulf of Mexico drainages.

As extracts from "Mineral Resources of the United States for 1904" the United States Geological Survey has issued "The Production of Graphite in 1904" and "The Production of Monazite, Zircon, Gadolinite, and Columbite or Tantalum Minerals in 1904."

Trade Treatises.

Bulletin No. 53 from the Crocker-Wheeler Co., Ampere, N. J., describes direct current lighting and power generators.

The Wild crushing mill is elaborately illustrated and described in a fine pamphlet issued by the S. H. Supply Co., Denver, Colo.

Catalogue 124 from the Allis-Chalmers Co., Milwaukee, Wis., describes the Overstrom concentrator. A colored plate on page 21 graphically portrays the operation of the table.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

Tin has been found at a number of places in Alaska, but as yet there has been little production. It has been found in place in Seward peninsula, at Lost river and Cape mountain, and is reported from Brooks mountain, Ears mountain and the Darby mountains. Alluvial deposits have been found on Buck creek and Old Glory creek, and are reported on the Arctic slope north of Buck creek, on Gold Bottom creek, near Nome, and at one or two other places. Pebbles of stream tin have been found in the gold placers of Cleary creek, near Fairbanks, and miners report it in the gold placers of the Koyukuk. At Lost river the country rock is a Silurian limestone, through which is thrust a granite boss about ½ mile in diameter. Quartz-porphyry dikes also cut the limestones in various places. These dikes are frequently much kaolinized, and in other places replaced by fluorite, which sometimes colors the dike violet or purple. The cassiterite occurs disseminated through the dikes, particularly in the kaolinized portions, and in veins in the limestone. Small amounts of tin are also found with pyrite in the granite. The accompanying minerals are tourmaline, topaz, fluorite, zinnwaldite, wolframite, quartz, epidote, garnet, chalcopyrite, iron pyrites and galena. About ten tons of ore, estimated to carry 10% to 20% of tin, have been produced. At Cape mountain cassiterite has been found near the contact of the Carboniferous limestone and slates with granite, occurring in both sedimentaries and granite. The Buck creek placers occur in a slate country rock, which is probably underlain at no great depth by granite. The gravel is nearly all of slate and quartz. Pyrites, hematite and a small amount of gold are the accompanying minerals. The cassiterite apparently comes from small stringers in the slate. During the last two years probably 100 tons of stream tin, carrying 60% tin, have been produced.

ARIZONA.

Cochise County.

(Special Correspondence).—An important strike has been made in the Warren district, in the Shattuck & Arizona property, in a drift at the 700-foot level.——The Calumet & Arizona at Bisbee has completed putting in hose carts and hose at the several shafts of the Bonanza Circle which will afford fire protection.

Bisbee, July 11.

Gila County.

L. F. Rotsler reports of his mine at Dripping Springs, 40 miles from Globe, that rich gold ore has been struck in a drift from the bottom of the 100-foot shaft. The owners have decided not to ship any ore, but to resume sinking.——J. M. Frederick and H. S. Buckner have bonded the Proctor mine on the divide between Mineral and Pinto creeks, near Globe. The claim is developed by a tunnel 300 feet long.

Maricopa County.

It is reported that a hoist capable of sinking to 1500 feet is to be put in at the new shaft of the Vulture mine, near Wickenburg. G. E. Sanders and W. B. Troy have charge.

Mohave County.

It is reported that a 60-ton smelter is to be put up at the Desert Queen mine, near Quartzsite. J. J. Wyatt of Los Angeles, Cal., is manager and superintendent.

Pinal County.

The Troy-Manhattan C. Co. at Troy have sunk the Buckeye shaft 375 feet. The company is preparing to make a smelter run next month, coke being now received.

Yavapai County.

The Crown King M. Co. at Crown King is concentrating seventy tons of tailings daily at Crown King.

At Val Verde, the site of the new smelter has been surveyed and ground is being broken for the foundation of the smelter. It is expected to have the sampling works completed by August 15th. The new sampling works will be operated in connection with the smelter. There will be two smelters, one for copper and one for lead ores, with a combined capacity of 800 tons a day.

M. Bradley, superintendent for the Buffalo M. Co. on Cherry creek, has purchased a gasoline engine, a blower and 1000 feet of air pipe. The tunnel is in 1000 feet and will be driven 500 feet more. The values are copper, gold and silver.—— S. H. Anderson reports that the Great Republic shaft, near Cordes, is 578 feet deep.—— In the double-handed drilling contest at Prescott, G. Dahlin and A. Nyberg drilled 30.7 inches in fifteen minutes. Dahlin drilled 15½ inches in the single-handed contest.

CALIFORNIA.

The Los Angeles Chamber of Commerce has taken action toward amelioration of the conditions on the deserts of southern California and Nevada which are again causing the deaths of many prospectors and travelers from thirst. The Chamber has twice before memorialized the various county governments in which these deserts are located, in an effort to save the lives of travelers, but so far there has been no action taken. As the heated season approaches, deaths on the desert are again becoming frequent, and within the last two weeks it is stated that twelve people have perished from thirst. The secretary was directed to prepare a letter to the supervisors of Los Angeles, San Diego, San Bernardino, Riverside, Inyo and Kern counties, in California, and Lincoln, Nye and Esmeralda counties, in Nevada, calling attention to the conditions on the desert and the previous efforts of the Chamber to have remedies provided. It was also decided to prepare an accurate and complete map of the desert country for free circulation.

El Dorado County.

The Last Chance mine at Coloma is in operation with seventeen men under the supervision of John Gray of Jerome, Ariz.——It is reported that work has been commenced at the Rosencranz mine, near Garden Valley, under the supervision of W. F. Holland. A new shaft is to be sunk on the mine and levels run 100 feet apart.

Mariposa County.

J. C. Rhoads of the Grimshaw mine, near Mariposa, states that sinking and drifting are being done with nineteen men. The ore is being milled at the Organita mill.

Nevada County.

Operations have commenced on a claim on Indian Flat, near Grass Valley, by the Prospecting Co. in which A. D. Foote, C. E. Clinch, R. Walker, T. Marshall, A. L. Gill, A. Hall and L. P. Larue, all of Grass Valley, are interested. The 50-foot shaft is being cleaned out and will be retimbered to the bottom. A. Hall has charge.

Work has been started at the Banner mine, near Nevada City. The old works will be removed and the new plant put in. The pumps will commence to lower the water and it is expected that the 700-foot shaft will be cleared in a short time.

Placer County.

Superintendent D. M. Ray of the Placer Gravel G. M. Co. at Last Chance is putting in a gasoline engine to ventilate the mine.

Shasta County.

Work has been started at the Graham group, near De Lamar, by A. Rossi.——W. F. Arnold is working his claims at De Lamar.

Sierra County.

Work is to be started at the Rainbow mine, near Alleghany.——The Tightner shaft at Alleghany is down 80 feet. The rich ore is holding out.

Siskiyou County.

The Yreka Creek Dredger Co. has put in a centrifugal pump below the pit in which the boat was built, 1 mile north of Yreka, for the purpose of pumping back the water running out, in order to keep the boat floating until machinery of same is ready to sink down to bedrock. The pump is run by electricity. The machinery is being placed as rapidly as possible, and it is expected will be ready for starting August 1st.——The water supply in the different mining camps is getting short, owing to the snow disappearing on the highest mountain summits, together with drying up of springs on account of warm dry weather. The result will be a shut down in hydraulic and placer mining until cool weather comes again. Many of the mines have already shut down.

Sonoma County.

A 5-stamp mill and other machinery is to be put in to develop a mine in Dry Creek valley, near Santa Rosa, by A. Lencioni, who claims to have uncovered a ledge carrying nickel, gold and copper. N. Silva has charge of the work.

Stanislaus County.

The California & Nevada Ore Co. have contracted to build an ore testing plant at Oakdale.

Trinity County.

The half-interest owned by Mrs. Phillips of San Francisco, in the Brown Bear mine, at Deadwood, has been sold to McDonald Bros., the former owners. The price paid is said to be $100,000.

Tuolumne County.

The hoist, blacksmith shop and mill at the Starr King mine, 3 miles above Carters, were entirely destroyed by fire on July 3. The loss is estimated to be $12,000, with some insurance.——At the Confidence mine at Confidence sixty men are employed. The 20-stamp mill is pounding continually on ore. Sinking the shaft was resumed on July 1 at a depth of 810 feet.——At the Longfellow mine, near Big Oak Flat, a raise is being made on the 400-foot level west from the main drift. Drifting is being done on the 300 level to the west, and on the 450 and 600 levels east, all in good ore. The shaft has been enlarged and retimbered to the bottom of the main shaft—600 feet. The ten stamps are dropping. The well at the pumping station on the creek will be sunk 10 feet and a drift run to make a larger reservoir for water, and when completed will furnish plenty of water for use at the mine and mill.

Stamps are dropping at the Clio mine at Jacksonville on good ore. The shaft is approaching the 200-foot level.——B. Addis has charge of the Lucky Find, 9 miles above Confidence. There is a 5-stamp mill on the mine and a concentrator will be put in.

COLORADO.

Boulder County.

In the double-handed drill contest at Boulder, Collins and Dopp of Jamestown drilled 33¾ inches in fifteen minutes, winning $400. In the single-hand contest F. Yockey drilled 24 inches.

It is reported from Eldora that the Mogul Tunnel will again start up. A disagreement between the operators and the tunnel management, as to their respective share of operating expenses, has been the cause of the shutdown.

Chaffee County.

In the Turret mining district a graphite deposit is being developed by the Ethel G. M. Co. of Detroit, Mich. Samples show the deposit to be amorphous graphite of good quality. The company is said to be putting up a mill for concentrating and refining the deposit.

Clear Creek County.

The Manda claims, on Douglas mountain, near Georgetown, have been sold to Pennsylvania capitalists. The claims are being developed by a crosscut tunnel, in 150 feet. The new company proposes putting up a 25-ton mill, in addition to mining machinery.——Operations have been resumed on the Fort Dodge group, on Leavenworth mountain, near Georgetown.

Manager J. J. May of the Newhouse tunnel, at Idaho Springs, says that work will be resumed on the breast of the big bore during July. It is reported that the tunnel will be continued ahead several hundred feet, when a lateral will be driven west which will ultimately connect with workings of the Old Town mine. For some little time the management of the Old Town has been making efforts to secure a right of way for a lateral from the Newhouse tunnel to the Old Town shaft. The distance to be driven is nearly 4000 feet, and the lateral will unwater a number of the best properties in Russell gulch, as well as permit of their operation at depth. The Old Town shaft is over 1500 feet in depth on the pitch of the vein, and the lateral from the Newhouse will cut underneath the shaft several hundred feet. It will require about two years' time to complete the connection, but in the meanwhile a considerable number of properties in Russell gulch will be enabled to resume operations which are now lying idle on account of the water in the mine workings. The Newhouse tunnel was located Feb. 13, 1891, and actual work was commenced in the fall of 1893. On Jan. 1, 1894, the machine drills were started. On Jan. 1, 1905, the breast of the tunnel was 14,570 feet from the portal, and the estimated cost of the work up to that time is placed in excess of $390,000, including equipment. The tunnel is 10x10 feet wide, with a double track, 18-inch gauge, with a space of 30 inches between the tracks for a distance of about 1400 feet. In the space between the tracks is a drain box, 14 inches deep by 2 feet in width, that carries the water from the tunnel. For the first 80 feet from the portal and at points where veins are cut, timbers have been used, but along the balance of the tunnel no timbering is required, as the cut has been made through solid rock. The grade is uniform—a raise of 5 inches in each 100 feet. From the 1400-foot point the double track size was reduced to 5x7 feet, or single-track tunnel, as this was thought the most desirable and practical, and this will be maintained to the proposed terminal in Quartz hill. The average progress made in the driving has been 200 feet per month. The power plant consists of three 80 H. P. boilers, two of which are used at a time, the one as a reserve; two 16x16 two-stage Norwalk compressors; one 22x24 two-stage Norwalk compressor; one No. 7 Root blower, driven by a 50 H. P. Atlas engine; one 30 H. P. high-speed engine connected with a 20 K. W. Westinghouse 500-volt generator; a 16 H. P. Baldwin-Westinghouse locomotive furnishes the motive power for the transportation of ore cars from the different properties operated from the tunnel, handling as many as twenty-five loads at a trip. The driving of the tunnel has been under the supervision of L. Hanchett as manager, with S. A. Knowles in personal charge up to a few months ago, when he left the employ of the company to superintend the driving of the Government's irrigating tunnel at Montrose, and J. J. May was placed in charge in his stead.

The St. Paul M. Co. has resumed development on its properties near Georgetown. It is expected that a power plant will be built at the base of Green Lake mountain and power drills used in driving the crosscut tunnel. W. L. Smith of Osage City, Kans., has been at the mine starting work. T. Guanella is superintendent.——Operations have been resumed on the Kingbird claims on Kelso mountain, near Georgetown, with L. Anderson in charge. The tunnel is in nearly 300 feet.

The Colorado Central mine has been bonded to F. A. Mazwell of Georgetown.——The Pelican mill of the Dives Pelican & Seven-Thirty M. Co., near Georgetown, has started regular work. According to the Georgetown Courier, the ore from the mine is fed into the crusher chute, which holds ten tons, and from this it is delivered to two 10x20 Blake crushers. The ore is crushed to 1½ inches, falling from crushers into a Jeffries pan conveyor which elevates the ore to top of mill, a distance of 122 feet on its pitch and 90 feet vertical. From pan conveyor ore is delivered to a horizontal belt conveyor, which distributes into the reserve ore bin at top and back of building. This bin is 52 feet long, 22 feet wide and 18 feet deep, holding 1000 to 1500 tons, depending upon the character of the ore. The ore is then fed from the bottom of this reserve bin through chutes, thence on to a second horizontal belt conveyor, delivering it through a Gates feeder, then on to the 16x36 coarse rolls, which are set to crush to ⅝ inch. At this stage water is added and washes the ore to the bucket mill elevator, where it is lifted to the first sizing screen of six mesh, the return from which going to the second set, or finishing rolls of same size as the coarse rolls. Thence it passes back to the same bucket elevator and back to screen. There are four revolving screens, which deliver three sizes, 6 to 8 mesh, 8 to 10 mesh and 10 to 18 mesh. Ore passing through 18 mesh is water-sized, thus giving four sizes, which are treated by eight side-discharge four-compartment jigs; the tailings from which are delivered to three 5-foot Huntington mills with 20-mesh screens. The pulp from Huntington mills flows into two sand pumps, which elevate it to a main distributing tank, from which it flows into two sets of sizing boxes, four to the set, making four water sizes, which are treated by seven Wilfley and three Cammet tables. The mill is driven by seven motors—one a 50 H. P. for crusher, a 50 H. P. for rolls, a 20 H. P. for jigs, a 20 H. P. for Huntington mills, a 7 H. P. for tables, a 15 H. P. for pan conveyor, a 5 H. P. for main belt conveyor, and a 2 H. P. for roll belt conveyor. J. H. Eaton is general manager. F. Graham is mill man.

Denver County.

A. B. Frenzel has arranged for building a large mill in Denver to concentrate uranium, vanadium, platinum, tungsten, molybdenite and other valuable minerals. Attention will be given to the separation of fine gold, platinum, osmium and iridium from black sand.

Dolores County.

The continued high price of zinc is encouraging the United Rico M. Co. to develop all its zinc-bearing properties, and in addition to the Atlantic Cable the company will soon commence operations on its Black Hawk, Yellow Jacket and Futurity groups.——The Rico Dolores M. Co. is arranging to operate its mines at Burns on a more extensive scale.——The Emma G. M. & M. Co. is shipping concentrates from its mill to Coke Ovens, and shipments to the Durango branch of the American S. & R. Co. will be resumed as soon as the road is reconstructed to Dolores.

Gilpin County.

It is reported that more machinery is to be put on the Modoc mine on Quartz hill, near Central City, operated under a lease and bond by the United M. & Ex. Co.—— R. Hastie, Jr., of Denver has taken a three years' lease

and bond on the Japan mine in Russell district and has done some sinking.——The Penn mill on North Clear creek, near Central City, has been started up on custom ores under the management of L. S. Newell, Jr., with J. Johnson as mill foreman. E. C. Holland is experimenting with the slimes in the creek from the Penn mill. ——Daily shipments amounting to sixty tons are being made from the Pewabic shaft in Russell district via the Gilpin tramway to the New York mill at Black Hawk, which is under lease to the Pewabic Con. M. Co., of which J. C. Fleschhutz is manager. The Pewabic shaft is down over 400 feet, and it is proposed by the company to sink it down to a depth of 1000 feet, commencing sinking operations soon. They intend to put up a new shaft building 24x60 feet on the Iron shaft and will build a 36-foot gallows frame and put in an 80 H. P. gear hoist and six-drill air compressor. The Iron shaft is about 600 feet deep, and as soon as it is unwatered sinking will be commenced.——The Mont D'Oro M. & M. Co. is operating in the Quartz Valley district, north of Central City. E. C. Sherman as manager. The company owns the New Century, Smuggler and Felix claims and have a lease and bond on the Delight and Colorado Girl. Operations are being carried on with tunnel workings. The main tunnel has been driven on the Delight vein.

At Central City the new Lombard shaft house of the Yankee Con. M., M. & T. Co. is ready for operations. H. I. Seemann of Denver is superintending work.

Gunnison County.

The Golden Islet M. & M. Co., operating the Cortland mine, in McIntyre gulch, near Ohio City, is taking out good ore. The shaft is down 300 feet. The company has leased the Jersey Blue mill, above Ohio City, and has been treating the low-grade product for several weeks. The dump ore runs .28 of an ounce in gold, 14 ounces in silver and 7% lead. Twelve tons are being put into one and the concentrates have a value of 3.92 ounces in gold, 101.32 ounces in silver, besides the lead values, showing a loss of but $1.99 per ton in the tailings.

The Lost Delusion, in Dutch gulch, near Bowerman, owned by J. Wey, is ready to ship high-grade ore.—— E. C. Staller has good ore in the Fraction lode, near Bowerman.——At Bowerman the Eureka, owned and operated by G. Morris, is showing free gold ore.

Lake County.

Work has been resumed this week on the Applegate group in Willis gulch, near Twin Lakes, with E. Morehead as manager. The main prospecting tunnel will be driven to tap the veins located on the surface. —— B. F. Magness has started work on the Silver Serpent property on Twin Peaks mountains, near Twin Lakes.

At the Bertha mine on Breece hill, Cripple Creek, preparations are being made to unwater the shaft so that the lower or sulphide zone can be worked. The shaft is 530 feet deep with 200 feet of water in it. When the shaft is unwatered drifting will be started. In the upper workings the property is shipping twenty-five tons daily of a good grade of siliceous ore.——The work during the winter on the Highland Chief on Breece hill has been done through a tunnel and shipments have been steady. Vernier & Shipley have decided to clean out the old shaft, which is 225 feet deep, and sink another lift. —— On the Curran and Grand Prize, adjoining the Highland Chief, a tunnel has been driven 500 feet, but the ore channel has not been found. The lessees have decided that they are above the ore and will sink a winze, starting 160 feet from the portal of the tunnel.——T. D. Kyle, leasing on the Fannie Rawlins, is shipping 100 tons per month of an excellent grade of siliceous ore.

The Sedalia, in Big Evans gulch, near Leadville, is sinking the shaft with three shifts to a depth of 950 feet. —— The Great Hopes, in Big Evans gulch, will resume sinking the shaft.

Larimer County.

At Pearl the Swede mine is being worked under the management of H. A. Brown.——The Zirkel mine at Pearl is to be started after two years' idleness.——The Big Horn shaft, near Pearl, is being unwatered preparatory to examination and sampling.

Ouray County.

It is reported that the Saratoga mill, near Ironton, is to be torn down so that a smelter can be put on the site. W. J. Sawyer has charge of the mill.——The Thistledown M. & M. Co. intends to put in an electric power plant and compressor and drills to drive the development tunnel on Mount Hayden.——M. L. Thistle of Ouray is manager.——The Treasury Tunnel M. & M. Co. will add twenty stamps to its mill at Red Mountain. W. J. Hammond is manager.

Saguache County.

Mrs. G. H. Adams has appointed H. A. Lee consulting engineer of the Baca grant, near Creston, and has decided to open the entire mineral section to lessees.——The Independence mine has a 100-stamp mill which will be opened to custom work.

San Juan County.

The Gold Tunnel & Railway Co., Wm. Cole superintendent, is working the Highland Mary mine, in Cunningham gulch, near Silverton.

The Bon Homme mine, in Burrows park, near Animas Forks, is to be worked, since all litigation has been settled. It is reported that men will be put to work during July and that heavier machinery will replace the present equipment.

San Miguel County.

The Smuggler-Union mill at Telluride has seventy stamps dropping on ore from leasers. The cyanide plant is treating 175 tons daily.——The Black Bear M. Co. plans to put up a 20-stamp concentration plant on land near Telluride leased from the Smuggler-Union Co. A 2½-mile tram from mine to mill will be built. G. C. Wagner of Telluride is general manager.

Teller County.

(Special Correspondence).—A few years ago the operators in Cripple Creek district united in building a railroad for the transportation of the ores from that district to avoid the excessive rates being charged at the time by the railroad doing business in the camp. Since then they have, to a certain extent, disposed of their holdings in the new road. It is now rumored that a merger has been made with all the roads entering the district and it is feared that the former excessive rates will be restored. To overcome this it is understood a suit is to be instituted against the railroads to prevent the merger and thereby prevent a raise in the rates. With the big drainage tunnel to be built and the railroad merger a probability, it is not a pleasant situation for the operators in Cripple Creek to contemplate. But from the manner in which they have handled their affairs in the past it is believed they will be equal to the task of settling things satisfactory to themselves.

Cripple Creek, July 11.

Superintendent C. C. Jackson has struck a vein in a lateral from the bottom of the shaft of the Mary Nevin, between Beacon and Rosebud hills, Cripple Creek. —— Murphy & Co. have discontinued sinking at a depth of 350 feet in the Monte Cristo mine on Beacon hill, Cripple Creek. —— An air compressor is to be put in at the Maloney workings of the Empire State by Crowder, Thompson & Co. of Cripple Creek.

The Fortuna shaft at Victor is to be sunk 300 feet deeper.——The Fort Pitt Co., working the Sunshine property on Galena hill, Cripple Creek, will sink the shaft from the 400 to the 700-foot level.——The lessees in the Battle Mountain of the Rose Nicol Co. of Cripple Creek are drifting on the 450-foot level.

Lessee W. O. Burnside and associates, who are operating under lease the Lonaconing property belonging to the El Paso Co. on Beacon hill, have opened up a large body of ore on the 300-foot level. —— The Mollie Kathleen property on Tenderfoot hill, Cripple Creek, is to be prospected by H. D. Gortner.

The output for the first six months of 1905 foots up to $10,858,695. The output by months is as follows:

	Tons.	Valuation.
January	63,800	$1,891,300
February	48,800	1,687,000
March	57,700	1,827,680
April	57,900	1,863,300
May	59,115	1,884,215
June	58,500	1,725,200
Totals	345,815	$10,858,695

The dividends of the public companies for the first six months of the year amount to $1,619,540.

The report of Stratton's Independence, Ltd., at Cripple Creek shows how the company has benefited by the leasing system. The report covers a period from July, 1904, to April, 1905, inclusive, leasing being started last July. Since that period three dividends have been declared, amounting to £75,000. During the ten months of operation a total of 42,555 tons were shipped out, which gave a net profit to the company of £89,967. Besides paying the three dividends, the company has a balance of cash of £49,600 in the treasury. In the report it is stated that compared with the results and reports published for the last financial year the change brought about under the leasing system inaugurated a year ago is remarkable. The ore during the ten months has run a little over two ounces to the ton. The richest ore came from the upper levels of the mine. Every level from No. 1 to No. 9, inclusive, produced ore of much higher grade than heretofore, and this output of ore has not only been a result of extensions in the old workings, but also from the exploration in fresh ground. Development work under the supervision of C. M. Becker from August, 1904, to March, 1905, amounted to 6261 lineal feet. It further states that the sulphide vein struck in the western portion of their ground on the sixth, seventh and eighth levels is an entirely new discovery to the mine, and it is said to be a most promising one. The vein averages 4 feet in width and it costs about 80 cents per ton to mine. Pumping was suspended in June of last year, when the water rose from the 1400-foot level to within a few feet of the 900-foot level. Lately, however, the water is lowering in consequence of drainage operations, and lessees are now driving a drift at a depth of 560 feet, taking out considerable good grade ore near their northern boundary line.

IDAHO.

Blaine County.

The equipment of the Minnie Moore mine and mill at Hailey has been turned over to Lyttleton Price, Jr., the superintendent, who has taken a contract to do 2000 feet of exploration work upon the 1000-foot level. The stopes have been leased to J. J. Donovan, who is to pay all expenses and to pay a royalty of 20% of the smelter returns.

Idaho County.

The 200-foot crosscut tunnel on the Columbia of the Gold Bug-Columbia, near Elk City, is to be run 500 feet farther.

The Thunder Mountain Gold Reef Co. has decided to put in a 30-ton mill and cyanide plant at its property near Warren.

The Atlas M. Co. are timbering their mine in the wet places, but the mill will not be run until definite plans can be made. Geo. T. Crane of Spokane, Wash., says that the saving on the plates is so low that it will be necessary to add a cyanide plant.

Owyhee County.

C. W. Hill has secured the option on the Stormy Hill, War Eagle, and purchased the El Madhi and Ninety-Two, and has located the Carton, all near Silver City.—— It is reported that the management of the DeLamar mines at DeLamar is having plans made to have the mill remodeled. It was first constructed as an amalgamating mill, and then, after many changes had been made, converted into a cyanide mill. —— The Sinker Tunnel people are running a crosscut, west, from the 600-foot level of the upraise, 400 feet to prospect for veins west of the Elmore Chariot. —— J. E. Masters of Silver City has started work on the Tybo-Blue Bird mines in Pixley basin.

Shoshone County.

In a recent account of the Cœur d'Alene district, F. L. Ransome says that the chief lead-silver ore producers are the Federal M. & S. Co., operating the Tiger-Poorman mine at Burke; the Mammoth mine at Mace and the Last Chance mine at Wardner; the Bunker Hill & Sullivan M. & C. Co. at Wardner; Larson & Greenough, owning the Morning mine, near Mullan; the Hercules M. Co., owning the Hercules mine, and the Hecla M. Co., owning the Hecla mine, both near Burke. Other mines which have contributed largely to the general production in the past, although they are not at present being worked on the same profitable scale as those just mentioned, are the Helena-Frisco mine, near Gem; the Granite and Custer mines on the west slope of Tiger peak; the Gold Hunter mine, near Mullan; the Sierra Nevada mine, 1 mile west of Wardner, and the Crown Point, owned by the Cœur d'Alene Dev. Co., west of Wardner. The Bunker Hill & Sullivan and the Last Chance mines are both on the same general zone of fissuring and their workings connect at several points. The deepest level, near Wardner, is the Kellogg tunnel of the Bunker Hill & Sullivan mine. This tunnel, which is a crosscut, runs southward from the mill, situated on the South Fork, about a mile west of Kellogg, for a distance of 12,000 feet to the lode. It cuts the latter about 2000 feet below the croppings. The Morning mine has a crosscut adit 2 miles north of Mullan, the ore being brought down to the mill on the South Fork over a narrow gauge railway. A new adit, now being run from the mill, will cut the lodes about 800 feet below the bottom of the present workings. The Gold Hunter mine is also opened by a crosscut adit, from which two lower levels are being worked through a winze. The Tiger-Poorman and the Hecla mines are operated through shafts in the town of Burke. These workings are respectively 1800 and 600 feet deep. The Standard-Mammoth mine has two long crosscut adits, the Campbell tunnel, running nearly north from a point on Canyon creek, below Mace, and the No. 6 tunnel, running nearly northeast from a point on the creek, 3000 feet west and about 150 feet below the Campbell adit. From the end of the Campbell tunnel, an underground shaft or winze gives access to five levels, the lowest being 1050 feet below the adit level, or about 2000 feet below the apex of the vein. The main adit of the Helena-Frisco mine is a south crosscut from Canyon creek, near Gem, at the end of which is a shaft 1400 feet deep, connecting with seven levels. The main adit of the Hercules mine is on Tiger peak, about 1½ mile north of Burke and about 1500 feet above the bed of Canyon creek. The mine as yet produces no concentrates, the crude ore being hauled by wagons to the railroads at Burke.

The Humming Bird Co. will resume work on its mines at Burke, with ten men. Arrangements have been made with the Federal Company for air with which to run its machine drills. D. Hudson, formerly superintendent of the Mammoth mine, will be in charge. The company shut down work a year ago, pending the obtaining of patents to all its holdings. For the present work will be confined to extending the No. 5 crosscut tunnel, which is now in 1900 feet, and to drifting on the two ore chutes already opened in this tunnel.

KANSAS.

The law passed by the Legislature last winter appropriating $410,000 to build an independent oil refinery at Peru has been declared unconstitutional by the State Supreme Court in an opinion rendered by Associate Justice Thompson. The oil refinery law provided for the erection at Peru also of a branch of the State penitentiary to house prisoners, who, it was intended, were to work the oil plant. State Treasurer Kelly and Warden E. B. Jewett, whose duty it was to issue the bonds, declined to sign them in order to first secure a decision on the constitutionality of the act. Attorney General C. C. Colman filed mandamus proceedings in the State Supreme Court on behalf of the State to compel the officers to sign the bonds. The opinion declaring the act to be illegal and unconstitutional was concurred in by all of the members of the Supreme Court.

MICHIGAN.

The fourteen leading producing mines at Lake Superior produced 10,720,000 pounds more of copper in the first half of 1905 than in the first half of 1904 and 13,430,000 pounds more than the first half of 1903. Nine show an increase over both years, four a decrease from both years and one a decrease from last year and increase over 1903. The comparison is as follows:

	1905.	1904.	1903.
Calumet & Hecla	40,550,000	38,900,000	40,100,000
Quincy	10,400,000	8,300,000	8,400,000
Osceola	9,250,000	9,650,000	6,470,000
Tamarack	9,150,000	7,170,000	7,000,000
Champion	8,250,000	5,700,000	5,375,000
Baltic	7,275,000	5,700,000	5,300,000
Trimountain	6,125,000	5,350,000	5,500,000
Mohawk	5,350,000	3,975,000	3,375,000
Wolverine	4,675,000	4,750,000	4,800,000
Franklin	2,300,000	2,525,000	2,750,000
Atlantic	1,700,000	2,700,000	2,800,000
Isle Royale	1,425,000	1,100,000	1,250,000
Mass	1,000,000	1,200,000	1,250,000
Adventure	1,000,000	710,000	650,000
Totals	108,450,000	97,730,000	95,020,000

The largest increase is that of Champion, 45%, the entire Copper Range output for the six months, excluding the half of Champion not owned, was 17,525,000 pounds, or at the rate of 35,000,000 pounds per annum, compared with 13,900,000 for the half of last year, an increase of 26%. Osceola, owing to the explosion and labor troubles, has fallen slightly behind last year, but will this month more than make up the loss. Mohawk has increased 34%, Tamarack 28% and Quincy 25%.

Houghton County.

At No. 1, or the northerly shaft, of the Franklin Junior, near Houghton, sinking has been in progress for some time from the nineteenth level. Drifting from No. 1 shaft is in progress at the seventeenth level northward, at the eighteenth north and south, and at the nineteenth north and south. Stoping is in progress at many points in the drifts tributary to No. 1 shaft, practically all levels below the eleventh, both north and south, having stopes working. No. 2, or the southerly shaft, has completed cutting the plat at the eleventh level and sinking is being resumed at that point. The conglomerate lode continues of the same favorable character with depth that has been manifested since about the fourth level. Drifting is in progress northward at the fifth, sixth and eighth levels and southward at seventh and ninth levels. Drifts have been started both north and south at the tenth and eleventh levels. No. 2 shaft is connected by means of the northerly drifts with No. 1

shaft at the fourth, seventh and ninth levels. The shaft is operating with only its temporary hoisting equipment, whose capacity is limited to a single skip. The Franklin is operating thirty-five drills at the Junior and fifteen drills at the old mine.

MISSOURI.

Jasper County.

The Joplin News-Herald reports that the Cataract M. Co., operating near the Mandarin mine, is a new Joplin producer.——The drill hole being put down south of Columbus is now 1530 feet deep and the drill is in limestone.——Two good drill strikes have been made on the Granby land at Smelter hill by the Granby M. & S. Co. ——It has been costing the Middle West M. Co. $1 an inch to sink a shaft near Joplin.——M. M. Smith and others of Joplin have taken a lease on ten acres of the Holton land, north of Joplin, and will prospect it for ore.——The Hancock M. Co.'s new mill on the Murphy land, south of Fairview cemetery, has been started up. ——J. H. Spencer and B. W. Lyon have taken a lease on forty acres, west of the old Spring City mines, and intends to prospect it.——W. T. Miller of Joplin has the contract to build a 100-ton mill on the Quaker Maid mine at Spurgeon.

The Montecillo mine and mill, near Prosperity, have been sold to R. M. Padgett and J. H. Schund of Chicago. The mine has been owned and operated by T. B. Amsden, T. Sawyer, J. Madeira and Al. Maness.——It is reported that the Sciota mill, on the Missouri Zinc Fields land, near Webb City, is to be remodeled and equipped with a hopper feed. Larger and heavier rolls are to be put in. The property is under the management of C. T. Orr.——The Express M. Co.'s new 100-ton mill at Neck City is nearly finished. The old mill and mine are being operated steadily.

Stone County.

Ten mills will be built in the Baxter Springs district this year, as follows: The Omaha, Perkins, M. K. & T., Ward & Co., Joanna, Dark Horse, Hobo, Boaz & Co., L. L. Wright & Co. and Strong Bow. Boaz & Co. have purchased the Monte Cristo mill at Galena and will remove it to their lease on the Crawfish land. The Hobo is having figures and plans made for a new plant. The Dark Horse mill is already under construction. The Joanna has shut down to build a mill. In addition to the ones mentioned the Mission M. Co. is contemplating a mill similar to the Yellow Dog mill at Webb City.—— Omaha parties have purchased the J. E. Wilson shaft on the Charters land, near Baxter. The shaft is down 47 feet. Machinery is being put in and sinking will continue as rapidly as possible.——The E. L. Wright M. Co. has made a contract which calls for the sinking of five shafts on their lease of the Crawfish land, near Baxter, and the erection of three modern concentrating mills.——The Spring River M. Co., south of the Joanna, is putting in a steam hoist.

MONTANA.

Lewis and Clarke County.

The Montana Electrolytic Reduction Co. has purchased the water plant of the Helena & Livingston Reduction Co., near Corbin, and the reduction works at the same place, where test work will be commenced, while the main plant, to cost $250,000, is being built. It is believed this plant will be located on the site of the Peck concentrator, near Helena.——M. Cavanagh of Helena, who has bonded the Sunrise group, 4 miles south of Helena, has placed men on the property.——The Whitlach M. Co. has sunk to the 500-foot level on the Whitlach-Union property, 4 miles south of Helena, and is cutting a station, from which crosscuts will be run.—— The Brooklyn Bridge Co., represented by Mr. Krueger, which has been developing properties 5 miles south of Helena, has commenced shipments.——M. Manuel of Helena is developing the Minnesota group, near Corbin. ——George Winter, who has a bond and lease on the Mammoth, at Clancy, has begun operations.——Kent & Cummings of Helena have bonded the Union mine, in the Elkhorn district.

Madison County.

Foster & Curran are working the Bull Dog mine, near Silver Star.

Missoula County.

The Monitor mine, near Saltese, is being pumped out preparatory to putting on a large force. Repairs to the road to the mine have been completed and the hauling of ore has commenced.

NEVADA.

Esmeralda County.

The smelter to be built at Sodaville by the Nevada Ore Purchasing, Refining & Smelting Co. is expected to be in operation within ninety days. The machinery, furnace brick, etc., have been shipped from San Francisco and Salt Lake and will soon be on the ground. The estimated cost of the mill is $182,000. It will have a capacity of 250 tons of ore a day and contracts, covering a period of two years, sufficient to keep the smelter running steadily, have been entered into with mine operators of Lida and Sodaville.——Satisfied with the tests that have been made during the last two months at Goldfield, it is reported that the H. L. Frank Co. is having plans and specifications drawn which will result in the construction of eight 5-stamp batteries with concentrators and cyaniding tanks. Power will be taken from the generating plant at Bishop Creek, Cal., but a gasoline auxiliary plant will be built at Goldfield to be used in case of accidents.

Lincoln County.

(Special Correspondence).—A small experiment plant, using the cyanide process, is testing the ores from the Red Cloud mine, 5 miles from Goodsprings. The average extractions have been successful, being 88% of the gold values.——G. Fitzgerald and party, developing gold-copper claims in the Kingston mountains, report high assays.——F. Williams is developing the Hoodoo lead-silver mine, near Sandy.

Sandy, July 11.

From Goodsprings Superintendent H. Hamy of the Chiquita group reports that good ore has been struck.

The Homestake mill at Deerlodge has been started after a complete overhauling and the addition of several new slime tanks. A. Myers has charge. ——Work will be commenced at the Wild Irish - Amethyst in Pike's Diggings by D. F. Kilbourne. S. P. Moore of Provo will be superintendent and G. A. Paxman of Silver City, Utah, will be assayer and metallurgist.

Lyon County.

J. Somers has resumed work at the Ludwig copper mine at Yerington, and will sink the shaft from the 500 to the 600-foot level.

Nye County.

In the double-hand drilling contest at Tonopah, Nev., on July 4, W. Bradshaw and W. R. Ross drilled 40⅝ inches in fifteen minutes. Bradshaw won the single-hand contest with 25⅛ inches.

NEW MEXICO.

Grant County.

The Burro Mountain district centers at Leopold, near Silver City. Here the Burro Mountain Copper Co., under the management of T. W. Carter, is developing copper mines. They have a concentrator of 140 tons daily capacity.——The Whitewater Copper M. Co. is working claims in the Burro mountains under the direction of C. P. Laughlin, president and general manager.——G. M. Sublett and E. G. Mahoney are arranging to start work on the Burro mountain properties, near Silver City.——The Alessendro Copper Co. of Silver City will start up its mines in the Burro mountains. ——The Comanche Co. is preparing to open its mines in the Burro mountains.——In the Bear Mountain district, 9 miles from Silver City, R. F. Clark is developing the Red Cloud mine.——H. S. Spense has returned to Grant county from England, where he interested capital in mines at Steeple Rock upon which development work is to be commenced.

Dona Ana County.

The new double compartment shaft on the Bennett-Stephenson mine at Organ is down 50 feet. It is to be sunk to a depth of 400 feet.

Sierra County.

The Moffitt M. & M. Co. intends to commence work upon mines in Kingston. The company has purchased machinery for a 50-ton plant.——Hillsboro people have organized a company, with J. F. Plemmons as general manager, to work the Palomas Chief mine at Hermosa. ——Ore hoisting has commenced on the 200-foot level of the Empire mine. The ore is being treated at the Bonanza mill.

OREGON.

Baker County.

In the double-handed drilling contest at Sumpter, July 4th, Engle and Henderson from the Platts mine drilled 33⅞ inches in fifteen minutes.

The Psyche mill, near Greenhorn, is running full capacity, ten stamps being run on Psyche ore and ten stamps on ore from the Diadem, an adjoining property. The Psyche has a large amount of ore blocked out, a part of which is of shipping quality and is sent to the Sumpter smelter. The Diadem is being put in shape for work.——The Snow Creek mine, near Diadem, has good ore on the 225-foot level, and the 10-stamp mill is running full time. The buildings that were destroyed by fire last March are being replaced.——The Greenhorn G. M. Co., operating at Worley, had twenty-three tons of its ore worked at the Psyche mill as a test, which gave returns of $18 a ton. A sinking plant has been ordered, which will be put in as quickly as possible. Meanwhile work will be continued on the tunnel level. ——The owners on the Salmon group, near Greenhorn, have decided to run a long crosscut tunnel to tap the ledge opened this winter by a prospect tunnel near the top of the hill. A compressor plant has been ordered. ——The Pyx mine, near Greenhorn, has begun operations under the supervision of C. Parker.——The Gold Coin, near Greenhorn, is being put in shape and will start July 15.——R. Godfrey and F. Conway have leased the Man of War claim, near Greenhorn.

Manager E. W. Messner of the Indiana mine, 28 miles from Baker City, has instructions to put in a heavier mining plant.

Crook County.

Construction of a mercury furnace for the Lookout mountain cinnabar property of the American New Almaden Co. has begun near Prineville.

Douglas County.

The Continental G. M. Co. of Portland have made arrangements to put in a mill at the Continental mine on South Myrtle creek. The lower tunnel is in 800 feet on the vein. Manager W. B. Stewart has charge.

On the Yellow Jewell, near Nugget, Superintendent Armitage has been sinking from the tunnel level.

Grant County.

Manager W. W. Gibbs, of the Copperopolis, near Prairie City, has the new concentrating plant ready for work. The plant consists of a rock breaker, Wild crusher, two concentrating tables and jigs, with 25 H. P. gasoline engine.——The Dixie Meadows, at Quartzburg, is making regular shipment of concentrates.

Operations in the Bull of the Woods, under direction of Superintendent E. P. Kennedy of the Badger Company at Susanville, have been opened this spring. Ten stamps were put in the Badger plant last winter for the Bull of the Woods.

Jackson County.

The Bliss mine, 3 miles south of Gold Hill, is being developed by the Bill Nye M. Co., who are driving a tunnel to tap the vein and also sinking a double-compartment shaft. Manager Andrus and Treasurer F. C. Bellamy are at the mine.

Josephine County.

The Overland M. Co. at Cable Cove is working a full force in good ore on the 250-foot level. The company has decided to place reduction machinery at the mine this summer. Secretary J. Fortin of Minneapolis is at the mine.

The Argo M. Co. has just finished a 5-stamp mill at its mine on the Galice creek, near Grants Pass. For the present it is only run on a day shift, but in a short time a night shift will be put on. The mill is operated by water power from Snake creek.——The Van Dorn copper property, at the mouth of Big Pickett creek, on Rogue river, near Grants Pass, has been bonded by the Golden M. Co.

SOUTH DAKOTA.

Custer County.

At the Clara Bell mine, 10 miles from Custer, work will be begun on a 10-stamp mill and cyanide plant.

Lawrence County.

The Hidden Fortune Co. at Lead temporarily stopped milling at its plant on the last day of June, as the ore on the south end of the property, mined near the surface, contained too much mud and mine work was too expensive on account of the wet weather. The mud could not be separated from the ore; it was necessary to pay freight on this worthless material, and when it was at the mill an excess of slimes gave trouble and annoyance. The company is considering leasing its mill.

Pennington County.

A crusher has been put in at the Golden West mill, near Rochford, by Manager E. J. Kennedy.

UTAH.

(Special Correspondence).—Mining operations in Utah are improving each month. With the big drainage tunnel once more in operation in Park City it will mean considerable to that district, as many of the mines depend to a large extent on this tunnel draining their ground, enabling them to work to a greater depth without pumping. It is understood the Keith-Kearns Co. will build a large mill near their mines to handle the ore from their property.——In the Tintic district the shipments have been greater than for several years past. The rates now being made by the smelters enable several of the low-grade mines to work at a profit. At Eureka especially a great deal of new work is being done and old abandoned mines being reopened. Robinson and Mammoth also show increased activity. In the southern part of the Tintic district, at Silver City, but very little is being done at present, but it is understood several of the properties will soon be operating. In this end of the district they encounter considerable water, which is rather expensive to handle.——The operators in the Mercur district are beginning to realize that the mines are not worked out, as heretofore reported, but that they are opening new ore bodies as development work progresses. In this district is found a large body of quicksilver ore, which is being made to pay the owners. It is also found that the old tailings dumps from some of the mills can be made to pay, and as a result the dumps are being put through the mill.——But little work is being done at present in the Sunshine district, although no good reason can be assigned for the district not being as prosperous as some of its neighboring camps. It is rumored that some of the properties will soon be in operation. —— Much work is being done at Kimberly, 200 miles south of Salt Lake City. The Annie Laurie Co., which is the principal mine of the district, has opened up another tunnel which promises to keep them in ore for several years, and it is understood the old mill will either be enlarged or a new one built to handle the ore from the mine. The Sevier Con. G. M. & P. Co. is also doing development work and preparing to erect a new mill.——In the Stockton, Binhgam and Newhouse districts everything is progressing as rapidly as possible. ——Generally speaking, the mining camps of Utah are in first-class condition, with the prospect of being much better in the future. With another large smelter about to be erected it will give the mines of Utah a good outlet for their ore.

Salt Lake City, July 11.

Juab County

The Raymond-Illinois mine is being put into condition to start work. Manager J. C. Sullivan will start operations on the 1500-foot level of the workings of the Raymond in both the north and south drifts.——J. Eustice recently shipped ore from the Emma Jane claims, 3 miles west of Eureka.——T. F. Singiser of Salt Lake, who has a bond and lease on the West Mammoth and Golden Ray property, will have a wagon road built to the mine from Eureka. Work has been commenced under the superintendency of W. Mathews, and the hoist and machinery now in use at the American Flag mine at Park City will be put on the property to sink the shaft.——The McKinley M. Co.'s tunnel is in 644 feet.

In the double-handed rock drilling contest at Eureka on July 4th, E. Lewis and J. Mingerotti drilled 37½ inches. J. Mingerotti won the single-hand contest by drilling 20⅝ inches.

Piute County.

The stockholders of the Sevier Con. M. Co., with properties in the Gold Mountain district, besides electing a board of directors, gave authority to this board to enlarge the company's present milling facilities. While the mill that has been in use at the mine has been doing satisfactory work, it is not large enough, as it was built for experimental purposes. Practically a complete new plant is to be built which will enable the treatment of 100 tons of ore per day. The officers for the next year are: S. W. Tulloch, Washington, D. C., president; W. E. Maison, Ogden, Utah, vice-president; E. H. Thorton, Ogden, treasurer. P. H. Maison was chosen as secretary and R. W. Foster, manager.

M. Krotki and J. F. Lyon have started a new tunnel on their iron property, north of Marysvale.

Salt Lake County.

In the double-handed drilling contest at Bingham on July 4th, T. Brady from the Yampa mine and W. Tasker from the Highland Boy drilled 31⅝ inches. In single-handed drilling, E. Thomas drilled 13⅝ inches.

The Beck tunnel of the Boston Con. is in 860 feet. The Ben Hur No. 1, the Ben Hur No. 2 and the Metropolitan tunnels have been started.

The Butler-Liberal M. Co. of Bingham state that their drain tunnel is 1542 feet long, 6 feet wide and 8 feet in height. In order to secure sufficient dump room they have run a single-compartment raise, with a manway and ore chute from the tunnel level to the surface, a distance of 237 feet. The Hart tunnel is in 364 feet.

J. M. Boutwell, in a recent Government report, says

that Bingham is the leading copper producing camp in Utah. The copper shipments are made up almost entirely of sulphide ores, in which low-grade primary sulphides, massive chalcopyrite and pyrite predominate. The grade is raised, however, by secondary black copper sulphides, including chalcocite, tetrahedrite and tenorite. Some argentiferous lead ores, mainly galena, are also shipped regularly. The copper ores yield accessory gold, silver and iron; the argentiferous lead ores, accessory copper. The copper content in the average sulphide ores is low, ranging from 2½% to 4½%; but the accessory gold, averaging from 10c to $1, and silver averaging from two to five ounces, raise the value of the ore. Zinc blende occurs in the argentiferous lead ores, but is not saved. The copper ores occur in large masses in metamorphosed limestone, and also in grains disseminated through monzonitic intrusives. The large bodies lie within massive marbleized limestones adjacent to intrusives and fissures. Associated with this ore in the coarsely crystalline marbleized limestone are the following minerals: Garnet, epidote, tremolite, sphalerite, specularite, pyrrhotite, etc. The ore bodies are in the form of lenticular beds lying roughly parallel with the bedding of the country rock, and exhibit a massive banded structure which is continuous with the bedding of the inclosing country rock. These beds are localized into elongated lenticular shoots which dip roughly with the bedding and pitch moderately. These shoots sometimes assume great size, being several hundred feet in length along their strike, nearly 200 feet thick, and have been followed downward continuously for several hundred feet. The disseminated auriferous copper ore occurs throughout extensive stocks of monzonite, but particularly in areas where it is fractured, fissured and altered. Irregular grains of chalcopyrite and cupriferous pyrite are there found in small veinlets, intergrown with secondary silica, sericite, etc., chiefly along joint or fracture planes, and subordinately in altered areas immediately adjacent to such planes. Definite shoots have not been proved. The argentiferous lead ores occur in veins filling fissures which trend northeast - southwest and traverse all kinds of rocks known in the district. The veins are widest in limestone and in shales which contain calcareous and carbonaceous matter. Their general structure is a rough banding parallel to the walls of the fissures, but these bands are not sharply defined, the minerals of one band being irregularly intergrown with those of adjoining bands. The relative distribution of minerals in these bands indicates that the general order of deposition from older to younger was sphalerite and tetrahedrite, pyrite, and galena, calcite, quartz, rhodochrosite, and barite.

Sevier County.

Work is to be resumed at the Perjue-Surprise claim at Richfield.

Summit County.

The Daly-Judge mill at Park City is likely to start up Aug. 1 and 200 men will be put to work in the mine.—— At the New York Bonanza mine, at Park City, work is being prosecuted on the 500, 600 and 700 levels.

WASHINGTON.

Clallam County.

According to R. Arnold, placer gold mining has been carried on since 1894 in the beach sands at different points along the west Washington coast, from about 10 to 23 miles south of Cape Flattery. During this period at least $15,000 has been taken from the district. The gold is derived from the Pleistocene sands and gravels, which cap the bluffs along this portion of the coast, being concentrated on or near the bedrock at the base of the bluffs by the action of the waves. The gold is accompanied by small amounts of platinum and iridosmine, the three being associated with magnetite and "ruby" (garnet) sand and small quantities of pyrite. Mining is carried on principally by the sluice box method, although where the water supply is limited, as at the locality 2 miles north of the mouth of the Ozette, rockers are used.

Stevens County.

During the last five months the Young America mine, near Bossburg, has shipped silver and lead ore to the value of $2000, says M. E. Jesseph of Spokane. The mine is worked by tunnel, the main tunnel being in 300 feet. The shaft is down 35 feet and will be continued to the 100-foot level.

FOREIGN.

AUSTRALIA.

Bendigo.

At the Catherine Reef United, Bendigo, a rich reef has been discovered at 2200 feet.

New South Wales.

Delprat's shaft of the Broken Hill Proprietary mine has been sunk to the 1020 level, and has been connected to the 800 and 1000 levels, and all the ore from these levels is now hauled through this shaft. All the stopes in the mine are well filled, most of the mullock being obtained as before—from the open cuts—but the tailings from the zinc plant are now used largely. The "crosscut" system of stoping in the heavy block ground at the 650 level, Block 12, has answered admirably, and no trouble has been experienced since this method has been adopted. The ore body discovered at the 800 level in Block 11 in 1903 by a diamond drill has continued to open up well, and is yielding good supplies of ore. No traces of the fire of 1902 were noticed, but to ensure thorough ventilation a large Capell fan, capable of handling 80,000 cubic feet per minute, has been put in underground with beneficial results. The permanent condensing plant has been running throughout the year with great success, and the old plant erected during the water famine is still working satisfactorily on the extraction engines. Three ball mills have been added to the ore dressing plant, and the electric motor continues to work well, handling the tailings on the dump. Superheaters have been added to the boilers, and automatic chain grate stokers are being put in. The salt cake plant originally built for handling 1000 tons of zinc tailings per week has been completed and enlarged, and is now in regular operation. In actual work, after certain modifications were effected, it proved equal to, and is at present treating, about 3500 tons of material weekly. The tailings of this plant, containing practically no metal, are sent underground for filling, and prove not only more economical, but also provide a superior material for packing the worked out ground, the filling being much closer than with ordinary mullock. The manufacture of sulphuric acid by the Carmichael-Bradford process has been elaborated since its establishment, and a second chamber of 100x20x20 feet added, and a third is in course of erection, together with Guy-Lussac and Glover towers. To the end of the year the company produced 470 tons of chamber acid, which is used for the manufacture of salt cake.

Queensland.

At a meeting of the directors of the Light of Day Prospecting Co., at Mount Morgan, it was decided to accept the offer of the Goldfields' Diamond Drilling Co. to bore 1000 feet at £1 1s. per foot. Mr. Sandstedt, who conducted all the drilling for the Mount Morgan G. M. Co., will have charge of the boring. The drilling operations at the Light of Day property, being next to the freehold of the Mount Morgan Co., will be watched with interest.

An official report says that the Hodgkinson gold field is almost deserted, many of the miners having gone to prospect for wolfram and molybdenite. The mines now working are the Hodgkinson, General Grant, Vulcan & Britannia, New Monarch, Homeward Bound, Southern Cross, Tyrconnel and Resolute and Home Rule mine at Woodville. The Cecil Syndicate recently put up a cyanide plant, which is now working. They are making preparations to put in a 20-head battery on their own mine. When the mill is finished the Cecil Syndicate will employ 100 men. The New Monarch is being worked by tributers, and since taking up the mine they have made £6 to £8 per man per week.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Boundary mines shipped in week ending July 8 as follows: Granby mines to Granby smelter, 13,018 tons; Mother Lode to British Columbia C. Co.'s smelter, 3776; Mountain Rose to British Columbia C. Co.'s smelter, 132; Oro Denoro to Granby smelter, 66; Providence to Trail smelter, 60. Total for week, 17,052 tons. Total for year, 476,473 tons. Following is the smelter treatment for the last week: Granby smelter, 13,250 tons; British Columbia C. Co.'s smelter, 3865. Total for week, 17,115 tons. Total for year to date, 487,965 tons.

Nanaimo District.

The Puget Sound Iron Co. has given a lease to Pittsburg men to work a part of the iron deposits on Texada island.

Nelson District.

G. O. Buchanan, lead bounty commissioner, reports for the fiscal year ended June 30 that the total lead production of Kootenay has been 55,752,019 pounds; 11,000 tons have been exported; the remainder, nearly 17,000 tons, has been smelted in British Columbia. The rate of bounty paid varies with the London price of lead, and is less for exported lead than for lead treated locally; $10 a ton in the first case, $15 in the second. He estimates that the total bounty to be paid will be about $340,000 out of the $500,000 set aside by the Government for this purpose.

Rossland District.

The Le Roi experimental concentrating plant has sent its first shipment of concentrates to the smelter. The test plant is to be kept in steady operation and the management reports that the process is operating in a satisfactory manner.——The winze driven on the main ledge of the Center Star has reached a depth of 190 feet below the ninth level and sinking has ceased. The next step will be the deepening of the shaft from the ninth level, which is to be commenced immediately.——The ore shoot found on the 1350-foot level and which extends down to the 1550-foot level of the Le Roi continues to be developed. A station is being cut at the 1550-foot level for the purpose of drifting along the shoot at that depth. The development of this shoot is most important.——Following are the shipments for the week ended July 8: Le Roi, 2000 tons; Le Roi, crushed, 150; Center Star, 2370; War Eagle, 1200; Le Roi No. 2, 260; crushed, 1400; Jumbo, 300; Spitzee, 150. Total for the week, 7630 tons; and for the year to date, 175,528.

Slocan District.

The Argenta wagon road has been completed. It is understood the Argenta Mines, Ltd., will put in a compressor and mill. There is some likelihood of the Lavina group, near Argenta, being worked.——The Silver Star M. Co., P. Maris of Kaslo, manager, is working twenty men at the Cork mill, which is running on ore from the Cork mine.

Vancouver Island.

On Howe Sound, 28 miles from Vancouver, the Britannia Copper Syndicate have completed the power plant and aerial tramway. The mines are 3 miles from the beach and consist of large bodies of auriferous and argentiferous copper ore developed by tunnels. A 21,000-foot Riblet aerial tramway, designed to handle 2400 tons of ore per day, connect the mine with the concentrating and shipping plant on the beach. The buckets have a capacity of 1000 pounds each. A direct current electric surface railway hauls the concentrates from the concentration buildings to the shipping bins at the wharf, and delivers timbers and supplies to the aerial tramway, a 35-ton capacity Westinghouse electric locomotive being used. The generating plant in the power house at the beach consists of two 250-kilowatt alternating current 3-phase Westinghouse generators, coupled to Pelton water wheels. A 250-volt direct current generator furnishes power for the direct current surface electric tramway. The alternating current will be used to run the aerial tramway motors, concentrator and crushing mill motors and for lighting. Water for power is brought 2⅝ miles from Britannia creek under a high head of 1600 feet. Each lengt of the steel pipe has been tested to withstand a hydraulic pressure of 1800 pounds to the square inch. W. Meredith is superintendent of the engineering and electrical equipment, and Mr. Carmichael general superintendent of construction for the Britannia Copper Syndicate.

CHINA.

The Far Eastern Review says that with the completion of the railway to Taokou, the coal deposits of Shansi and Honan will find an outlet to the coast. Since the work of Von Richthofen thirty years ago, it has been known that both anthracite and bituminous coal occurred in these provinces. Recently the Peking Syndicate has been engaged in their development. The new railway line, in connection with the Wei river and the Grand Canal, will make it possible to deliver the coal to Tien-Tsin at prices much below present charges for imported fuel. It is expected that the freight on railway and canal will amount to $2.45 per ton, while the cost of mining is estimated at from 25 to 60 cents. The present price for good European coal on the coast ranges from $7.25 to $9.75 per ton. The Peking-Hangkow Railway, now being constructed through the coal fields, will shortly afford a second outlet by means of the Yangtse river. When the necessary connections are completed, coal can be delivered to Nanking for about $2 45 per ton, and to Shanghai, which imports about 1,000,000 tons annually, for little more. The known coal fields of China are estimated to extend over 400,000 square miles. So far development has been altogether for local trade. The Kaiping, which extends for 20 miles along the Tien-Tsin-Newchwang Railway, is, on the whole, the best developed. It is said that in this field there are 60,000,000 tons in sight. In China the winters are severe, and, if cheap coal is available, people will buy it. At present only the wealthy can afford coal. At Po-tou, 468 miles from Wei Hai, anthracite coal from the Chinghwa mines is sold for $24.50 per ton, whereas with improved transport it should be sold for one-fifth of that price, at a profit of about $2.45 per ton. The numerous navigable waterways connecting with the Wei river and the Grand Canal will afford cheap transportation to a large, densely populated area. Shansi is said to be rich in iron ore, which occurs in the Coal Measures, and the local iron industry has also been developed. It seems likely that with the development of the fields and facilities of transportation, manufacturing industries of various kinds will be developed.

MEXICO.

Durango.

It is reported that the smelter of the American-Mexico M. & D. Co. at San Lorenzo will soon be increased in capacity, as an order has been placed for a 200-ton copper furnace. At present the smelter is running full capacity with its 100-ton copper furnace. A tramway is to be built from the mines to the smelter.

Chihuahua.

The Calera M. Co. is shipping zinc ore to Pueblo, Colo., from its Calera mine, 12 miles from Minaca. The company recently completed a narrow gauge railroad from the Chihuahua & Pacific's Guerrero Valley Extension to the mine. It is developed for zinc alone.

Jalisco

The San Rafael mines in the Parnaso district has been sold to H. H. Sawyer and associates of Philadelphia, Pa. —— The Paloma M. Co. has been organized in Springfield, Ill., to develop copper-silver mines near San Antonio de los Moran in Ayutla district. The company was promoted by J. Breckenridge, who will have the management. The company expects to put in reduction machinery.

Guerrero

The 200-ton experimental smelter of La Dicha M. Co. at Acapulco is almost finished. The survey and grading of the railroad from the mines to San Marquez has been completed.——The Guardena M. Co. is putting up a 16-stamp mill near Cayuca de Catalan.——J. G. Moylan contemplates putting in a power plant on the San Cristobal river for the Poder de Dios mine near San Cristobal.——The San Mateo mine near Taxco is being unwatered by E. du B. Lukis.——A concentrator is planned for the La Delfina mine at Chichihualcos.

Mexico.

The San Rafael Amparo and the Prestacion mines at Sultepec, which were abandoned by the Arcos Co. because of water, are to be unwatered and worked by a company being organized by J. B. Phipps.——Work has been resumed at La Quimaca mine at Sultepec by Compania Minera German Roth y Cia and at the Munoz by Telesforo Garcia.——At the Maria de Oro mine, near Morelos, a cyanide plant has been put in by J. R. Ambrosius.

Sonora.

The Monte Vista G. & S. M. Co. is preparing to start work 15 miles east of Cos station and 65 miles southeast of Douglas, Ariz., under the superintendency of C. E. Hanson, formerly of Wicox, Ariz.

RUSSIA.

According to Naphtha, the entire Russian production of crude oil in meter centners in 1904 and 1903 was:

	1903.	1904.
Balachany	14,520,893	13,437,728
Sabuntschy	37,746,063	35,515,554
Romany	19,646 706	21,917,995
Bibi Ejbat	25,764,022	29,670,958
Binagady	42,309	49,875
Totals	97,719,993	100.592,110

Production of naphtha from flowing wells in meter centners:

	1903.	1904.
Balachany	.....	.....
Sabuntschy	493,710	879,606
Romany	2,151,218	1,392,284
Bibi Ejbat	6,120,829	3,661,782
Binagady	.....	.....
Totals	8,765,757	5,933,671

Production of naphtha in pumping wells in meter centners:

	1903.	1904.
Balachany	14,520,893	13,437,728
Sabuntschy	37,252,346	34,635,948
Romany	17.495,478	20,525,713
Bibi Ejbat	19,643,224	26,010,776
Binagady	42,310	49,874
Totals	88,954,111	93,658,439

Commercial Paragraphs.

THE Abner Doble Co. of San Francisco, Cal., have the contract for the machinery for an addition to the hydro-electric plant of the Cramer Electric Co.

BULLETIN No. 2003 from the Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York, gives further information regarding the "Little Jap" hammer drill.

THE Iler Rock Drill Manufacturing Co. has been organized, capital $100,000, to manufacture the Iler drill. Officers: F. M. Iler, president; A. U. Magnan, secretary; F. C. Mulvaney, vice-president. Place of business, 1325 Blake street, Denver, Colo.

Obituary.

GILBERT JOHNSON, mining engineer with the Trinity Copper Co. at Kennett, Shasta county, Cal., was killed July 6, by a Mexican while surveying for the company in Mexico.

D. W. BALCH, for many years engaged in mining and mill work on the Comstock Lode of Nevada and the Mother Lode of California, died July 3d at Honolulu, H. I.

GEORGE STRAUGHAN, once manager of the Winterpeck mine in West Virginia, and interested in mines in Nevada and California, died recently in San Francisco, Cal., age 73 years.

Latest Market Reports.

SAN FRANCISCO, July 14, 1905.

METALS.

SILVER. — Per oz., Troy: London, 27 5/16d (standard ounce, 925 fine); New York, bar silver, 59¼c, refined (1000 fine); San Francisco, 59¼c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, $15.00; Lake, 1 to 3 casks, $15.00@15.25; Electrolytic, 1 to 3 casks, $15.00; Casting, 1 to 3 casks, $14.50@14.75. San Francisco: $16.00. Mill copper plates, $17.00; bars, 18@24c. London: £66 spot per ton.

The copper market remains unchanged, with a good healthy condition all around. Production is not influenced by any unusual conditions and the demand is normal. There is a slight gain in the visible supply, a noticeable feature during each summer, when isolated mines which are restricted more or less in their operations during winter months can work uninterruptedly. It is said that the domestic consumption is rather lighter than might be expected, but that shipments to China are very heavy, and no cause for these heavy importations of the metal by the Chinese has been assigned. Some believe that this heavy buying is for delivery to others through China, presumably Japan, but there is no confirmation of this idea.

Following are the figures of the German consumption of foreign copper for the months of January to May, 1905, compared with the same period of time for 1904 and 1903:

	1905.	1904.	1903.
Imports, tons	42,744	47,231	36,223
Exports, tons	5,324	3,239	4,739
Consumption, tons	37,420	43,992	31,484

Out of the above, 35,882 tons were imported from the United States.

LEAD.—New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.12½; San Francisco, $3.70, carload lots; 4¼c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £13 11s 3d ℔ long ton.

SPELTER.—New York, $5.40; St. Louis, $5.80; London, £24 2s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $31.25@31.50; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, ℔ lb., 35@37½c. London, £143.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $19.50 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER.—New York, $39.00@$40.00, large lots; London, £7 7s 6d; San Francisco, local, $38.00@38.00 ℔ flask of 75 lbs.; Denver, $45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20.75c; San Francisco, Plumbers', 100-lb. lots, 17.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.60; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@$23.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lbs. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ℔ set; 14 oz., 40s., 9¾c.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¼@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 62c; cs., 67c; raw, bbl., 60c; cs., 65c; Lucol oil, boiled, bbl., 54c; cs., 59c; raw-bbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

MOLYBDENUM.—Best, $2.75 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

URANIUM.—Oxide, ℔ lb., $3.50.

MERCURY.—Bichloride, ℔ lb., 77c.

TUNGSTEN.—Best, ℔ lb., $1.25.

PHOSPHORUS.—American, ℔ lb., 70c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¾c; less than 500 lbs., 8c.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MAGNESIUM.—Pure, N. Y., $1.60.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

HOSE COUPLING.—No. 793,869. July 4, 1905. Andrew H. Anderson, Kellogg, Idaho. This invention relates to a device which is designed for the detachable coupling of hose or like conductors. It consists of a house-coupling having two abutting sections of substantially equal diameter, a head upon one section chambered to receive the opposing end and having inwardly projecting pins, slots in the other sections, into which the pins are slidable, collars fixed upon said slotted sections, a sleeve slidable between the collars and having inwardly projecting pins, slots upon the head of the other section into which said pins are slidable, said slots having circumferential extensions into which the pins of the sleeve are turnable to lock the coupling.

FLY-PAPER HOLDER.—No. 793,871. July 4, 1905. Julius H. Bien, San Francisco, Cal. This invention relates to a holder for sticky fly-paper. Its object is to provide a holder for sticky fly-paper which will prevent the adhesive from running off the paper, protect the hands in handling the paper, allow the paper to be stood on edge or held at an angle when in use, enable the paper to be folded and pressed tight together into a small compass for packing and shipping purposes, and which will operate to exclude moisture from the paper when stored in stock. It consists in the combination with a sheet of sticky fly-paper of a flexible backing therefor having sides and end flaps adapted to be folded over and united directly to the sticky edges of the sheet of fly-paper and forming a non-adhesive border around the same, the side flaps of said border having central incisions as to permit the sheet and backing to be folded in book form.

FRICTION CLUTCH. — No. 793,927. July 4, 1905. William H. Fulcher, Oakland, Cal. This invention relates to a clutch mechanism designed to readily unite or disengage revoluble parts. It consists of a plurality of circular segments forming one member of the clutch, an exterior shell forming the other member, and mechanism by which the said segments are simultaneously expanded within the shell to produce the grip and unite the two members or correspondingly contracted to release the grip and allow either member to be moved separately. Its object is to provide a clutch which is especially designed for the driving of machinery of any description and particularly such machinery as is operated under heavy stresses.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JULY 4, 1905.

793,869.—HOSE COUPLING—A. H. Anderson, Kellogg, Idaho.
794,071.—SURVEYING INSTRUMENT—J. Barbon, Portland, Or.
793,633.—BOAT—J. W. Beall, Laton, Cal.
793,817.—TRACTION ENGINE—J. H. Beckner, Seattle, Wash.
793,871.—FLY-PAPER HOLDER—J. H. Bien, San Francisco.
794,141.—FOLDING STEP—J. S. Coxey, Aberdeen, Wash.
793,820.—TELEPHONE—N. E. Damico, Redlands, Cal.
793,827.—RAILWAY SIGNAL—H. M. Davenport, Long Beach, Cal.
793,828.—SHELF—W. L. Dunn, Buckhorn, Cal.
793,829.—WALL STRUCTURE—A. W. Eager, Los Angeles, Cal.
793,830.—GAS GENERATOR—Eichler & Becker, San Francisco.
793,927.—FRICTION CLUTCH—W. H. Fulcher, Oakland, Cal.
793,722.—CURRENT MOTOR—P. Henrichs, Clarkston, Wash.
794,110.—FRUIT GATHERER—C. Hertz, San Francisco.
793,839.—RAISIN STEMMER—J. T. Latta, Selma, Cal.
793,845.—TELEPHONE—F. B. Long, Los Angeles, Cal.
794,151.—ADHESIVE DEVICE—R. C. Lowry, Seattle, Wash.
793,728.—BINDING STRIPS—B. F. Mackall, San Francisco.
793,673.—FOLDING CHAIR—F. T. B. Mann, San Diego, Cal.
793,795.—BRIQUETS—H. E. Marsh, Los Angeles, Cal.
793,889.—VALVE—J. C. Martin, Jr., San Francisco
793,797.—FORMING GLASS—D. Murray, Seattle, Wash.
794,119.—HOE—A. Richardson, Milton, Or.
793,690.—COUPLING—K. P. Snyder, Pasadena, Cal.
793,862.—SASH CLOSER—A. C. Van Doren, Seattle, Wash.

Dividend Notice.

Mutual Savings Bank of San Francisco,
710 MARKET STREET

For the half year ending June 30, 1905, a dividend has been declared at the rate of three and one-quarter (3¼) per cent on all deposits, compounded semi-annually and free of taxes, payable on and after Saturday, July 1, 1905.

GEO. A. STORY, Cashier.

Dividend Notice.

SAVINGS AND LOAN SOCIETY,
101 MONTGOMERY ST. COR OF SUTTER.

Has declared a dividend for the term ending June 30, 1905, at the rate of three and one-half (3½) per cent per annum on all deposits, free of taxes, payable on and after Saturday, July 1, 1905.

EDWIN BONNELL, Asst. Cashier.

Dividend Notice.

SECURITY SAVINGS BANK,
316 MONTGOMERY ST.

For the half year ending June 30, 1905, dividends upon all deposits at the rate of three and one-quarter (3¼) per cent per annum, free of taxes, will be payable on and after July 1, 1905.

FRED W. RAY, Secretary.

Dividend Notice.

THE CENTRAL TRUST COMPANY OF CALIFORNIA,
42 Montgomery Street, Cor. of Sutter.

For the half year ending June 30, 1905, a dividend has been declared on the deposits in the savings department of this bank, as follows: On term deposits at the rate of 3 6-10 per cent per annum, and on ordinary deposits at the rate of 3¼ per cent per annum, free of taxes, payable on and after Saturday, July 1, 1905. FRANK J. SYMMES, President.

Dividend Notice.

DEBENTURE SURETY COMPANY, RIALTO Bldg., Cor. Mission and New Montgomery Sts., San Francisco, Cal., has declared a monthly dividend for June (No. 26) of five (5) cents per share on its issued capital stock, which will be paid at the office of the company July 10, 1905.

Dividend Notice.

A dividend at the rate of ten (10) per cent per annum has this day been declared upon the capital stock of THE FIRST NATIONAL BANK OF SAN FRANCISCO, CAL., for the six months ending June 30, 1905, payable on the 10th instant. Transfer journal will be closed on the 7th and 8th instants.

JAMES K. LYNCH, Cashier.

San Francisco, July 5, 1905.

FULLY ONE HALF

the price paid for high-priced FANCY PACKING is wasted. There is none better than "EUREKA"—few, if any, so good—and it is but about ONE-HALF the price. Every dealer will furnish it. Be sure though to name GENUINE "EUREKA."

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tells at once if engine is doing its duty, and how to correct the trouble. They are moderate in price.

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HINE STEAM SEPARATOR.

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MINING AND SCIENTIFIC PRESS.

Whole No. 2348.— VOLUME XCI. Number 4. SAN FRANCISCO, CAL., SATURDAY, JULY 22, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

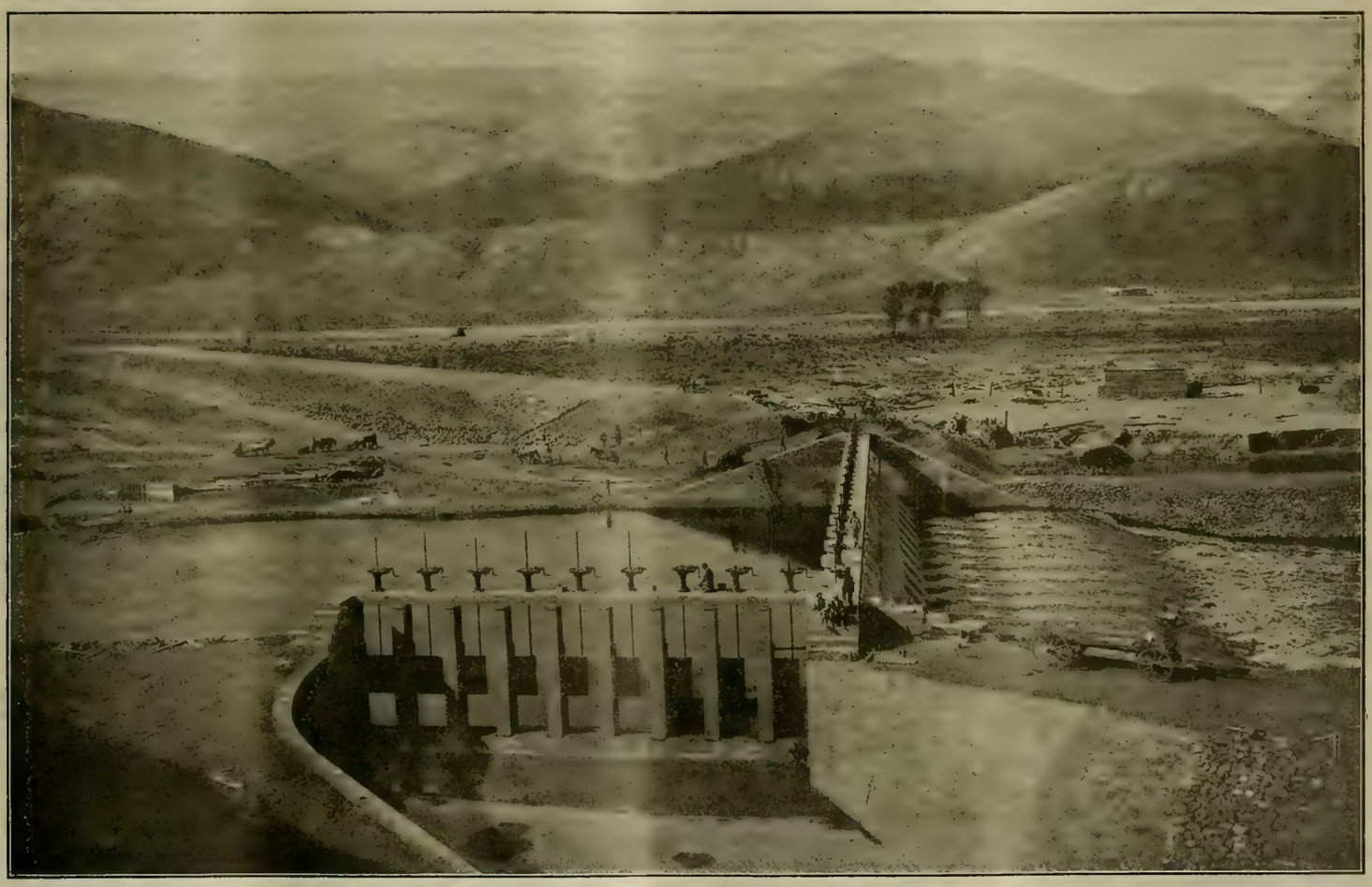
Value of Geological Knowledge.

A knowledge of geology is as essential as a knowledge of mining methods themselves. There are many expert miners who are capable of handling difficult undertakings in mining work and who can carry that work to a successful termination; but all good miners are not geologists, and a lack of a knowledge of even the rudiments of structural geology on the part of a mine manager or superintendent has not infrequently cost mining companies large sums of money. One curious fact in connection with such cases is found in the sublime confidence the miner places in his own judgment when lacking this essential training. He does not know much, if anything, of geology, but he is not aware how much he lacks in this, and, when such is the case, he probably never will know it. There are abundant illustrations of the necessity for geological knowledge, as well as a practical knowledge of mining. The mine superintendent who ran a long tunnel and then sunk a shaft in black clay slate, thinking it was coal, is an exaggerated example of this sort of miner; but he is little worse than he who ran a tunnel to reach a flat shoot of ore which cropped out on the surface in a later and unconformable formation. When he failed to find the ore, he sunk a winze and did a great deal of crosscutting in search of the vein, which, of course, he never found. A third mine superintendent started a shaft in the debris of the hillside in which occurred a quantity of float. The shaft was started lower than the apex of the vein, and, as the vein pitched into the hill, he never found the ore body. In another instance the mine superintendent started a shaft on the top of a rounded hill, fully 100 feet higher than the collar of the shaft of a mine half a mile distant. In the latter shaft a rich, flat ore body was encountered at 200 feet from the surface. The first-mentioned shaft was sunk 300 feet and nothing of value found. The reason was at once apparent to anyone having even rudimentary knowledge of geology—the collar of the shaft, though higher than its neighbor, topographically, was about 400 feet lower on the geological horizon, owing to a fault which passed between the two shafts. These are only a few of the mistakes made by first-class miners owing to their having little or no knowledge of geology. More serious errors than any of those here mentioned have been made, and those of lesser importance are of daily occurrence.

It is not enough to study ore deposits within themselves, but to also acquire a general knowledge of stratigraphical geology and the relation of ore deposits to the formation in which they occur, and also the dynamic and structural conditions affecting the deposit since its formation, each of which is important, and a knowledge of these conditions is as essential to success as experience in breaking rock and handling men.

The Detection of Salting.

A great deal of space is devoted by mining journals and the transactions of technical societies to methods of mine sampling. The engineers who are called upon to sample mining properties have various ideas on this important subject, but any of those laid down on common sense lines will give satisfactory results, if the necessary care be taken. It would be quite as interesting if the engineers would give some of the details of methods employed to prevent salting, or to detect the fraud if it is attempted. In some cases the mines are salted, and so deftly is this done that the sampler would not suspect it. There is always the likelihood that the experienced engineer will first make a new rock exposure and cut a channel for his sample that has not been reached by the salter. In most instances successful salting has been accomplished after the samples have been broken down and sacked. Where a large number of samples are taken, it is a physical impossibility for the engineer to keep these samples with him. He must find a secure place in which to put them, pending the final grinding down, quartering and assaying. It is in this supposedly secure place that the salting is sometimes accomplished, and it is to guard against this, or, in fact, any tampering with the samples at any period of the operation, that an absolutely dependable method is desired by the engineering fraternity. Different engineers have their own methods for detecting salting, and of providing checks against salting; some of these are ingenious, and some of them afford a false security. The plan mostly depended upon is that of personal surveillance of the sampling and of the samples from the time they are broken down upon the canvas.



The Dam and Gates on the Truckee River, Nevada. (See Page 61.)

THE discovery of a new diamond-bearing pipe or crater in South Africa is announced. Diamond mining has now been successfully carried on there for thirty-five years, and at one time, several years ago, it had become the generally accepted belief that no new deposits or pipes of diamonds would be found. Within the past ten years there have been a number of important new discoveries, and still others are being made. This latest discovery was made in prospecting for coal and is but one of several recent diamond discoveries made in the same manner by means of bore holes.

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J. F. HALLORAN.....Publisher

SAN FRANCISCO, JULY 22, 1905.

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THE mine owners of the Cripple Creek region of Colorado are again experiencing a great deal of trouble with ore thieves, and the complaint is made that there are unprincipled assayers in the district who buy the stolen ores. The chief difficulty in the prosecution of these cases has always been, not only in Cripple Creek, but in high-grade districts elsewhere, that the plaintiffs were unable usually to prove the identity of the ore. It will be remembered that ten years or more ago a similar condition prevailed in the Cripple Creek district, at which time a number of assay offices, supposed to be recipients of stolen ores, were dynamited.

Wholesale Location in Alaska.

For several years past complaints have come from Alaska concerning the wholesale location of mining claims by agents in that Territory without any assessment work being performed. Alaska, being without a legislative body, the mineral lands are taken up and held under the Federal statutes. The miners, presumably, may make local laws governing the location of mining claims, not in conflict with United States laws, and fix a minimum amount of work to be performed within a stipulated time as a part of the act of location. The several States have this privilege, and some of them have wisely enacted laws of this character. The several State courts, and United States Supreme Court as well, have recognized the force of laws and rules made by the miners of local organized mining districts as well as the State laws, and there seems a remedy for the existing condition in Alaska, where a few men locate large tracts of land for non-residents, but perform no work upon these locations. Judge Wickersham, of the Fairbanks district, has made a ruling requiring a bona fide discovery as a precedent to location, but this ruling, while seemingly sufficient to meet the exigencies of the case, really goes no further than the requirements of the Federal statutes, and the remedy appears to lie in local rules made by the organized miners of the several districts.

The Cost of Mining.

In statements made by mine superintendents in official reports and elsewhere, unless the conditions under which these costs obtain are stated in such a manner as to be fully understood by one unfamiliar with the situation, the figures are of little use for the purpose of comparison with costs in other places. Each mine superintendent or manager aims to make his mining costs as low as possible. Some give the fullest possible information, but the reports of others are more vague and ambiguous. If taken as stated, without careful analysis, the figures often impress the reader with the economy which has evidently been practiced at the mine in question. For instance, the cost of shaft sinking in an itemized statement is apparently $40 per foot, when some important details, such as the cost of supplying air to drills, cost of repairing drills and expense of power in hoisting, have been omitted. These items added may bring the cost up several dollars per foot. In driving a drift, the same thing is sometimes noticed. Machine drills are used, good progress is made and the expense is surprisingly low, but, on analyzing the expense account, no charge for power for air compressor is made, which will raise the cost substantially. To appreciate the cost of mining per foot, or per ton, requires a definite knowledge of every factor which has an influence on the cost of the work. Among these are the cost of power, of whatsoever kind, and its efficiency, cost of labor and supplies, character of the ground, ventilation of the mine and its cost, and so on through every item of expense, including general expense, which is often omitted, for the reason that this is charged up under some particular department, which is not connected with the operation in question.

It is always interesting to know the cost of mining and milling at any particular place, but this knowledge has no real significance as applied to some other place, unless it be known that the two places being compared are very similar when viewed from a general standpoint.

In a certain district a superintendent of an operating mine was asked the cost of sinking a three-compartment inclined shaft at his mine. He said he could sink such a shaft for $45 per foot, and had actually done so. This placed another superintendent in his neighborhood in rather a bad light, for the second man had stated that he considered $65 a reasonable figure for sinking a three-compartment shaft on a mine within a mile of that managed by the other. This discrepancy was wholly due to the fact that no explanation of the sort of shaft contemplated was offered.

The fact was that the first had sunk an inclined shaft on a soft fissure at something less than $45 per foot, and the second based his estimate on sinking the shaft in the hard country rock. In either case the respective figures given were approximately correct, but without detailed knowledge of the situation it is as impossible to judge of the relative merit of an expense account of mining operations as it would be to estimate the cost of any undertaking of the kind in ground entirely unknown.

Nothing exemplifies this statement better than the fact that conservative mining companies, whose affairs are in the hands of excellent and experienced managers, sometimes set aside stated sums to perform some particular operation, such as driving a tunnel or sinking a shaft, and find that their calculations were entirely at fault, and that owing to unseen and unanticipated conditions, the expense is far greater than was provided for.

When a piece of mining work is done the expense sheet should show every detail under which the work was accomplished. Included in this should be stated the number of men employed in the various tasks; whether machines were used or not, and how many; the size and kind of machine; air pressure at the drill; number and depth of holes drilled; time drilling, and amount of powder used. The progress made daily under these conditions gives a fair idea to an experienced man of the character of the rock passed through, though he may never have seen the place. The method of cleaning up after blasting and the number of men employed in the work also will give an idea of how efficient this class of labor is. Tramming, or transportation by other means, requires attention, and the framing and placing of timbers is an item often of importance, for rock hard enough to justify the use of machine drills does not always stand well after breaking. Superintendence, incidental and general expenses must be included.

These are some of the items of cost in mining, which, when followed out on this line and are faithfully and wholly given, form a valuable means of information as to the cost of mining work, and they may be used to advantage in the conduct of similar operations elsewhere. Statements of mining cost which do not include such itemized details are merely interesting in a general way without being of particular value.

Shaft sinking on the Rand in South Africa has been reduced to a science and some phenomenal work has been accomplished there; but no one will claim that there are not as good and capable mining engineers in America as there are on the Rand—indeed, some of the best and fastest work accomplished on the Rand has been under the direction of Americans; but no one has ever heard of a large shaft being sunk and timbered in America at the rate of 230 feet per month. This has been accomplished in the Rand, and every miner knows that there must be some great advantage in the physical conditions on the Rand to make this high rate of speed possible. And yet, strange as it may appear, with the rapid rate of progress, with the cheap Kafir and coolie labor on the Rand, the cost of sinking these deep shafts is much higher per foot than work on shafts of similar size and depth in the United States. What these South African shafts lose in direct cost is, however, more than offset by the speed and time saved, which reduces the interest charge on capital invested.

Cost of Transportation.

Many of the mines of the northern Black Hills, South Dakota, are so situated that it has been found necessary to place their mills at a distance, often of several miles, from the mines, the ore being hauled by the railroad companies to the mills of the several companies or to custom mills. An official report recently issued by the Dakota Mining & Milling Company shows that, although the property was vigorously worked and the mill kept employed, the heavy cost of mining, transportation and milling absorbed all the revenue derived from these operations, the transportation costs being an important item of this expense.

The company's mines are at Bald Mountain and the 30-stamp, wet-crushing cyanide mill at Deadwood, about 8 miles from the mines. The ores are worth nominally about $5 per ton, and, considering the good showing of profit made by some other similar mines where the ore is no better, but where the transportation problem is not a factor, the company owning the mills at the mines, it is evident in the case of the Dakota Company that the railroads are the only ones who derive a substantial benefit from the operation of this mine. There are several mills in Deadwood which treat ore from the mines at Bald mountain and Terry's peak, and, unless lower rates of transportation are made, it is said all of these mills must close. Water is scarce in the Bald mountain and Terry's peak region, these mountains being at the highest part of the drainage area, and it is therefore inexpedient to place the mills at the mines. There are instances of record where mining companies similarly situated constructed a local railroad and have hauled their ore a distance of 6 miles—nearly as far as in the case above cited—for 12 cents per ton. In the Dakota case it should not exceed 20 cents on a road owned by the company—that is, for the actual expense of ore transportation. Interest on the cost of the railroad and the expense of keeping up the road would increase the cost somewhat; but even so it would be far less expensive than it is at present. The Homestake Company fully demonstrated the value of owning its own narrow-gauge railroad more than twenty years ago. When a proposition of this character is too large for a single company to undertake, the combination of several neighboring companies for the purpose is not by any means a new idea. There is usually a way to circumvent extortionate charges for any service, and combination is usually the best means of accomplishing the desired end. A somewhat similar state of affairs is threatened in Cripple Creek, Colo., where it is now reported the several transportation companies are about to combine their interests.

CONCENTRATES.

WHEN copper is strongly heated before the blowpipe, the flame assumes a green color, which serves to distinguish the presence of that metal from others.

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ABOUT 700 tons of tin-bearing ore concentrated at Tinton, South Dakota, produced eight tons of cassiterite. This is equivalent to about $4.75 per ton of ore treated.

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CRYSTALS of baryta are comparatively rare, although crystallized baryta is common enough. All quartz is crystalline, but all quartz does not occur in the form of crystals.

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ORDINARILY ores which have been roasted concentrate more readily than raw ores, as all the minerals present lose in weight by the roasting, excepting gold and silver.

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A COPPER SULPHIDE ORE which also contains zinc blende can usually be successfully treated so that the zinc may be separated from the copper and iron by electro-magnetic separators.

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SULPHUR is contraband in time of war, and a neutral power cannot furnish sulphur to either belligerent nation. The uses for sulphur are increasing. In the United States sulphur is made from pyrite, about 50% of sulphur used in the United States being from this source.

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IT would not be advisable to build the cyanide plant on a mine dump, or other fill, as it is almost certain to settle and cause much trouble, particularly should the tanks overflow, or the ground become wet from any cause. Tanks must always be provided with a secure foundation, and this can not be found on a fill.

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ORDINARILY no use is made of the power developed on a brake incline or gravity tramway, the energy thus developed being offset by the brakes. A certain amount of power may be derived from the excess energy developed by the downward loaded car, which may be taken from the shaft of the drum at the head of the tramway.

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AN attempt to smelt raw concentrates with hot blast was made at Anaconda, Mont., some time since, but the idea was abandoned. A 35% matte was produced, but this was too low-grade for converting at Anaconda. By resmelting, the grade of matte was raised to 45%, but elimination of the iron was not further affected by means of the hot blast.

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A SERIES of drops in the apron plates of a stamp battery is generally acknowledged a good thing. The drops or steps should not exceed ½ inch in height, or the falling sands will have a tendency to scour the plates. Shaking amalgamating plates are also often of service in saving particles of amalgam on gold which become detached and are likely to be carried away by the flow of pulp.

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WHERE the vein outcrops 500 feet higher than the proposed tunnel site, and the slope angle of the hill is 30° and the distance on the slope 1000 feet, it will require a tunnel 866 feet long to reach a point under the croppings, and if the vein dips into the hill at a uniform angle of 60°, it will be cut by driving the tunnel 288.65 feet farther, or a total of 1154.65 feet. This will reach the vein 577.3 feet deep on the dip.

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WHERE the vein is wide and is stoped from wall to wall and will stand in large stopes without timbering, filling should be run in before the size of the excavation proceeds too far, as there is danger of collapse if the stope becomes too large, there being a limit to the extent that ore may be removed. The work of mining should be so planned as to make the filling of such stopes easy of accomplishment and at little expense.

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THE metallurgy of zinc is of comparatively recent origin. For several centuries prior to 1700 the metal was known, but it appears to have been rather the result of accidental reduction from some of its ores, rather than the outcome of method. Zinc was first reduced commercially at Bristol, England, about the middle of the 18th century, where it was distilled from its ore smithsonite. The normal ore is sphalerite, commonly called zincblende, blende and blackjack.

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LOOSE earth when piled in an embankment invariably shrinks, the shrinkage being from 3% to 15% dependent upon the character of the material in the embankment. The liability to shrinkage is reduced somewhat if the embankment be built in thin layers, placed one above the other. Rock dumps shrink in the same manner, but in a somewhat less degree than loose earth. All embankments built in dry weather shrink more than those built during wet weather, or of wet material.

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WHETHER a proposed shaft shall be an incline or vertical is a matter which the existing conditions should determine. If the vein dips at 50° or less, it is usually better to sink an incline either on the vein or in the foot wall country rock. For permanency and the minimum trouble in the future the foot wall shaft is most desirable, and is advisable under almost any conditions, while in some instances it is foolhardy to sink it elsewhere. For veins of high inclination a vertical shaft in the hanging wall is proper.

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A CUBIC FOOT of quartz weighs about 165 pounds, and a cubic foot of quartz sand weighs about 100 pounds. A sand which has not been sized—that is, sand of approximately uniform size of grains—weighs less than a natural sand in which the grains are of many sizes, as in the latter the smaller grains help to fill the interstitial spaces. A cubic foot of moist sand will weigh somewhat less than a cubic foot of the same sand when dry, but a sand that is perfectly wet and the voids full of water weighs more than the sand when dry.

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QUARTZ does not act as a cementing material for granite. Silica often is deposited in fragmental and other rocks, and then acts as a cementing material, of which the recrystallization of quartz grains in quartzite is the best example. By this process a quartzose sandstone becomes a dense quartz rock, to which the name quartzite has been given. Slates and schists are frequently rendered highly siliceous by the infiltration of silica. In some instances the silica replaces some original constituent, such as feldspar or calcite.

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SO far as known to "Concentrates," there is no "divining rod" or other reliable device for the discovery of veins of gold, copper and silver, and any one making a claim that he has an instrument by the use of which he can find veins and distinguish between veins of the various kinds of metal, is presuming on the credulity of those giving attention to such representations. An instrument known as the dipping needle has been used for years in locating hidden deposits of iron ore. Magnetite strongly influences the dipping needle, which is similar to the ordinary magnetic needle of the compass, excepting that it is suspended so as to move vertically instead of horizontally.

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THE choice of method of concentration of copper ores by wet or dry methods is partly dependent on physical conditions and partly on cost and the result of the operation. It is comparatively easy to concentrate by hydraulic methods, copper sulphides from a quartzose gangue, or from a kaolinized feldspathic gangue, but to successfully concentrate by this method a low-grade (1% to 2% copper) ore, in which the principal constituents are pyrite, pyrrhotite, zinc and altered magnesian material, is quite another matter. This latter class of ore might be worked in with other and higher grades of ore in the blast furnace, but no success need be anticipated, financially, by treating it otherwise.

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BY magmatic separation or differentiation is meant the separation or segregation of certain portions of a molten magma from the mass, upon cooling, thus forming a distinct deposit. Chromic iron in serpentine is an example of this type of ore deposit. So also is the occurrence of masses of magnetite in certain basic rocks, such as peridotites. Metasomatic replacement is an entirely different phenomenon, and may occur ages after the rock, in which the process takes place, was formed. The ore deposits in Leadville, Colo., are a typical example of the replacement of limestone by the sulphides of iron, lead, zinc, copper, etc. The rich ore bodies found in that district are the result of secondary enrichment. Ordinarily where replacement has taken place the normal grade of ore is low.

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IN the roasting of a base and complex ore, containing iron sulphide, zinc blende, copper sulphide, arsenic, antimony, etc., numerous chemical changes take place, and these sulphides are mostly converted into sulphates and oxides. Copper sulphide, upon roasting, becomes copper sulphate, when oxygen is present. Thus: $CuS + 4O = CuSO_4$. In roasting ores the copper is partly changed to sulphate and partly to oxide. The iron sulphide acts in the same manner. Zinc will be formed from the sulphide and part of it will be volatilized. Galena is changed into a subsulphide of lead and lead sulphate, and arsenic will be volatilized and a portion will be oxidized and in this latter form combine with metallic bases to form arsenates, and antimony acts in the same manner. In roasting such ores the heat must be low at first, and never very high, for success in further treatment.

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THE cause of there being so much iron in the gold bullion cannot be readily explained from the data furnished. It may be due to the use of too much copper sulphate (bluestone) in the pans, though the information given does not state whether bluestone is used at all in the pan. Another possible reason for the presence of this iron may be due to improper cleaning of the amalgam, which would naturally mechanically combine a large amount of fine iron particles ground from the pan bottom and the muller. The amalgam after squeezing through canvas should be placed in a wedgewood mortar and ground with a wedgewood pestle, with the addition of several times the weight of amalgam of clean quicksilver, and a little water to cover the surface. By this means the iron is freed and rises to the surface of the quicksilver, and may be collected by means of a magnet. If these propositions do not explain the presence of the iron in the retorted gold, send full information as to the process of treatment in the pans, stating what chemicals are added, and all the conditions under which the amalgamation is accomplished.

ANNUAL assessment work on unpatented mining claims is not required to be performed in any particular manner, but must be of such a character as to show a substantial evidence of good faith on the part of the claim holder, and not be of such a sort as will give rise to any doubt as to its purpose. The placing of machinery, construction of buildings, tramways, ore bins and chutes and other permanent improvements are all admissible as assessment work, as much as work of excavating in the vein, sinking a shaft, or driving a crosscut tunnel to reach the vein. It is not necessary that the work be done within the lines of the claim, for a tunnel, for instance, may be driven to reach the vein in depth, which has its mouth outside the claim. This work may be done on an adjoining unpatented or a patented mining claim, or on adjoining agricultural land. Work may also be done in one place for the development of several contiguous claims, if it is clearly for the benefit of all the claims.

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WHERE manila rope is used in transmitting power the grooves must be carefully turned so as to fit the rope. When the groove has too small an angle for the size of rope employed, the rope is forced down into the groove, creating unnecessary friction. In practice it has been found that a groove having a 45° angle is satisfactory. The rope should not touch the bottom of the groove, and the size of the groove should be such that the center of the rope is somewhat above the lines of contact of the rope with the sides. The angle of the groove remains constant, no matter what the diameter of the rope, though the flat space at the bottom of the groove will vary in width with the diameter of the rope used. The grooves vary in depth as they do in width. A groove suitable to run a 1-inch rope is ½ inch wide just above the bottom, and one suited to a 2-inch rope is 1 inch wide just above the bottom space. Grooves should not only be turned smooth, but should be polished as well to lessen the friction, and also to obviate any tendency on the part of the rough sides of the groove to cut the rope. The inequalities left by the turning tool, though small, are nevertheless sharp, and quickly cut a manila rope, fiber by fiber, until the rope is destroyed. Any imperfection in the wheel casting, such as sand or blow holes, will injure a rope seriously in a short time and should be looked after, and filled with iron cement, if present.

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WHEN contemplating the building of an inexpensive dam in a creek, or river, as mountain streams are frequently called, the material of which the bottom of the stream and its banks are composed is a matter of importance. If the bottom be soft and loamy, a dam may be built of logs laid in tiers lengthwise of the stream. The first layer is placed and weighted down with earth or boulders, and the second layer placed on top of the first, but somewhat further up stream, so that from 3 to 6 feet of the first tier projects beyond the second. The third tier is laid still further back, and so continuing until the logs have reached the proper height, when the inner or upper side of the dam is filled in with abundant rocks and earth. At the sides a crib is built into the bank, filled with stones. Another form of dam is that of the crib, filled with stones and earth. The inner slope of dams built of logs, brush, rock and earth should not be greater than 30°—2 in 1—and the outer slope not greater than 75°, but the dam must be so built that it will not undercut from the washing away by the water overflowing the crest of the dam. Dams are often built in a curved form or that of a V, with the point up stream. In small streams a log may sometimes be thrown across the stream and boards driven downward like sheet piling pointed up stream, the earth being piled upon the boards. A dam of this kind can hardly be expected to resist floods, as the planks cannot usually be driven down securely enough to make the construction durable.

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THE theory of the lixiviation process for silver ores is based on the fact that silver chloride, antimonate and arsenate are soluble in a solution of hyposulphite of sodium or calcium, and that silver may be precipitated from such solutions by means of calcium or sodium sulphide. Where the ore contains lead in the form of sulphate, this is also soluble and will be precipitated by the same reagents as the silver, but the lead may first be precipitated by means of sodium carbonate as carbonate of lead, and the solution then drawn off and the silver precipitated. An ore of silver, where the values are chiefly chloride or chloro-bromide, which largely breaks up into fines upon being shot down in the mine, may possibly yield a large percentage of its silver values by the lixiviation process without further crushing. Some experiments along these lines should be made, with a view to making a practical test. If the ore will not yield a satisfactorily high percentage in this manner, it should be crushed sufficiently fine, with rolls, without much expense, being already in a comparatively fine state. The percentage of extraction of gold present in the silver ore varies, being higher on low-grade material (less than one ounce gold per ton) than that which is high grade. Where it is necessary to roast ores in a gangue largely calcite, it is better to treat the ores by amalgamation than by hyposulphite solutions, as the caustic lime formed in chloridizing the silver has the effect of reducing a part of the silver to metallic form. Where the ore is naturally chloride, having been reduced to this state by nature, and it occurs in lime, there should be no difficulty, as the lime is in the form of carbonate, and not oxide.

Vein Outcrops.

Written for the MINING AND SCIENTIFIC PRESS.

There is nothing in the development of a mine more interesting, and, at the beginning of a mine's history, of greater importance to the prospector than the outcrop of the mineral deposit or vein. All veins do not reach the surface, and it may therefore be safely assumed that there are many valuable deposits and veins of payable mineral which have not been discovered, and some which never will be discovered, being buried beneath hundreds and, in some cases, thousands of feet of volcanic or other debris. In a region like that cut by the Grand canyon of the Colorado in Arizona, for instance, the mineral veins in the Archæan rocks are covered by from 4000 to 5000 feet of sediments—sandstones, shales and limestones—and excepting those exposed in the canyon and its tributaries, these veins will in all probability remain covered and untouched to the end of time. In northern California, the great gold and copper belts which have been developed for a distance of over 200 miles pass northward beneath the immense lava fields of the Lassen peak and Shasta region.

There are many other instances of this character, but these are mostly beyond the reach of human possibility. It is more particularly to the occurrence of outcrops of veins which actually exist at the surface that attention is here directed.

Many vein outcrops are deceptive, even to the trained student of mining geology, and require careful study and investigation. The accompanying sketches show a number of characteristic outcrops, with a diversity of geological conditions:

Fig. 1 illustrates the occurrence of an outcrop of copper ore in the Black Hills of South Dakota. The ore lies along the footwall of a large reef of quartzite —100 feet in width. The leaching of this low-grade sulphide ore through centuries of time has resulted in the saturation of a superficial zone of the slates on the footwall. This enrichment of the soft porous slates proceeded downward until a flat sheet of quartz was encountered, which, acting like a dam, the solutions penetrated but slightly below it. The surface had the appearance of an immense outcrop of rich copper ore, whereas the ore shoot proper was only a few feet in width in the quartzite.

Fig. 2 is the outcrop of a vein of hard quartzose-silver ore in Montana. The disintegration of the boulder-like outcrop has resulted in the slopes on either side of the vein being covered beneath the fragmental masses of ore, large and small, and gave to the vein the appearance of a huge outcrop, over 100 feet wide, when the vein itself is less than 20 feet in width.

Fig. 3 is a characteristic outcrop on the Homestake vein as it appeared before the great open cut was made at that point. The vein did not outcrop prominently, but occupied rather a slight depression on the hillside at that place, though the erosion was doubtless influenced largely by the harder masses of porphyry in the neighborhood.

Fig. 4 shows a flat sheet of ore, the edge of which is buried beneath a porphyry talus. One unfamiliar with the geology of the region would not suspect the existence of a valuable ore body a few feet beneath the surface. This occurrence is in the Terry peak region, Lawrence county, South Dakota.

Fig. 5 shows the great outcrop of a vein standing 80 feet above the inclosing walls, in San Bernardino county, California. This vein can be seen for miles, and at a distance was mistaken for a great dike.

Fig. 6 is the outcrop of a quartz vein on the desert. The low-lying rolling hills is not a region where the average prospector would expect to find valuable mineral veins, preferring usually the mountain region, but veins occurring under the conditions here illustrated are not uncommon in the desert regions of Western Australia and of the southwestern United States. The boulders of quartz are scattered on either side of the reef, but are mostly buried beneath the earthy debris, making the outcrop obscure and unnoticeable from even a short distance.

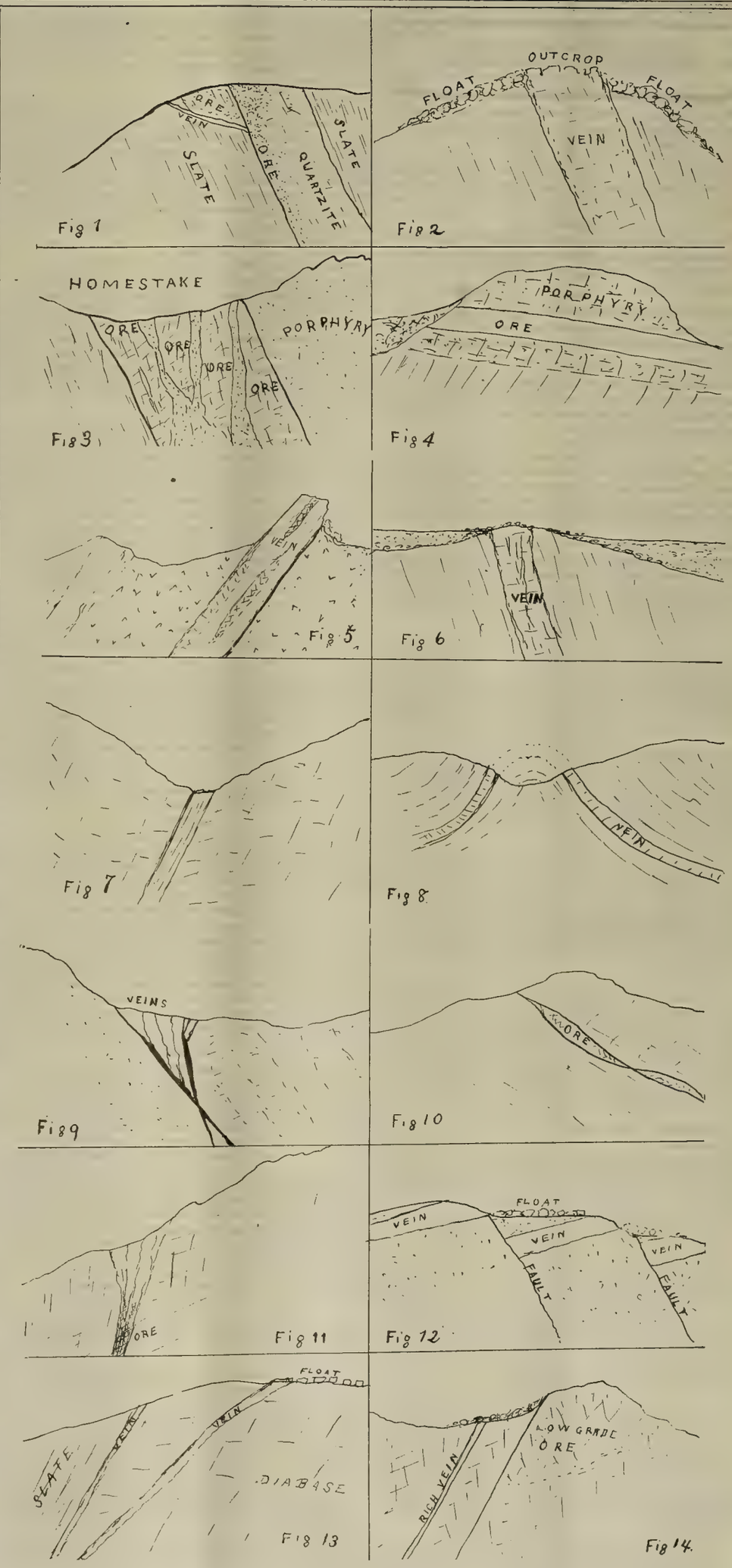
Fig. 7 illustrates the outcrop of a vein in the bottom of a canyon. The vein walls being softer than the surrounding rocks, erosion has cut the canyon down along the course of the vein. This is a very common occurrence in many regions.

Fig. 8 shows a bedded vein duplicated by a fold. This has been taken for two distinct veins; but while it is such as viewed from a legal standpoint, they are of the same origin and formed contemporaneously, but lifted and folded later.

Fig. 9 illustrates the general features of the outcrop of the Comstock lode at Virginia City, Nevada. The footwall dips eastward at about 45°. The hanging wall was shattered by the movement of the rocks and numerous subsidiary fissures were formed in the hanging wall, some of which dip westerly. This, in the early history of the lode, gave some the impression that the vein would dip to the west in depth. A fissuring of the hanging wall of a vein, as in the manner here illustrated, is not of uncommon occurrence.

Fig. 10 shows a valuable ore body which reaches the surface as a mere seam. The only indication here at the outcrop is the softened condition of the country rocks and the occurrence of the oxide of iron. Sometimes a line of springs indicates the proximity of the outcrop of a vein or lode when the outcrop itself is obscured beneath surface debris.

Fig. 11 shows a large and valuable vein of ore



reaching the surface as a system of stringers. No ore is visible, but the place is damp and the country rock—granite—is much decayed. This was the condition at the outcrop of the Bi-Metallic mine, near Phillipsburg, Montana. This condition is duplicated in many places elsewhere.

Fig. 12 shows a curious phenomenon. It was mistaken for the outcrop of a vein of immense width—several hundred feet—and an elaborate report on the extent and possibilities of this huge vein was sent abroad. Nearly half a million dollars in improvements were made as a result. The sketch shows a flat sheet of quartz, 3 to 10 feet thick, faulted several times, with boulders of quartz lying on the segments of granite. To the careless observer it might be mistaken for one immense vein. One person who examined the deposit recognized the fact that it was not a continuous sheet of quartz, but assumed the several repetitions of the same sheet, by faulting, to be the individual outcrops of different veins, and reported twenty-three veins in the property. This phenomenon occurs in Madera county, California.

Fig. 13 illustrates another mistake made where a small vein—2 feet and less in width—was thought to be an outcrop 125 feet wide. The point of real outcrop is seen in the sketch. The detached boulders lying on the surface were thought to represent the width of a large outcrop. After extreme development the true condition was learned.

Fig. 14 illustrates a large mass of low-grade ore which outcrops boldly, while the small accompanying fissure vein of high-grade ore was scarcely noticeable beneath the debris, but was discovered in running a crosscut. This occurrence is in San Bernardino county, California.

In addition to these several instances there are many others that could be added. One, for instance, where a vein was cut by a fault striking nearly with both dip and strike of the vein and causing the latter by displacement to appear to be twice the width it really is at the surface.

There is one condition, however, upon which the prospector may almost universally depend, and that is that there are few veins either great or small, and producing great amounts of gold or silver, that do not show signs of extensive mineralization at the surface, and the same may be said of most copper, lead and quicksilver mines. This mineralization may be merely the kaolinization of the feldspars of the rock walls and a consequent softening of the rock, but in nine instances out of ten the surface along the line of a rich and largely productive vein shows iron oxides, a softening of the country rock and the occurrence of small veinlets of quartz, calcite and iron ore and often a seepage of water, whether the quartz outcrop be prominent or not. Sometimes the quartz outcrop is prominent, but practically valueless, the pay rock being found elsewhere in the vein. In some cases this surface mineralization extends for 1000 feet or more, often very much more, and is from 20 to several hundred feet wide. A great outcrop of quartz is not the most positive sign of a great and valuable mineral deposit or vein, though it is not an infrequent accompaniment.

Goldfield, Nevada, Fire and Explosion.

Goldfield's first serious fire occurred on the 8th inst., as narrated in last week's issue. Herewith are two portrayals of the fire at its height, engraved from photographs received through the courtesy of Mr. Wm. B. Kehoe. Like all great mining camps, such visitation seemed inevitable, and, as it will undoubtedly result in better fire protection, the fire will prove of ultimate benefit to the town. Every mining town has had its big fire, and Goldfield is fortunate if it escapes a more serious conflagration. Already rebuilding has begun and in a few months the fire will be but a memory.

A more serious disaster, so far as loss of life was concerned, took place at Goldfield the day before the fire, when the explosion of a boiler at the Spiking mill resulted in the death of Jas. Spiking and Taylor Bates. The accompanying engraving is from a photograph taken immediately thereafter and graphically depicts the sudden ruin wrought.

Boiler Explosion at Goldfield, Nevada, July 7, 1905.

Fire at Goldfield, Nevada, July 8, 1905.

Fire at Goldfield, Nevada, July 8, 1905.

Ore Sampling.

Henry Louis, in the Transactions of the Institution of Mining and Metallurgy, has the following:

It may be of use to draw attention to a convenient method of sampling either in the field or in the laboratory, which appears to be very little known in this country; I first saw it in use in Sweden and have used it myself a good deal with perfectly satisfactory results. The appliances consist of three troughs, V-shaped in cross section and open at both ends, the angle at the apex being 90°. Dimensions depend upon the material being treated; for field work and large parcels broken say to 1½ inch ring, troughs made of pieces of 10-inch board, 4 feet long, held together by a few nails, answer admirably. For laboratory work I use pieces of stout sheet zinc or tinplate, 12 inches long and 6 inches wide, bent up lengthways, so that each side is 3 inches broad. To use this appliance, one of the V-shaped troughs is placed horizontally, apex upwards on two sheets of canvas, or over two boxes; another trough is placed, apex downwards over the first one, inclining towards it at an angle of 30° or 40°, the lower end resting on the center of the apex of the lower one; the third trough

is placed above the second in zigzag fashion, and similarly inclined, its lower end delivering material at the top end of the second trough. Thus, any material poured down the top trough runs fairly into the second, and then falling on to the apex or edge of the first, is divided into two equal parcels. The operation is very rapid, and may be repeated as often as is required, until the sample is reduced to the requisite size. The appliances are simple in the extreme, may be improvised almost anywhere, and, if the troughs are made of two-hinged pieces, are portable. The few tests that I have made have shown that this simple method seems to be as accurate as any other.

Concentration of Silver-Lead Ores.*

NUMBER II.—CONCLUDED.

Written by V. F. S. Low.

Various methods of sampling the material leaving the mill are in vogue at the present time, but it is often found that samples taken from the trucks with a "spear" are very unreliable. A good system is to sample each truck as it is being tipped and is only part full, and, further, to sample each dump every twenty-four hours. The former assays should be used only for comparison of the work done on the various shifts, but for all official purposes the latter method of sampling should be adopted, as there is much less likelihood of error.

In conclusion, while admitting that there are many points in connection with the subject of concentration which are open for discussion, the writer would state that the practices as set forth in the above brief paper are the outcome of the efforts and experience of the many engineers who have given much of their time and attention to the treatment of the silver-lead ores of the Broken Hill field.

In discussing the paper of V. F. S. Low, F. D. Power said: One would think that any man erecting valuable machinery would take the trouble to see to his foundations, and yet he had seen, in Queensland, the upper stopes of a lode filled in and preparations made on the surface for erecting a winding engine on the top of it. In another case, in Victoria, a battery site was selected on the side of a hill and twelve vanners erected on the ground made from the excavations. As this ground had not settled it was impossible to adjust the vanners, for as soon as they were got right they were thrown out of adjustment by further sinking, and, to make matters worse, the motive power used was a large water wheel, which was also connected with the stamps, so that the rate of work was most irregular. The question of whether it was better to select a site for dressing floors on an incline or on a flat was a moot point. There was much to be said in favor of both, but the matter was generally settled by local conditions. When crushers are placed at the head frames they should be on a separate foundation; if in the head frame itself, as was sometimes seen, they shook the whole structure too much. Sufficient storage capacity for ore on the surface is very important, so as to enable a manager to weather a temporary shortage, due to some accident. When the plant is divided into units not only is there the advantage that only a portion of the plant need close down in case of a breakage or for want of sufficient ore or water for the whole, but, if necessary, ore from different parts of the mine can be treated separately, and experiments might even be carried out with one unit, with the view of ascertaining a better adjustment of the machinery, proportion of water, etc. Seconds should, strictly speaking, consist of particles of ore and gangue combined, which required further reduction in order to separate the ore before it could be concentrated. The remarks about "working back" should be laid to heart by directors and others. It might look very nice on paper to see things balance, but if they were made to balance by working back, the figures were absolutely worthless, and those who relied on them were living in a fool's paradise.

W. Maddern said he had spent some years in the designing and laying out of the largest concentration plant at the Broken Hill Proprietary; and had also recently paid a visit to the Hill when he noted the developments made during his absence. He was also privileged to see the construction of the plant described in the paper. Machines of all kinds had been given their opportunity in the many mills which had followed each other in succession on the Proprietary and other mines, and now they had in the paper under discussion a description of a mill which they could take as a final result to date of all past experience. All the Broken Hill plants differ considerably from what mostly obtain on the Continent and in America. There, classification and grading into several sizes, with separate treatment for each, was more or less resorted to, sometimes making an elaborate system, in order to get the maximum of concentration; but in Broken Hill the commercial aspect was of prime importance in dealing with the large quantities of stuff. It was not so much "What metal can I get out?" as "What will it pay best to get out of the ore?" Consequently, close initial grading had been rejected as so much humbug, and the stuff was rushed through in bulk, leaving the tailings to be subsequently dealt with for zinc recovery. Putting the breaker at the shaft was a very good practice, and one which seemed to be rapidly becoming universal. He noted that instead of the usual perforated percussion feeder from the bin to the rolls, large trommels were being used, the object being, no doubt, to get rid of all the fines possible, to avoid wear on the rolls. He thought that every dry or wet crushing mill, concentrating or otherwise, should be sectioned off. It was very often not possible to apply this to the crushing department, but suitable storage bins effected the same end. In regard to the question of middlings from the tables, there was no doubt that some of the middlings returned more than once in the same way, but he was inclined to agree with the principle of returning the middlings and thus giving them a second chance to get with the concentrates. He thought it paid to do so in the majority of cases. He came across a curious feature about concentrating tables some two years ago in Western Australia. A couple of machines were laid on a timber framing, while others were built on stone foundations. Those on timber gave very poor results, and the cause was attributed to synchronous vibrations. It was decided that stone or brick was the proper thing. However, as machines all over the country were put on timber, it was evident that the case he alluded to was not of frequent occurrence.

*Trans. Aus. Ins. Min. Engrs.

The Machine Drill in Mining.*

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS.

As previously stated, one of the most important matters in connection with the successful operation of a machine drill underground is its care. With a good machinist, who not only understands the trade of machinist, but who also knows from experience what a machine drill can actually do, and what some men expect it to do—with such a man in the machine shop, and a careful man to run the drill in the mine, repairs should be comparatively light, and a drill should last a long time.

Each machine should be numbered by file cuts, or otherwise, and the superintendent or foreman should know where each machine is operating during every shift that it is employed, and also who is in charge of it. This idea may not be popular, but it will go a long way toward insuring good treatment for the machine. If a man can abuse and break a machine, take it down, send it to the surface, and substitute another machine, and no one but the drill runner himself and his partner the wiser for it, machines will often be found out of commission—front heads out, back heads broken, flanges knocked off of the shell, and with other aggravating and expensive injuries, evidently the result of carelessness, and no one upon whom the blame may be fixed. With the number system this difficulty is largely obviated. Not only this, but by its use a record of the work actually done by each machine in the mine (as well as by the men), and its cost as compared with the other machines, may be ascertained.

It is bad practice to take a machine apart in a mine. There are a few men running drills who have had sufficient experience in the shop to be able to make any small repairs required, but, even so, in the dark workings of a mine, with the many chances of getting grit into the machine, for losing small parts, etc., it is an unsatisfactory and improper place for taking a machine apart. When a machine is in evident need of the machinist's skill it should be sent to the surface and another machine substituted. It can be more quickly done than the time wasted in trying to fix the machine at the working face. It is perfectly proper to have a suitable place on each level of the mine where such repairs as are necessary may be made by a competent man, but it is more particularly the practice of overhauling machine drills in the drift, shaft or stope that reference is here made.

Each machine or drill crew should be supplied with the necessary wrenches, bars, oil cans and other tools required, and these should be kept in a suitable box near at hand. They will require no crimps, springs, ratchets, pawls or other small parts—these being an inducement to attempt repairs underground. Make the crew responsible for the tools delivered to them, and there will be money as well as unpleasantness saved, for machine men are notorious borrowers of each other's machine tools, and a hunt for a misappropriated wrench or oil can usually costs the company half an hour's time, and often more, every time this incident occurs, which is frequently, if no steps are taken to prevent it.

The machine drill should be well oiled, but it is neither economy nor good sense to pour half a pint or more of oil into a machine at one time. Some men think that all a machine requires is a good liberal dose of oil, and thereafter it will care for itself. If an excess of oil is poured in, the greater part of it will be blown out at the exhaust within five minutes after starting up.

The machine drill is just like any other engine and requires a stated amount of oil, and no more is beneficial, while very much less is detrimental. Some machines are provided with automatic oilers. The machine should be kept carefully packed around the front head so as to reduce air leakage to a minimum. It is not uncommon to find machines leaking badly, and this detracts from the efficiency of the drill more than is supposed.

The pressure of air at the compressor should be high to secure the greatest economy in drilling. There are automatic regulating devices which keep the air pressure at the compressor well within definite limits—90 to 100 pounds per square inch—and sometimes they are regulated to operate within a variation of 5 pounds (95 to 100 pounds). High pressure at the compressor means reduced pressure at the machine, unless the air be reheated intermediately. A rock drill will undoubtedly last a long time if the drill is operated by a careful man and only moderate air pressure is furnished—say 60 to 75 pounds—but the machine will do far less work, for this reduced pressure at the compressor means a still lower pressure at the machine. The drill runs beautifully under comparatively less pressure, but the blows lack force, and headway is consequently slow. It were far better to put on high pressure, and then, employing experienced men, drive ahead as hard as conditions will admit. The bill for expenses and repairs will be higher, but the cost per foot drilled will be noticeably less, and this is the real test of efficiency.

When changing position the drill runner should see to it that the air is shut off, or a serious accident may occur at any moment should the air be accidentally admitted to the drill cylinder. This danger can be obviated by placing a "tee" in the pipe just before the connection with the machine—between the machine and air cock. This tee is fitted with a plug which is easily removed. When the position of the drill is to be changed without disconnecting the hose this plug should be unscrewed. Then, if by any mischance the air cock is opened the air will exhaust through the tee, and no harm is done. Without this simple arrangement, should the air be turned into the cylinder, the piston will be driven violently back and forth, and would seriously injure any one who unfortunately chances to be in the way. Moreover, there is great danger of knocking out the front head, as there is in such cases usually nothing to resist the blows from the piston. In drilling this danger is obviated by keeping the drill bit fed against the rock.

(TO BE CONTINUED.)

Steam Turbine Tests.

Following is a record of tests of operation of the Curtis steam turbine as furnished to E. W. Rice Jr., third vice-president General Electric Co., by the engineers making the test, F. Sargent and L. A. Ferguson:

"We submit herewith the report of tests made on a 2000 K.W. Curtis turbine, made at Schenectady, under our supervision, May 3, 1905, as follows:

"We sent our assistants, Messrs. Clark & Eastman, to Schenectady to prepare the apparatus for making these tests, and they made several preliminary trials before our arrival, and the results of each of the trials very closely approximated the results of the official tests herein mentioned. We had all the instruments carefully tested and standardized during the trials, the electrical instruments being tested by the New York Testing Laboratory in the presence of Mr. Eastman. The surface condenser showed practically no leakage. We took every precaution to satisfy ourselves that the tests were reliable and accurate, and we beg to certify that the results were as follows:

"Full Load Test: Duration of test, 1.25 hour; steam pressure (gauge), 166.3 pounds; back pressure (absolute), 1.49 inch of mercury; superheat, 207° F.; load in kilowatts, 2023.7; steam consumption per kilowatt hour, 15.02 pounds.

"Half Load Test: Duration of test, 0.916 hour; steam pressure (gauge), 170.2 pounds; back pressure (absolute), 1.40 inch of mercury; superheat, 120° F.; load in kilowatts, 1066.7; steam consumption per kilowatt hour, 16.31 pounds.

"Quarter Load Test: Duration of test, 1 hour; steam pressure (gauge), 155.5 pounds; back pressure (absolute), 1.45 inch of mercury; superheat, 204° F.; load in kilowatts, 555; steam consumption per kilowatt hour, 18.09.

"Zero Load Test: Duration of test, 1.33 hour; steam pressure (gauge), 154.5 pounds; back pressure (absolute), 1.85 inch of mercury; superheat, 156° F.; steam consumption per hour, 1510.5 pounds."

THE PROSPECTOR.

The rock from Homestead, Or., marked "No. 4," is a much altered greenstone of the type called by the United States Geological Survey "meta-diabase." It contains some pyrrhotite (magnetic iron sulphide).

The rock sample from Marial, Or., is a silicified eruptive rock, diorite or grano-diorite, and contains on one edge a little fine iron sulphide and a less amount of copper sulphide. The metallic appearance of one face of this specimen is due to pyrite deposited in a seam, and which was subsequently polished slightly by movement of the rocks. The dark green material at the opposite end of the specimen is chlorite.

The Ore Deposits of Mount Lyell.*

NUMBER II.

Written by J. W. GREGORY.

There is little doubt that the great pyritic mass of Mount Lyell is limited in depth. It has been cut off below by a great thrust plane, which brings the conglomerates under the ores and schists, 97 feet below the center of the No. 8 level, which is 755 feet above sea level.

The ores in this ore body are of remarkable purity and uniformity. Peters remarked that in a width of 300 feet across the mass "in the entire distance there is not a piece of gangue rock as large as a walnut." The ores consist almost entirely of iron pyrites containing copper, gold and silver. There is little galena and less sphalerite (zincblende). The only two important minerals forming gangue are quartz and barite.

The most remarkable feature in the Mount Lyell pyrites is the comparative richness of the precious metals. The copper, gold and silver are not uniformly distributed through the pyrites, being less abundant in the ore near the hanging wall, which is in places so poor that it only pays to work as fuel in the pyritic smelting of the richer ores. The ores near the footwall are much richer; thus Peters' assays of a series of samples taken by 2-feet drill holes along the footwall of the southern drive of the No. 3 tunnel varied from 11% to 30% of copper.

The average yield of the mine is about 1000 tons a day. It was at first proposed to limit the open cut to the No. 4 level, above which it was calculated that 693,045 cubic yards or 2,339,000 tons of ore could be obtained by the removal of 1,500,000 cubic yards of the overhanging schists as overburden.

The average composition of the ore which pays to extract is :

Iron	40 30
Silica	4.42
Barium sulphate	2 50
Copper	2.35
Alumina	2.04
Sulphur	46.50

Hence, in spite of the extreme care with which Dr. Peters took the samples, the general richness of the ore is below his estimate; for he excluded the poorer hanging wall portion of the deposit, and based his estimate on samples obtained from the footwall portion, which only was exposed by underground workings at the time of his visit. The richer ore has not proved to be representative of so large a part of the mine as the evidence then suggested.

The mine is by no means equally rich throughout, for the ore on the hanging wall side contains less copper and precious metals than on the eastern or footwall side, and the ore is also, as a rule, richer near the surface than at the deeper levels. Accordingly, for the purpose of estimating the available ore reserves, the mine is divided into five sections, which are numbered from 1–5, from the footwall to the hanging wall side. The three sections (1–3) on the southeastern side of the mine contain the best ore; this has been described as the payable ore, but the limit between the grades of ore which pay to work and those which are useless is of course variable; and now that the ore of the North Lyell mine and the Mount Lyell pyrites can be smelted together, some of the material in the fourth and fifth sections can be used.

Mr. Sticht estimated on March 31, 1901, that above the No. 4 level there was a total tonnage available of 978,337 tons, giving an average value of 2.35% copper, 2 ounces of silver and .0725 ounce of gold to the ton. The two northeastern sections (4 and 5) contained above the No. 4 level 648,328 tons of ore, of which the average assay value is .64% of copper, 1.6 ounce of silver and .06 ounce of gold. The prices of metals at that date were: Copper, £70 per ton; silver, 2s 3d per ounce, and gold, £4 5s per ounce. Value of southeastern ore was estimated at 43s 7d per ton, whereas ore of the second division was only worth 17s 8d per ton.

Between levels Nos. 4 and 5 there was, according to Mr. Sticht's estimates of March, 1901, 1,723,218 tons of ore, and the average assay value of the whole of it was, copper, .64%; silver, 2.15 ounces, and gold, .048 ounce, which at the current prices of the metals was worth 17s 10d per ton. Within these levels there had originally been some masses of much richer ore, which had been entirely worked out before that date. Below levels Nos. 5 and 6 the ore available was at least 561,386 tons, the existence of which had been proved by the workings up to that date. Subsequent work has shown that this amount will be exceeded. In this zone of the mine the average contents of the ore are, copper, .57%; silver, 1.74 ounce per ton, and gold, .04 ounce per ton, and its value, according to prices in March, 1901, is 15s 4d per ton. Accordingly Mr. Sticht concluded that the original ore contents of the Mount Lyell ore mass had been 4,187,499 tons, of which there was still available on March 31, 1901, 3,349,883 tons, as well as the whole of the material below No. 5 level, the amount of which could not then be calculated.

The remarkable purity of the Mount Lyell pyrites mass is one of its most striking features. It is generally uniform in grade, though the ore on the footwall side is much the richer; as a rule, the ore is completely free from any extraneous matter, but at the northern end there are some fin-like projections of schist into the pyrites.

Some masses of rich ores occur in the ore mass; most of them have already been removed by underground excavation, and they are therefore generally reported as the "stoped ores." These ores are siliceous, and the copper-bearing minerals they contain are bornite and chalcopyrite. The average analysis of these ores is as follows:

	Per Cent
Iron	24.75
Silica	30.69
Barium sulphate	1.48
Copper	5.33
Alumina	6.30
Sulphur	30.0

The bornite enrichments form shoots, extending from the surface of the ore body to below No. 7 level; they occurred at both corners of the southern end of the ore body. The material was uniform in character, and consisted of a siliceous mixture of pyrites and bornite, while in the lower depths of the mine siliceous copper pyrites was also present.

In addition to the bornite shoots there are some much smaller enrichments of fahlore. One of the most interesting was discovered in the north hanging wall drive off the main tunnel at No. 5 level. The enriched ores were there 6 feet thick on the hanging wall side of the ore mass, and contained patches of solid fahlore in pyrites. The average assay value of this material was copper 3.65%, silver 2.07 ozs. and gold .02 oz.

Similar, but apparently disconnected, shoots of the richer ore have been traced down to No. 8 level, and some of this ore was worked by a winze from the No. 7 level.

More important shoots of the richer ores have been found on the footwall side of the mine. The largest, known as the Mount Lyell Bonanza, was discovered and worked out in 1894; it yielded 850 tons of ore, which was sent to London and sold for £105,000. The bonanza was found between the pyrites mass and the lower continuation of the hematite of the Iron Blow. It consisted of a vein of copper glance (redruthite, Cu_2S) and bornite, with fahlore and argentite (silver glance, Ag_2S). It was found in a drive from the No. 4 tunnel. The entire shipment averaged 1011 ounces of silver to the ton, and one specimen which was assayed by the Tasmanian Government assayer yielded 8765 ounces of silver and 45 ounces of gold to the ton, and 19% of copper. Some specimens assayed nearly 50% silver. As the vein was followed downward it increased in thickness, being in places 2 feet in width. The discovery of this body of rich ore was of great importance in the history of the field, as it had a considerable influence in securing the capital necessary for the development of the mine.

On the footwall side, between the fifth and eighth levels, there have since been found several other fahlore enrichments; but none of them have been as important as that beneath the hematite blow.

A shoot of ore containing copper 4.55%, silver 3.58 ounces and gold .119 ounce was found in the northern drive from the No. 5 level; but this shoot was not connected with the old bonanza of the higher levels. The stopes between the sixth and seventh levels yielded ore containing copper 10.94%, silver 6.23 ounces and gold .022 ounce.

The quantity of these richer underground ores is, however, comparatively small. For the half year ending March 31, 1902, they amounted to 6479 tons, with an average assay value of copper 5.23%, silver 3.45 ounces and gold .059 ounce, and in the following half year 4595 tons, giving an assay value of copper 4.93%, silver 3.90 ounces and gold .064 ounce.

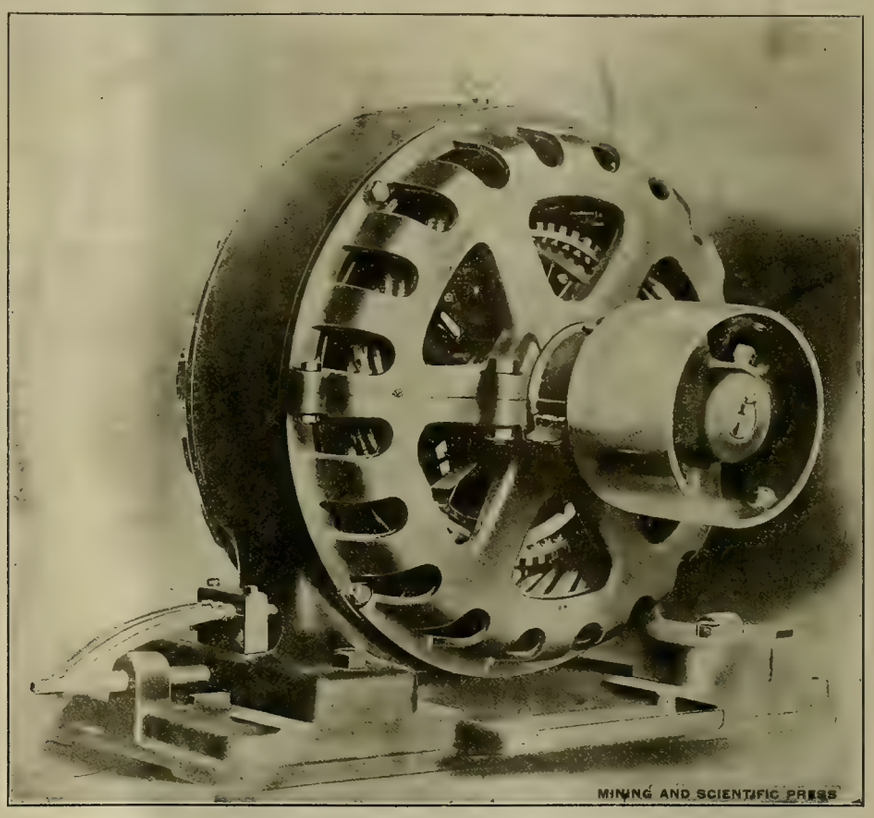
These enrichments are of considerable interest, as they throw light on the genesis of the Lyell ores. The main bonanza occurs immediately below and opposite the great body of barytic hematite of the Iron Blow.

(TO BE CONTINUED.)

*Abstract Trans. Aus. Ins. Min. Engrs.

Polyphase Induction Motors.

A new type of polyphase induction motor has been placed on the market by the Westinghouse Electric & Manufacturing Co., which is designated as type CCL. These motors are manufactured in sizes from ½ to 75 H. P., and are wound for operation on two or three-phase circuits at voltages of 200 and 400 for all sizes except the ½ H. P. The sizes from ½ to 5 H. P., inclusive, are also wound for 100 volts. The frame of the motor consists of a solid, cylindrical cast iron yoke, to the ends of which are bolted brackets which carry the bearings. These brackets are open to provide ventilation, and may be fastened to the frame in any of four different positions, making the motor suitable for floor, wall or ceiling mounting. Motors up to and including the 5 H. P. have solid brackets and bearings, with slotted holes in the feet for adjusting the tension of the belt. Larger machines have the brackets and the bearings split horizontally, facilitating the removal of the bearings. Belt adjustment on these motors is made by tension screws which shift the motor on a cast iron bed plate. There are no wearing parts on the machine except the bearings; these are of ample dimensions, with a light rotor and flooded lubrication maintained by oil rings.



Type CCL Polyphase Induction Motor.

The stationary part of the motor is the primary, or element which is connected to the source of current. The magnetic circuit consists of circular laminations of sheet steel, securely keyed into the cast iron frame. Terminal leads are brought out at the base of the frame, held in a cast iron cleat. Hand connectors or knuckle joints, such as are supplied with railway motors, are used to connect the motor to the supply circuit.

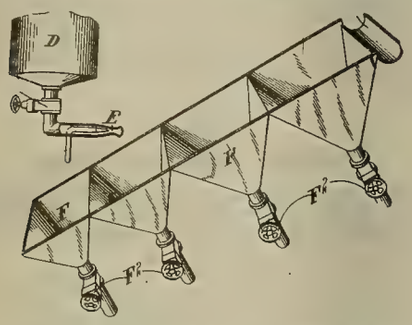
The secondaries of these motors are of the squirrel cage type. The winding consists of square copper bars lying in partially closed slots and bolted at the ends to metallic rings of ample cross-section to dissipate the heat generated in them. For the ½ H. P. motor round bars are used and are riveted to brass or copper rings at each end.

Mining and Metallurgical Patents.

PATENTS ISSUED JULY 11, 1905.

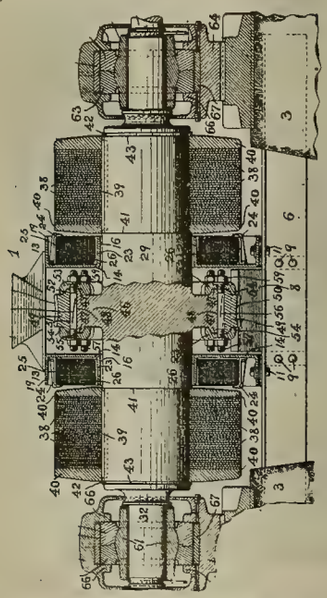
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE CONCENTRATION.—No. 793,808; H. L Sulman and H. F. Kirkpatrick-Picard, London, England.



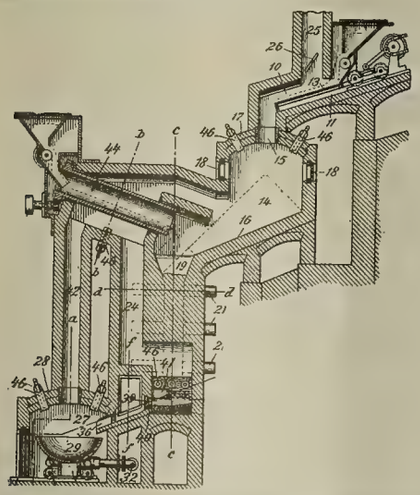
Process of concentrating ores by bringing pulp into contact with "oil" in form of spray and with gas and thereafter separating metalliferous constituents from gangue in water.

CRUSHING APPARATUS.—No. 794,703; M. Dickerson, Newark, N. J.



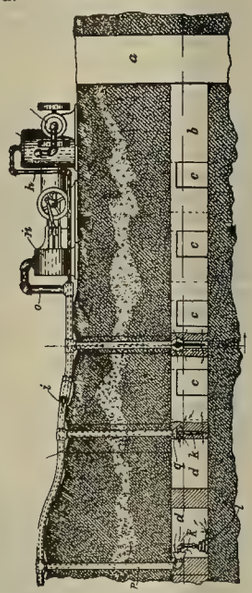
Combination, with main operating rolls arranged upon separate shafts revolving in same plane, one of rolls and shaft having pure rotary motion, and other roll and shaft being slidably mounted so as to be capable of lateral motion in plane passing through central axes of shafts, and electro-magnet encircling each shaft, electro-magnets having central axes in same plane passing through central axes of shafts, and electro-magnet on one shaft being located opposite electro-magnet upon other shaft.

METALLURGICAL FURNACE.—No. 794,212; G. H. Benjamin, New York, N. Y.



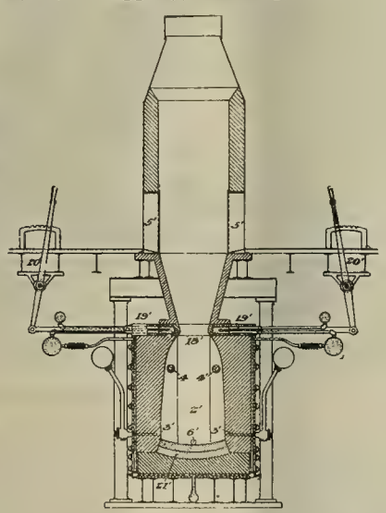
Metallurgical furnace comprising in construction calcining chamber, reducing chamber, electrically heated chamber, and oxidizing chamber arranged at progressively lower levels, together with means for creating required temperatures within chambers.

MINE VENTILATION.—No. 794,384; F. C. Weber, Pittsburg, Pa.



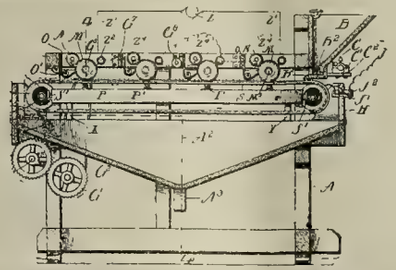
Combination with mine having shaft, main passage, and series of rooms communicating with main passage, of system of air supply pipes and exhaust pipes laid on top of ground outside mine and shaft, and having separate branches immediately tapping each of rooms independently of shaft and main passage.

METHOD OF PRODUCING COPPER MATTES, WHITE METAL AND BLISTER COPPER IN A SINGLE FURNACE.—No. 794,272; R. Baggaley, Pittsburg, Pa.



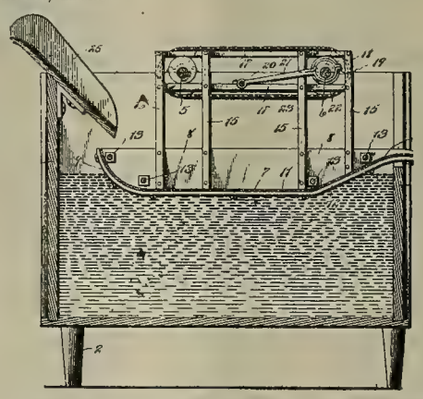
Method described of producing matte, white metal or blister copper in single vessel or chamber, which consists in producing bath by melting matte-making material in such vessel or chamber with flame applied from above, producing thereby low-grade matte, adding to molten bath from time to time ore in small quantities at a time, namely, in less quantities than molten bath, blowing air through bath, and by heat thereby developed fusing and fluxing such additions of ore.

ELECTROSTATIC MAGNETIC SEPARATOR.—No. 794,647; H. M. Sutton, W. L. Steele and E. G. Steele, Dallas, Tex.



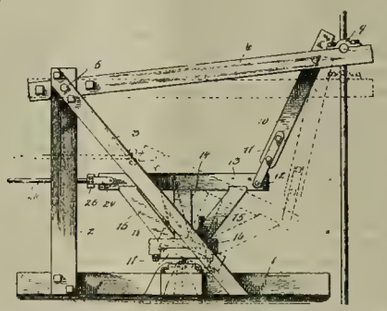
In device of class described, traveling conveyor belt, means disposed above same adapted to raise and convey material therefrom, driving shaft extending longitudinally of belt and carrying eccentrics, straps extending from belt to eccentrics, spring support for belt to permit vibration thereof, means for adjusting belt vertically relative to devices above same, longitudinal support extending between layers of belt, rollers carried by upper surface of support, speed regulating device carried by driving shaft, geared connections to speed device to drive belt, and driving connection therefrom for actuating material raising means above belt relative to speed of belt.

ORE CONCENTRATOR.—No. 794,555; H. Scovell, H. B. Scovell, L. E. Scovell and W. E. Scovell, Galena, Kans.



In device of character described, combination with fluid-holding tank, shafts mounted in suitable bearings on tank, and set of cams secured on each of shafts, one cam near each end of each shaft, of screen suspended in tank, forward end of screen having sharp upward curve, and tail portion thereof being slightly upwardly inclined to permit easy discharge of waste matter from screen, suitable hanger secured to each side of screen and supported on cams on shafts, cam secured on one of shafts, and pitman, one end pivoted to hangers and other end provided with strap adapted to embrace cam, whereby, when motion is imparted to shaft, screen will be given compound vertical and horizontal movement.

PUMPING JACK.—No. 794,546; G. Pitcher, Montpelier, Ind.

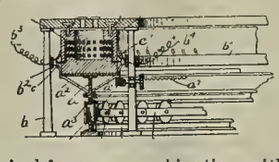


Improved pumping jack comprising sill, samson post, walking beam having one end fulcrumed upon samson post, polish rod connected to free end of walking beam, jack comprising central post, cross bar on upper end of post and extending to opposite sides of same, base block at lower end of post fulcrumed on sill, and braces between cross bar and base block, straps pivotally secured to one end of cross bar, pitman secured between straps and connecting jack with walking beam, and pull rod pivoted to opposite end of cross bar.

PROCESS OF REMOVING OR RECOVERING ZINC FROM ORES.—No. 794,198; W. Stewart, Mount Florida, Glasgow, Scotland.

Process for removing or recovering zinc from ores containing it, consisting of pulverizing ores, mixing therewith bisulphate of alkali metal, and common salt, furnacing at red heat and thereafter lixiviating or leaching and precipitating zinc salts.

ELECTRIC FURNACE.—No. 794,255; C. L. Saunders, Cleveland, Ohio.



In electrical furnace, combination with horizontal continuous annular trough forming hearth, of means for continuously rotating same, positive and negative electrodes supported on hearth and adapted to convey current to and from material thereon, stationary contact pieces with which electrodes make temporary contact, and connections from contact pieces to source of electricity.

The Use of Stulls.

The most common method of supporting mine walls is by the placing of "stulls." By stulls is meant single pieces of timber which reach from wall to wall of the deposit or vein. A stull may be only 3 or 4 feet in length, or it may be a great log over 20 feet long and from 12 to 24 inches in thickness. Ordinarily stulls vary in length greatly in the mine workings, each one being cut to fit the particular place for which it is intended. The difference in the slope angle of opposite walls of a vein, and the frequent change in the slope of the same wall—often within a short distance—makes this necessary. While the proper position of the stull, when in place in the mine, is at such an angle that it will be somewhat higher than a line normal with the average dip of the hanging wall, the ends may, and usually do, have a great variety of angle with stull itself, due to inequalities of the wall. Of course these angles usually approach 90°, but at times they depart considerably from the right angle. It is not uncommon to cut a hitch in either the foot or hanging wall, when the conditions are such that the timber cannot have a secure resting place without it. In soft rock a foot and head board must be placed in order that the ground may find sufficient support. These head and foot boards usually consist of pieces of 2 or 3 inch plank, which vary in length with the character of the ground, the soft or sloppy ground which caves readily requiring more support than where the walls are more firm. Some mines have been successfully worked by means of stulls, and the walls remained so firm over large areas that many of the stulls were knocked out and reused in other parts of the mine.

Open Cut Timbered by Stulls, Trinity County, Cal.

In some instances where timbers were not obtainable of sufficient length stulls have been spliced, but this is a dangerous practice and ought never to be attempted where the work is permanent. Instances are known where timbers 12 inches square and 20 feet in length were spliced to reach across an excavation 30 feet or more wide, but these timbers were aided by the placing of sprags at right angles to the main stulls, but the whole structure caved in in a few weeks, showing it to be insecure and unsuited to the conditions. When the stope or open cut is too wide to safely support the walls with stulls some other method of support should be adopted, the square set system being always available and satisfactory where the expense is not too great. The accompanying illustrations show two open cuts timbered by stulls—one in a mica mine, the other in a gold mine. Although these workings in both cases are superficial, the method of placing is characteristic, and is the same as that adopted in the deepest mine workings where stulls are employed. Often it is necessary to build temporary platforms to place stulls, and sometimes they are placed after a round of ore has been shot down and before it is withdrawn from the stope. In either case, and, in fact, in every case, the timbermen should see to it that the timber is securely placed and firmly wedged, and that the system of stulls is so arranged that any subsidence of the hanging wall will only serve to make the stulls the tighter, rather than to loosen them.

Production of Monazite, Zircon, Gadolinite and Tantalum in 1904.

So much has been written during the last year concerning the "tantalum lamp" and the occurrence of tantalum minerals that considerable interest is likely to attach to a report which J. H. Pratt of the United States Geological Survey has recently prepared on the production of monazite, zircon, gadolinite and columbite or tantalum minerals. These minerals are all mined for a similar purpose, that is, for use in the manufacture of electric and incandescent lamps.

Of these minerals the production of monazite is at the present time of the greatest importance, as the others have all been produced in much smaller quantities. With the exception of portions of the monazite and columbite, which were exported to Germany, all of the output of these minerals was used in the United States. The demand for monazite is constantly increasing, while there is but little increase in the use of zircon and gadolinite. The demand for columbite and other tantalum minerals has arisen only during the last year, and it is impossible to predict the extent to which these may be used.

A Vien Worked by Stulling the Walls, Crown Mica Mine, South Dakota.

The commercial value of monazite is due to the presence of thoria, which is used in the manufacture of the mantles for the Welsbach and other incandescent gaslights. The Welsbach light consists of a cylindrical hood or mantle composed of a fibrous network of the rare earths, the top of which is drawn together and held by a loop of platinum wire. The exact composition of the hoods is not generally known, as it is a trade secret, but they are composed largely of thoria with smaller quantities of the lanthanum and didymium oxides.

A portion of the cerium obtained in the reduction of the monazite is prepared for market in the form of the oxalate and is used in the drug trade.

In the chemical laboratory of the Welsbach Lighting Co. of Gloucester City, N. J., a great many chemical compounds have been made of the rare earths found in monazite, and considerable experimental work has been done to discover what economic use could be made of these compounds.

In a recent publication on the "Origin of Radium," B. B. Boltwood has shown that the proportion between the uranium and the radium in minerals is constant. One of the interesting facts brought out by Mr. Boltwood's investigations, especially as they refer to monazite, is that the thorium apparently does not participate in the production of radium and that the radio-activity of monazite is due to its uranium contents.

The sources of supply of uranium in the United States are still the deposits in North Carolina and South Carolina, and the entire production for 1904 was obtained from these States.

ZIRCON AND GADOLINITE.—The output of zircon and gadolinite is employed almost exclusively in the manufacture of chemical compounds that are utilized in the construction of the glower of the Nernst lamp. The zircon is mined for its zirconia content, and from the gadolinite is obtained yttria, these two oxides representing the principal ores used in the glower. The zircon is obtained entirely from the deposits in Henderson county, N. C., and the gadolinite is obtained from Llano county, Tex.

TANTALUM MINERALS.—The use of tantalum in the commercial world is due to the discovery that this metal is capable of withstanding the highest temperature obtained in an incandescent light, and that it is sufficiently ductile to permit its being drawn into a very fine wire, which shows little tendency to break when heated by the electric current. The experiments made in the chemical laboratory of Siemens & Halske, manufacturers of incandescent lamps, which led to the discovery of these qualities in tantalum and the invention of the tantalum lamp, are clearly recounted by Dr. Pratt.

The localities in North Carolina, Connecticut and South Dakota where tantalum minerals have been or may be found are enumerated, and a list is given of minerals that contain tantalum, together with their chemical composition and the localities where they have been discovered. The quantity of tantalum required in the manufacture of the lamps is exceedingly small, however, so that a few tons of these minerals will go a long way in supplying the demand for the metal.

PRODUCTION.—During 1904 the production of monazite, columbite, gadolinite and zircon amounted, collectively, to 745,999 pounds, valued at $85,038. Of this amount, by far the largest quantity was of monazite. There was a decrease of 119,001 pounds in 1904 in the quantity of these minerals produced, but an increase in value of $19,838. This increase in value, which accounts for the decrease in quantity, is due largely to the purer quality of the monazite which was put on the market. The larger part of the monazite was obtained from North Carolina, only small quantities coming from South Carolina. All of the zircon was obtained from North Carolina, all of the gadolinite was produced in Texas, and the columbite in South Dakota.

None of these minerals was imported into the United States during 1904, but there was a large importation of thorium nitrate, which amounted to 58,655 pounds, valued at $249,904.

About one-fourth of all the monazite mined in the United States during 1904 was exported to Germany.

Reclamation of Arid Lands in Nevada.

It was long since recognized that in most instances the arid valley lands of the great basin, and those of the Pacific coast States, which were dry and apparently sterile, only required artificial irrigation to render them productive, and that they really were wonderfully fertile lands, if this artificial irrigation could only be applied. In many instances the matter has been taken up by the citizens of certain counties and the so-called irrigation districts formed. The lands within these districts were bonded, or the necessary financial aid was provided in some other manner, and irrigation systems, some of them of considerable magnitude, were built. Dams costing hundreds of thousands of dollars were constructed, behind which artificial reservoirs were formed, the waters of winter and spring being impounded, thus creating a supply for irrigation during the long dry summer months. Some of these great dams have been doubly useful, the water being first utilized to generate power, which has been distributed electrically to mines and to other industries, and the water later used on the ranches, orchards and vineyards of the valleys.

Although some of these irrigation schemes were of considerable magnitude, there were other similar propositions of undoubted merit, but which could not be handled in the manner above referred to, for the reason that no settlers occupied the land and few would be willing to make their homes there and pledge themselves to pay for the improvements necessary to impound large amounts of water and to convey it many miles in pipes, flumes and ditches to the arid land. The proposition was too large for a district, a county or even a State. Consequently the Government has taken up a number of these larger projects in Arizona, California, Nevada, Colorado, and also east of the Rocky mountains. One of the most important of these is the reclamation of a large area in western Nevada. L. H. Taylor, engineer in charge of this great enterprise, has contributed an interesting account of the work to "The Progressive West" of Reno, Nev.—a new publication devoted to Nevada's interests—from which the following as well as the illustrations are taken:

The passage by Congress of the Act of June 17, 1902, provided Nevada's opportunity. In the early part of September, less than three months after the approval by the President of the United States of the National irrigation law, the engineers of the U. S. Geological Survey were in the field in Nevada making exploration for, and studying the feasibility of, an irrigation system, which should utilize the great volume of water flowing to waste through the rivers of the western part of the State, for reclaiming the adjacent deserts.

The first investigations of the engineers were directed to the upper portion of the Truckee river, and the valleys to the north and northeast of the city of Reno, embracing some 73,000 acres of rich land.

Exhaustive surveys were made in this district during the fall and winter, and close estimates of the cost of the requisite canals were made. It was found, however, that the cost of construction, while not prohibitive, would be relatively high, and it was deemed inadvisable to initiate work at a point where the unit cost, or cost per acre, of reclamation approached too closely the value of the reclaimed land. A preliminary investigation of the possibilities for irrigation in the vicinity of Wadsworth and in Carson Sink valley was, therefore, begun in January, 1903. Before the opening of spring, it had been determined that a large acreage—over 200,000 acres—could be watered in that region at a comparatively small expense, and it was decided to begin construction at the earliest practicable date.

The definite location of what is now known as the main Truckee canal, designed to convey Truckee river water from a point 24 miles east of Reno, a distance of 31 miles, to Carson river, was begun in April, 1903.

Bids for its construction were asked for in May of that year, opened on July 15th, and on August 28th and September 3d contracts were executed with E. B. & A. L. Stone Co. and C. A. Warren & Co., respectively, both of San Francisco, Cal., for its construction. These were the first construction contracts awarded under the Reclamation law in the United States.

This main canal has a capacity for the first 6 miles of its course for 1400 cubic feet per second—70,000

The Truckee River Near Derby, Nevada.

The Construction Camp on the Reclamation Ditch at Derby, Nevada.

miner's inches under 4-inch pressure—and, for the remainder of its course, of 1200 cubic feet per second. The depth of water will be uniformly 13 feet, and the top of banks is 2 feet above the high-water line. The width at the top varies from 24 to 63 feet, the narrow part being lined with Portland cement concrete, and having a heavy grade. Nearly 2 miles of the canal, exclusive of tunnels, are lined with concrete.

There are three tunnels of 308, 900 and 1515 feet length, respectively. All are lined with concrete, 12 feet wide, and about 16 feet high, to crown of arch inside.

The main Truckee canal will discharge its water into Carson river at the site of the lower Carson reservoir, about 9 miles west of Leetville, in Churchill county. Thence, the water flows in a channel of that stream about 4½ miles to the diversion dam at the head of the distributing system.

This dam is a concrete structure, built to last for all time, which directs the water into two main distributing canals on either side of the river. That on the south has a bed width of 22 feet, a top width of 78 feet, and carries 12 feet of water, the capacity being 1500 cubic feet per second.

The canal on the north side is 13 feet wide at bottom, 45 feet wide at top, carries 6½ feet depth of water, and has a capacity of 450 cubic feet per second.

At present, these two canals are completed for a total length of 38 miles. With their main branches, they will ultimately have a total length of over 90 miles, while the laterals and drain ditches to be constructed in Carson Sink valley alone will aggregate 1200 miles. Already, nearly 200 miles of these have been finished, and before the end of July, 1905, nearly 300 miles now under construction will be ready for use, and will distribute water to 50,000 acres of land.

This part of the irrigation system comprises the most difficult and expensive portion of the initial item of the Truckee-Carson project, and when finished, will have cost about $1,750,000. The extensions of this, in Carson Sink valley, completing the initial item, and bringing under irrigation not less than 200,000 acres of land, will increase the total expense to about $2,600,000, and consume about two years' time.

Further extensions of the Truckee-Carson project to a total area of, approximately, 375,000 acres of land, involve the construction of expensive storage reservoirs, and costly high-line canals. This work has been planned, however, and as the lands to be immediately watered are being rapidly taken by homeseekers, funds for the completion of the work will be provided by the payments to be made on the water rights therefor.

It is estimated that the entire undertaking can thus be completed within nine years, the total cost being estimated at approximately $9,000,000.

THE LANDS TO BE IRRIGATED AND DISTRIBUTED TO HOMESEEKERS.—The number of acres of land ultimately designed to be irrigated is from 300,000 to 400,000 acres, of which 200,000 will be supplied within the next three years. Of this acreage, it is estimated that about 40,000 acres will be irrigated during the present year.

The land is located in a number of valleys along the Truckee and Carson rivers, extending on each side from the Central Pacific railroad, the distance being in some places 25 miles from the road.

The main body of 200,000 acres to be irrigated first is in the Carson Sink valley, south of the railroad. Some of the land is immediately adjacent, while the farthest extends about 25 miles from the railway.

The soil is adapted to alfalfa, all forage crops, potatoes, onions, beets and other vegetables, apples, pears, berries and other hardier deciduous fruits. The soil and climate are similar to those in the vicinity of Salt Lake and Ogden.

The public lands are subject to entry under the Homestead Act, no price being charged for the land, but the cost of irrigation will be assessed against the land as a charge for the water right, to be repaid in ten annual installments without interest, at the rate of $2.60 per annum per acre. This covers the cost of maintenance and operation during the ten-year period, and provides for the delivery of water to each farm, and also for a comprehensive drainage system.

After the ten-year period stated, the land and water rights belong to the holders of the lands forever, with no further charge by the Government. The care and maintenance of the system then passes into the hands of the land owners, under laws, however, made for the purpose which will insure protection against corporate or individual greed and fraud.

The drainage is a more important factor than would be commonly supposed, as it has been estimated by the U. S. Agricultural Department that one-tenth of the land that has been irrigated by private or corporation enterprises has been greatly injured, if not permanently ruined, by too much water and too little drainage. Drainage is imperative on account of the heavy alkali deposit, which must be carried off to insure the good quality of the soil. This drainage system has increased the cost of the project from $5 to $10 an acre, but the prosperity of the settler depends upon the one about as much as upon the other.

Title to the public lands is not given until all payments for water have been made. Lands held in private ownership are supplied with water as desired, at the same price, and upon the same terms as public lands.

The public lands are now open to entry under the Homestead Act, but intending settlers are strongly advised not to file upon any of the lands outside of the district to be irrigated during the current year, and not until it is known when the water will be ready for delivery to such outside lands, for, without water, they can produce nothing which will yield them a living.

Following is specific information for the benefit of intending settlers:

The provisions of the Reclamation Law authorize the Secretary of the Interior to limit the homestead entry to any area between 40 and 160 acres, to fix the price per acre that shall be charged for water, which price shall return to the Government the cost of the irrigation works; to fix the number of annual payments, not exceeding ten, and the date when the payments shall begin; and to perform any acts and make all rules and regulations necessary to carry out the provisions of the law.

The lands under the Truckee-Carson project can be entered under the Homestead Act only. The U. S. Land Office, where entries are made, is at Carson City, Nev. There is no charge for the land other than the usual land office fees. All entries will be limited to from 40 to 160 acres of land, depending upon location, character of soil, roughness of surface and irrigability.

Site of the Lower Carson Reservoir, Near Leetville, Nevada.

All of the public land will be divided into homestead or farm tracts, each of which will embrace enough irrigable land to support a family comfortably, if well and carefully tilled under irrigation.

Any unmarried person over twenty-one years of age, or any head of a family, who is or has declared his intention to become a citizen of the United States, who has not used his or her homestead right, or who is not then owner of more than 160 acres of land in any State, can file on any one of these tracts. Title to land cannot be acquired until all payments for water have been made. The law requires a homesteader to see and select his land personally.

Residence must be established on land within six months after filing thereon, and must be continuous thereafter, and the land cultivated for the term of five years.

The cost of water to settlers has been fixed at $26 per acre irrigable, payable in ten equal annual installments, without interest.

The homestead fees and commissions for filing, payable when application is made, are as follows:

	Acres.	
For land at $2.50 per acre for	160	$22 00
For land at $2.50 per acre for	80	11 00
For land at $2.50 per acre for	40	8 00
For land at $1.25 per acre for	160	16 00
For land at $1.25 per acre for	80	8 00
For land at $1.25 per acre for	40	6 50

Originally the Homestead Law required the appli-

cant to appear personally at the District U. S. Land Office to present his application. This requirement was modified by allowing parties who are prevented by reason of distance, bodily infirmity or other good cause from personal attendance upon the U. S. Land Office to make the preliminary affidavits for homestead entries before a commissioner of the U. S. Circuit Court having jurisdiction over the county in which the land is situated, or before the judge or clerk of any court of record of such county, and to transmit the same, with their applications and the proper fees and commissions, to the register and receiver of the U. S. Land Office of the district.

The land is from 3900 to 4200 feet above sea level. The climate is dry, the mean annual precipitation being 4 to 6 inches. Snow rarely falls to a depth of 3 or 4 inches, and never lies more than a few days.

Temperatures are about the same as at Salt Lake City, and the same crops raised there flourish here.

The soils are sandy loam, and ashy in the main, but in the lower part of the Carson Sink valley they are heavier, containing an admixture of clay. It is all valley land, covered with sagebrush and greasewood.

Well water, usually of good quality, can be obtained on the lower land at from 10 to 30 feet from the surface, and on the higher land at from 100 to 160 feet depth.

The Central Pacific Railroad traverses a part of the land, but the main body of Carson Sink valley lies from 5 to 30 miles from it.

There are now 12,000 or 15,000 acres of land under cultivation in Carson Sink valley, and the present population is less than 1000.

It will take two more years to complete the construction of the system of irrigation of the above lands; water for about 40,000 acres is now available.

Ore Deposits of the Cœur d'Alene, Idaho.

NUMBER III.

Written by F. L. RANSOME.

At the beginning of 1892 most of the South Fork mines stopped work, ostensibly to secure better freight rates. Wages at this time were $3 50 a day. In the following April a reduction was made in wages, followed by a strike of the union men. The Frisco, Gem and Bunker Hill & Sullivan mines attempted to resume work with non-union men and in July were attacked by armed strikers. Troops were called into the district and for a time order was partly restored. In July, 1894, a second attack was made upon the Gem mine, and in December the Bunker Hill & Sullivan mine closed rather than accede to union demands. In June, 1895, it resumed partial operations, paying $3 a day to miners. The Tiger and Poorman mines consolidated in this year.

In May, 1898, the Empire State Mining & Development Co. was organized to control the Last Chance mine and to acquire additional territory west of Milo gulch. This was the beginning of the process of consolidation that afterwards resulted in the formation of the Federal Mining & Smelting Co The county seat was this year moved from Murray to Wallace, now the largest town in the district.

The opening of the year 1899 found the miners' unions still determined to enforce their demands upon the mine owners, and in a particularly bitter mood against the Bunker Hill & Sullivan Co., which maintained its right to employ non-union labor. On April 29 a force of several hundred men attacked the buildings of the company at Kellogg. The office of the mine was rifled and both office and mill were totally destroyed by dynamite.

After this episode 500 regular troops were sent into the district and martial law was proclaimed. The mines were closed until June, when the Standard mine reopened with men brought from Missouri. The other mines resumed work one by one as they secured non-union miners. From that time to the present no man has been able to secure employment in the larger mines (with one exception) save through the employment bureau maintained by the principal mine owners.

In 1901 the Tiger–Poorman mine, previously acquired by the Buffalo Hump Mining Co., was consolidated with the holdings of the Empire State Co., and in September, 1903, the Empire State, Standard and Mammoth properties were all consolidated under the Federal Mining & Smelting Co. Other notable events of the past few years were the discovery in 1901 of the rich ore body of the Hercules mine, which has produced ore of a gross value of about $2,000,000 in less than three years, and the development of the Snowstorm mine in 1903. This is the only mine in the district that ships copper ore.

GENERAL CHARACTER AND DISTRIBUTION OF THE ORE DEPOSITS.—The ore deposits of the Cœur d'Alene district may be divided with reference to metallic contents into three classes:

1. Lead-silver deposits.
2. Gold deposits.
3. Copper deposits.

The lead-silver deposits are in general metasomatic fissure veins, formed in greater part by replacement of siliceous sedimentary rocks along zones of fissuring. They consist essentially of galena and siderite. The gold deposits comprise bed veins, fissure veins and placers formed in at least two periods. The gold-bearing veins consist essentially of quartz carrying free gold and auriferous sulphides. The copper deposits include impregnations along certain quartzite beds and metasomatic fissure veins. The impregnated quartzite only has produced copper on a commercial scale.

These three classes of deposits are fairly distinct in their geographical distribution. The principal lead-silver deposits occur in the portion of the district drained by the South Fork of the Cœur d'Alene river and its tributaries. They fall into three main groups—one near Wardner, one near Mullan and one near Burke. The principal gold deposits are found in the country drained by the North Fork, particularly by Prichard and Beaver creeks. The copper deposits are apparently confined to the corner of the district lying southeast of a northeast-southwest line drawn through the town of Mullan.

The geological distribution of the ore deposits is of a more definite character than might have been expected from the lack of lithological contrast in the thick series of the Cœur d'Alene sediments. The gold veins, so far as known, only occur in the Prichard slate, the oldest formation in the region. These slates constitute the prevailing rock along Prichard creek from Eagle to Thompson Pass on the main divide. The principal gold quartz veins occur in this area, the most productive being between Murray and Littlefield. Another area of Prichard slate extends along the South Fork from Osburn past Kellogg and contains the gold quartz veins worked in early days on Elk creek.

The principal lead-silver deposits are in the Burke formation which overlies the Prichard and which, as already described, is prevailingly a sericitic quartzite. Probably over 75% of the lead-silver ore mined comes from this formation. The remainder is derived from the lower beds of the Revett quartzite, from the more slaty and calcareous Wallace formation, perhaps in part from the St. Regis formation, and from the upper part of the Prichard formation, which is separable merely by a rather arbitrary plane from the Burke formation, into which it really grades.

The only productive copper deposit in the district occurs in the Revett quartzite, although a number of copper prospects have been opened in the Wallace and St. Regis formations.

LEAD–SILVER DEPOSITS.—The principal companies operating in the Cœur d'Alene district on lead-silver ores are the Federal Mining & Smelting Co., owning the Tiger–Poorman mine at Burke, the Standard-Mammoth mine at Mace and the Last Chance mine at Wardner; the Bunker Hill & Sullivan Mining & Concentrating Co., owning the Bunker Hill & Sullivan mine at Wardner; Larson & Greenough, owning the Morning mine near Mullan; the Hercules Mining Co., owning the Hercules mine, and the Hecla Mining Co., owning the Hecla mine, both near Burke. Other mines which have contributed largely to the general production in the past, although they are not at present being worked on the same profitable scale as those just mentioned, are the Helena–Frisco mine near Gem, the Granite and Custer mines on the west slope of Tiger Peak, the Gold Hunter mine near Mullan, the Sierra Nevada mine about a mile west of Wardner, and the Crown Point, owned by the Cœur d'Alene Development Co., also west of Wardner but just outside of the area mapped.

Some idea of the present relative importance of the different mines may be had from the following figures derived from a table compiled by S. A. Easton, manager of the Bunker Hill & Sullivan mine, for the Mineral Industry for 1903:

GROSS VALUE OF PRODUCT FROM THE LEAD-SILVER MINES OF THE CŒUR D'ALENE DISTRICT IN 1903.

Standard-Mammoth	$2,544,918
Morning	1,635,612
Bunker Hill & Sullivan	1,604,538
Last Chance	1,409,672
Hercules	850,258
Hecla	655 72
Tiger-Poorman	580,477
Helena–Frisco	465 287
Gold Hunter	166,000
Other mines	151,735
Total	$10,064,218

The Bunker Hill & Sullivan and the Last Chance mines are both on the same general zone of fissuring and their workings connect at several points. The deepest level near Wardner is the Kellogg tunnel of the Bunker Hill & Sullivan mine. This tunnel, which is a crosscut, runs southward from the mill, situated on the South Fork, about a mile west of Kellogg, for a distance of about 12,000 feet to the lode. It cuts the latter about 2000 feet below the croppings. The Morning mine has a crosscut adit 2 miles north of Mullan, the ore being brought down to the mill on the South Fork over a narrow gauge railway. A new adit, now being run from the mill, will cut the lodes about 800 feet below the bottom of the present workings. The Gold Hunter mine is also opened by a crosscut adit, from which two lower levels are worked through a winze. The Tiger–Poorman and Hecla mines are operated through shafts in the town of Burke. These workings are respectively 1800 and 600 feet deep. The Standard–Mammoth mine has two long crosscut adits—the Campbell tunnel, running nearly north from a point on Canyon creek, just below Mace, and the No. 6 tunnel, running nearly northeast from a point on the creek, 3000 feet west and about 150 feet below the Campbell adit. From the end of the Campbell tunnel an underground shaft or winze gives access to five levels, the lowest being 1050 feet below the adit level, or about 2000 feet below the apex of the vein. The main adit of the Helena-Frisco mine is a south crosscut from Canyon creek near Gem, at the end of which is a shaft 1400 feet deep, connecting with seven levels. The main adit of the Hercules mine is on Tiger Peak, about 1½ mile north of Burke and about 1500 feet above the bed of Canyon creek. This mine as yet produces no concentrates, the crude ore being hauled by wagons to the railroads at Burke.

It appears from the foregoing that the mines working below the main canyon bottoms of the district are the Tiger–Poorman, Hecla, Standard-Mammoth and Helena–Frisco. Of these the Tiger-Poorman (1800 feet) is the deepest.

The lead-silver mines, as a rule, are equipped with excellent machinery and are operated in a first-class and substantial manner.

Most of the lead-silver deposits in the Cœur d'Alene district are metasomatic fissure veins. They are generally tabular deposits, formed partly by the filling of open spaces, but largely by replacement along zones of fissuring or of combined fissuring and shearing. The type is best exemplified by the Canyon Creek and Mullan groups of mines. The deposits worked in the mines at Wardner have different forms from those of Canyon Creek and Mullan, but, broadly regarded, fall into the same class. The ore bodies of the Granite mine also present some exceptional features, which will be adverted to later.

The general strike of the lodes is northwestward. In the Canyon Creek and Mullan groups the prevailing strike is about N. 70° W., with local variations from N. 55° W. to west. At Wardner the Bunker Hill & Sullivan–Last Chance lode strikes N. 42° to 45° W. With the exception of this lode, which dips toward the southwest at an angle of 38°, and the Sierra Nevada lode, which in places is almost horizontal, the lodes are nearly vertical. The Standard–Mammoth and Hecla dip north-northeast at an angle of about 85°. The Tiger–Poorman, Hercules and Helena-Frisco have generally south-southwest dips ranging from 75° to nearly vertical, while the Morning and Gold Hunter lodes are practically vertical.

While the fissures appear to have been opened originally by faulting, the displacement could in no case be measured, and there is usually no observable difference in the rock on each side of the fissure. The region, as has been shown, contains many large faults that have left their marks upon the geological structure. But these structurally important faults are not ore bearing.

The productive fissures are occasionally simple fractures. Usually, however, they exhibit complexity of various kinds.

In the Morning mine are two nearly parallel zones of fissuring about 1000 feet apart. The northern one, known as the Morning vein, conforms approximately to the cleavage of the sericitic Burke and Revett quartzites in which it occurs, fissuring and cleavage being so closely related that the structure may be termed a shear zone. The average width of this zone is about 9 feet The southern zone, known as the You Like vein, is similar in character but narrower, being only about 6 feet wide. In both lodes the ore occurs to some extent in small branching, irregular, or lenticular veinlets, but the ore is mainly a replacement of the country rock and as a whole has no definite walls.

In the Gold Hunter mine are three parallel lodes, which, with minor intermediate ones, constitute a shear zone about 70 feet wide, of which a small part only is productive. Structurally this zone resembles the Morning and You Like veins, but is less persistent, and the productive parts of the lode, as they are followed along their strike, lose their identity in the slaty cleavage of the Wallace and probably St. Regis formations, which form the country rock of this deposit. The Gold Hunter lode is supposed to be a continuation of the You Like vein. While this is probable, the continuity has not been established. The Gold Hunter and Morning zone of shearing and fissuring probably continues west-northwest to Canyon Creek, where it seems to be represented by the fissures of the Helena-Frisco mine, which is in the Burke formation. The lodes worked in the Helena-Frisco are three in number, known as the Black Bear, Frisco and Gem veins. They are apparently parts of a single faulted lode, as shown in Fig. 1, but as the mine was only in small part accessible at the time of visit, this hypothesis, which is strongly supported by the maps of the underground workings, could not be fully verified. The three veins, moreover, are not identical in structure or in character of ore, and it is possible that the transverse faults are older than the ore. The Black Bear vein is rarely over 3 feet wide and is a simple filled fissure with very little metasomatic replacement. The Frisco vein is also in the main a simple fissure, but a considerable part of the ore occurs as a replacement of the country rock. The Gem vein is much like the Frisco. It splits up and can not be followed after entering the intrusive mass of syenite on the west.

The Standard-Mammoth and Hecla mines are prob-

ably on a single fissure zone, but the actual continuity is broken by a northwest-southeast fault, dipping northeast, against which the vein abuts at the eastern end of the Standard-Mammoth mine. Between this fault and the Hecla shaft the vein is unknown. In the Standard-Mammoth and Hecla mines the general country rock, as in all of the large Canyon Creek mines, is the Burke formation. The ore occurs in a

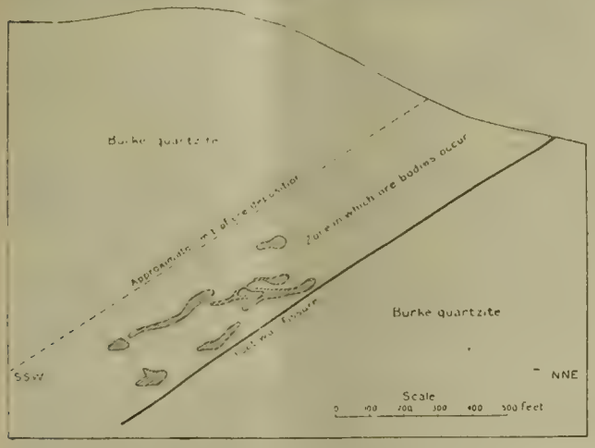


Fig. 1—Cross Section Bunker Hill & Sullivan, Showing Relation of Ore Bodies to Foot Wall.

zone of combined fissuring and shearing, partly as the filling of fissures and partly as a replacement of the sericitic quartzite. The lode has no definite walls and usually ranges from 4 to 10 feet in width. In the Hecla mine the ore usually occurs on one side of a dark narrow dike, of which no microscopical examination has yet been made, but which resembles a fine-grained diorite. Very rarely a little ore occurs as a replacement in the dike. A little of the same rock, although discontinuous and much more decomposed, occurs with the Standard-Mammoth vein.

The Tiger-Poorman lode is generally similar to the Standard-Mammoth, the ore being usually from 3 to 15 feet in width. In the eastern part of the mine the lode exhibits a well-marked linked vein or imbricated structure.

In the Wardner deposits, as exemplified in the Bunker Hill & Sullivan and Last Chance mines, there is one dominant fissure, locally known as the "foot wall," which strikes northwest and dips southwestward at an angle of 38°. The rocks on both sides of this fissure are sericitic quartzites of the Burke formation. Those in the hanging wall are much more fissured than those in the foot wall, and it is in the fissured hanging wall quartzite that the ore bodies occur. No ore of importance has yet been found in the quartzite of the foot wall in these mines. Although the main fissure was undoubtedly formed prior to the deposition of the ore, it has also been a plane of later movement, as shown by the slickensided surfaces on the ore, and it is always accompanied by soft gouge.

The zone of fissured quartzite in which the ore bodies occur has a maximum width, measured perpendicularly to the foot wall fissure, of about 300 feet. Within this zone, sometimes in contact with the foot wall, sometimes separated from it by barren quartzite, occur numerous ore bodies of very irregular shape

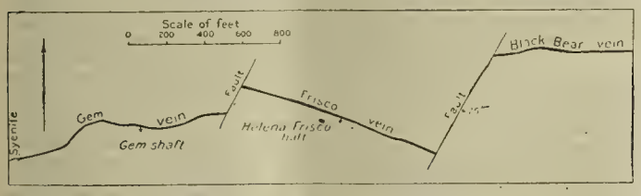


Fig. 2—Plan of the Veins in the Helena-Frisco Mine.

(see Fig. 2). The whole fissured zone, 300 feet in width, may be regarded as a single great lode, within which the partly overlapping and partly connected ore bodies are not uniformly distributed in the plane of the zone, but are grouped in at least four fairly distinct shoots, three of which have a general northwesterly pitch (in the plane of the lode) of 45°. The fourth, which is the most northwestern of the large pay shoots, occurs at the junction of the main foot wall fissure, with a zone of pressure running off into the hanging wall in a southwesterly direction and dipping southeast. This is the so-called Jersey or Skookum fissure. Along this fissure zone for a horizontal distance of nearly 500 feet, and in the pitching trough formed by the intersection with the main foot wall fissure, occurs some of the richest ore in the Wardner mines. The other pay shoots are also connected with distinct fissuring of the hanging wall quartzite, but this fissuring is elsewhere of a more irregular character than in the Jersey fissure zone. The ore of the Sierra Nevada mine also occurred in a hanging wall fissure zone connecting with the main foot wall of the Bunker Hill & Sullivan lode.

Definite walls to the ore bodies of the Wardner mines occur only where the ore rests upon the gouge seams marking the main foot wall or the foot wall of the Jersey fissure zone, or where the ore has been locally faulted. As a rule, the ore passes gradually into the unmineralized quartzite.

In the Granite mine the ore occurs in extremely irregular masses in a tongue of metamorphosed and fissured quartzite which projects into the intrusive mass of syenite north of Gem.

CHARACTER OF THE ORES.—The most characteristic minerals of the lead silver ores are galena and siderite. Both of these minerals occur as the filling of fissures and as metasomatic replacements. In many cases the galena directly replaces sericitic quartzite. But in some large ore bodies, particularly those at Wardner, the quartzite was first replaced by siderite, which was in turn replaced by galena. All stages may be seen, from siderite that is traversed by little reticulating veinlets of galena to complete replacement by the lead sulphide. That galena was formed at more than one period is shown by the fact that masses of coarsely crystalline galena are sometimes traversed by veinlets of a more compact variety of the same mineral.

Pyrite and sphalerite are found in all the deposits. The latter is particularly abundant in the Granite mine. Elsewhere it is a minor constituent of the ore and many of the deposits are remarkably free from it. The average quantity of zinc in the concentrates from the Federal Co.'s mines is about 4.5%. While most of the mines working above the main drainage lines of the district show no impoverishment of the ore through an increase of pyrite and sphalerite, the conditions in the lower levels of the Helena-Frisco, Tiger-Poorman and Standard-Mammoth indicate that such a change, probably a gradual one, may be expected at considerable depths.

Tetrahedrite occurs in bunches in the galena of the Wardner and Mullan mines and in the Standard-Mammoth. It is never very abundant and always indicates ore rich in silver. It appears to be rather more abundant near the surface than at great depth.

Chalcopyrite is very rare in the mines at Wardner. In the Standard-Mammoth mine, however, it is fairly common, though never found in large masses, and it occurs also in the Tiger Poorman, Helena-Frisco and Granite mines. It is frequently closely associated with pyrrhotite, particularly on the bottom level of the Tiger-Poorman. Pyrrhotite was detected also in the concentrates from the Morning mine. Small quantities of stibnite occur in the Gold Hunter lode.

In addition to the prevailing siderite, quartz forms a subordinate part of the gangue in all the large mines. Barite was noted in the Standard-Mammoth, Gold Hunter and Morning mines and a little calcite in the Hecla mine. As a general rule, the quartz is more abundant in the low-grade portions of the ore bodies.

The minerals found in the oxidized zone are cerussite, cerargyrite, native silver, pyromorphite and occasionally a little malachite or azurite. Limonite, of course, is always present, and results from the oxidation of the pyrite and the siderite. Plattnerite occurred in the upper tunnels of the You Like vein.

The average content of the ores in silver is a little over half an ounce to each per cent of lead per ton. During the fiscal year 1903-4 the ore of the Bunker Hill & Sullivan mine averaged 8.8% of lead and 3.9 ounces of silver. The first-class concentrates from the same mine averaged 55% lead and 19.5 ounces of silver to the ton. The ore of the Morning mine in 1903 had an average tenor of 7.4% of lead and 2.9 ounces of silver per ton. The average contents per ton in the ore of the Helena-Frisco mine in 1903 were 4.5% of lead and 2.7 ounces of silver. Such ore, however, is unprofitable. In 1897 the average of the same mine was 5.5% of lead and 4.2 ounces of silver. Probably the richest ore now produced on a large scale is that of the Hercules, with approximately 50% of lead and 45 ounces of silver to the ton. This, however, is picked material, as this mine does not at present concentrate any of its ore.

(TO BE CONTINUED.)

Trade Treatises.

"California—Her Resources and Possibilities" are described in the 15th annual report of the California State Board of Trade.

The Reynold Roller Chain, for chain drives, is tersely described in illustrated booklet No. 54 of the Link Belt Engineering Co. of Philadelphia, Pa.

Crandall Packings for steam, ammonia and hydraulic purposes are catalogued and priced in a booklet from the Crandall Packing Co. of Palmyra, N. Y.

The Allis Chalmers Co., Milwaukee, Wis., have republished Prof. H. O. Hofman's "Gold Mining in the Black Hills" in attractive form. This paper has been in demand since its first publication by the American Institute of Mining Engineers.

Personal.

F. A. HEINZE of Butte, Mont., is in London, Eng.

F. J. FROST is in Denver, Colo., from Buena Vista, Colo.

E. L. NEWHOUSE of New York City is in San Francisco, Cal.

W. R. RUST of Tacoma smelter has returned from San Francisco, Cal.

O. A. NICHOLS has taken the management Nichols M. Co. at Sherwood, Mo.

G. R. YEARSLEY has been appointed mill superintendent Pfau G. M. Co., at Cherry, Ariz.

W. L. COBB has returned to San Francisco, Cal., from mine examination at Plymouth, Cal.

J. T. WELLS has resigned as superintendent Luna Lead Co.'s smelter at Deming, N. M.

JAS. HAMPTON has been appointed foreman Oneida mine at Jackson, Amador county, Cal.

THOS. H. LEGGETT, mining engineer of San Francisco, Cal., has returned from London, England.

L. M. ADSIT has been appointed assistant superintendent Highland Boy mine at Bingham, Utah.

A. W. ROBBINS has been appointed superintendent Gold Sovereign mine at Cripple Creek, Colo.

A. B. ROYAL has returned to Pasadena, Cal., after examining mines at Cerbat, Mohave county, Ariz.

S. E. BRETHERTON of Joplin, Mo., has charge of the Afterthought smelter at Ingot, Shasta county, Cal.

G. D. REID has resigned as superintendent Ladds Metal Co. of Portland, Or., and will examine mines in Mexico.

C. R. NORRIS, superintendent Great Sulphide mine near Tucson, Ariz., is consulting with stockholders at Oxnard, Cal.

E. P. POPE, treasurer La Libertad M. Co. of Altar, Sonora, Mexico, has returned to Parkersburg, W. Va., from the mine.

W. F. DE CAMP, formerly superintendent, has been appointed manager El Tigre mine, with headquarters at Douglas, Ariz.

G. H. HOOPER AND E. G. ECKIS of Los Angeles, Cal., have been examining the Midnight and Pinkham mines at Chloride, Ariz.

R. L. HENDRICK has been appointed superintendent Black Hawk mine at Soulsbyville, Cal., succeeding R. H. Barnes, resigned.

J. A. CREIGHTON has been appointed superintendent Dalton & Lark mines at Bingham, Utah, succeeding Chas Lawton, resigned.

WM. CLARK of Grass Valley, Cal., has been appointed superintendent Eagle & Blue Bell mines at Eureka, Utah, succeeding J. A. Creighton.

G. W. MYERS, representative Chrome Steel Works, has left San Francisco, Cal., on the Sierra for Australia, whence he will visit Japan and China.

W. C. BOGUE, Salt Lake City, Utah, has resigned as local manager Mine & Smelter Supply Co. and will be manager Western Iron Mills Co. at Denver, Colo.

T. H. OXNAM, formerly manager, has been retained as consulting engineer for the Palmarejo & Mexican Goldfields, Ltd., at Chinipas, Chihuahua, Mexico.

W. D. WALTMAN, formerly of Cripple Creek, Colo., is supervisor of mining for the Mining Bureau of the Panama Canal Commission at Empire, Canal Zone, Panama.

R. H. BARNES has resigned as superintendent Black Hawk mine at Soulsbyville, Cal., and will go to Sinaloa, Mexico, on professional business for the Black Hawk M. Co.

W. B. ROUNTREE, chief assayer and chemist for the Mountain Copper Co. at Keswick, Cal., has been transferred to the company's new reduction plant at Martinez, Cal.

WM. A. POMEROY, recent manager Great Fingall mine, West Australia, has been appointed manager Palmarejo & Mexican Goldfields, Ltd., at Chinipas, Chihuahua, Mexico.

DANIEL GUGGENHEIM, ROBT. GUGGENHEIM, S. W. ECCLES AND H. B. TOOKER, all of American Securities Co., are in San Francisco, Cal., to plan improvements for the Selby and Tacoma smelters.

A. H. WHITESIDE of the Allis-Chalmers Co.'s office at Atlanta, Ga., is transferred to the Philadelphia district office, where he succeeds as manager W. A. Wood, resigned. M. W. Thomas has been appointed Atlanta manager. W. J. Buckley has been appointed St. Louis manager. H. P. Hill, whom he succeeds, goes to the Salt Lake City office.

Obituary.

W. F. NEWELL, ore buyer for the Selby Smelting Works, died July 19 in Oakland, Cal., age 47 years. He was one of the best known mineralogists on the Pacific coast.

W. F. PATRICK, for years one of the leading mine operators of Colorado, died July 14 at Rhyolite, Nev. He, with his brother, L. L. Patrick, was one of the leading owners of the Combination mine at Rhyolite.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The 14 miles of railroad from Chena to Fairbanks was completed July 18. A branch road to the creeks is graded and expected to be in operation by September.

An important decision affecting the mining interests of Alaska has been rendered by Judge Wickersham at Fairbanks. Miners there believe it will do more toward the development of the resources of that country than anything else which has occurred within recent years. The judgment will result in developing the country by compelling men who lay claim to mineral ground to dig into it in order to make good their rights. The posting of a notice of location is no longer sufficient. Judge Wickersham defines the rights of the miner and locator in unmistakable terms, as follows: "Discovery of mineral is necessary to the validity of a placer mining claim. If staking and recording shall follow after the date of the discovery they relate back to the discovery, and, in case no intervening rights have attached, perfect the claim as of that date. But it is not so with the discovery. If acts of staking and recording are performed first, as in this case, and discovery last, the validity and life of the claim begin only with the discovery. The greatest evil in the administration of mining law in Alaska is the habit of the shiftless, in staking and recording claims, generally by power of attorney, whereby one person out of ten acquires a claim to a large area of supposed mineral lands and excludes the willing miner from working it and developing the resources of the Territory. Since the threat of lawsuit lurks behind each of these pretended locations, the prospector generally passes it by, and thus the speculative locator controls the property.

ARIZONA.

Cochise County.

(Special Correspondence).—R. Mitchell of Los Angeles, Cal., and associates have completed details for a smelter at Naco. The capacity of the plant is 250 tons a day, and the works will be devoted almost entirely to copper ores.

Naco, July 16.

(Special Correspondence).—T. King and J. Warren of Johnson are mining and shipping ore from that camp to El Paso. There is considerable mining going on in the district. The Arizona Con. is shipping a good grade of sulphide copper from the Republic and Mammoth mines.

Johnson, July 15.

P. S. Simmons, president of the Flourine M. Co., at Pearce, reports that the shaft is down 75 feet and a vein of silver has been cut.——It is reported that the Tombstone Consolidated Mines Co. is to begin the treatment of a portion of its ores by the cyanide process.

On the 700-foot level on the Shattuck & Arizona a fine body of ore has been found. The main shaft is down 750 feet. The pumps are in operation. Superintendent Pattison will resume work in the bottom of the shaft as soon as the water is taken out.——Of the Copper Glance property, near Bisbee, the stockholders are left with the patented ground, as the machinery has been taken off.

Gila County.

The Arizona Commercial Copper Co. have completed track connecting the Copper Hill mine with the United Globe surface tramway and are shipping ore to the Old Dominion smelter. Initial shipments will not exceed 100 tons per day, but will be gradually increased.

Graham County.

(Special Correspondence).—The output of copper in the Clifton-Morenci district for June was nearly 3000 tons with the increased facilities for reduction now being installed; an increase of 500 tons per month is expected by Jan. 1, 1906. The Arizona Copper Co. is driving a tunnel through the mountain at Morenci to connect the Humboldt mine with the new concentrator they are building. This company is also sinking their main working shaft on the Big Coronado lead an additional 200 feet from the 500 to the 700-foot level.——The Coronado Copper M. Co. is putting in a gasoline hoist at the Garnet shaft.——The Crawford Gold M. Co. has opened up a high grade gold ore.——The Shannon Copper Co. is shipping on an average 900 tons of ore daily. This company is putting in converters at their smelter and hereafter will treat their own matte instead of getting it done by the Arizona Copper Co.

Metcalf, July 16.

Announcement is made that the Shannon Co., at Clifton, will have a converter plant in operation before the close of the year. Heretofore the Shannon matte has been run through the converters of the Arizona Copper Co. in Clifton, at much expense through transportation and cooling.——A briqueting plant is being added to the equipment of the Arizona Copper Co. of Clifton, with capacity for compressing twenty-five tons a day of slack coal, coke or flue dust.

Two shifts are at work on the Weaver mines in Greenlee district, north of Clifton.

Mohave County.

W. C. Howard, general manager of the Katherine and other mines in the Pyramid section, 20 miles from Kingman, is putting in a large pumping plant for the mill and a new hoisting plant. The main shaft is down 200 feet on the Katherine mine.

Pima County.

C. R. Norris, superintendent of the Great Sulphide mines near Tucson, reports that the main shaft is down 200 feet. The new railway from Tucson to the Copper Belt mines passes within 6 miles of the Great Sulphide workings. Work has been temporarily suspended.

Pinal County.

The leaching experiment on the Ray mine, near Kelvin, is apparently giving satisfaction. Electricity is used as a precipitating agent. The company thinks that it will be ready to commence active operations in both mine and smelter within a month.——A stamp mill is to be put in at the Lucien Walker mine in the Casa Grande district.

Yavapai County.

Work has begun on the excavations for the smelting plant and necessary buildings at the Val Verde mine.——The main shaft of the Pine Mountain mine, at Walker, is to be sunk 400 feet deeper from the present 200-foot level, where crosscutting will be done to follow up the ore bodies.——The Gold-Copper Co. is working mines south of Prescott under the direction of T. Marmont.——Work is to begin on the Rosalie copper mines near Mayer with ten men. D. J. Thompson of Prescott is one of the owners.

The Sayer G. M. Co. intends to sink their main shaft east of Martinez 100 feet deeper and will then drift on the vein to show the extent of the ore body.——It is reported that work is to be resumed at the Octave mine at Octave upon the return of Superintendent A. E. Hurley from the East.——A hoist and pump are to be put on the Octave Extension gold mines, which are being worked by the Southwestern Development Co.——C. E. Butler and associates will place a hoist and pump on the Commodore mine preparatory to sinking the shaft.——The Alaska group, near Congress, with D. J. Sullivan as manager, will soon put up a hoist.——The Planet Saturn group, east of Martinez, has recently been bonded to a company who will unwater the main shaft and commence active development work. The main shaft is down over 1000 feet.——East of Martinez the Rincon Mines Co. are building a new mill.——Recently fire destroyed the blacksmith shop and pump house at the Pfau mine in the Cherry Creek district, but has not interfered with the working of the mine, and everything is to be replaced.

Yuma County.

(Special Correspondence).—The California & Arizona M. Co. are employing a good force on their claims at Melton. The work consists principally of tunnels run off on the veins and in making upraises for the purpose of obtaining better ventilation. Two shipments of ore have been made.

Melton, July 15.

CALIFORNIA.

Butte County.

Articles of incorporation of the Cascade Placer Corporation have been filed at Oroville. The purpose is to develop the Cascade mine, 12 miles above Lumpkin.

It is reported that the deal pending between the London Venture Corporation and the owners of several dredger properties on the Feather river for the sale of the latter has finally been effected in London. The properties involved are the Boston & California and the Boston & Oroville companies, the Oroville Gold Dredging & Exploration Co. and the Bear River Co. The latter is on the Bear river. The price agreed upon is said to be $3,000,000. Among the owners of these properties are Evans & Clark of Boston and W. P. Hammon and A. F. Jones of Oroville, the estate of the late J. E. Doolittle, F. W. Bradley, W. H. Crocker, the Guggenheims, J. H. Hammond and several others. There are eight dredgers already at work on these properties and orders for six more have been placed.

Calaveras County.

Work has been commenced on the San Andreas quartz mine at San Andreas, under the direction of John Henry.——The air connection has been finished at Reed's mine on Central hill, near San Andreas.——The Bertola and Zugar gravel mines, between El Dorado and Sheepranch, have been bonded through E. C. Rigney of El Dorado to Los Angeles capitalists, and development work on the properties, with Mr. Rigney as general manager, will commence on July 15.——The owners of the Gum Boot mine, near Esmeralda, have bonded their property to a company, with John Campbell of Murphys as general manager.——The new mill for the Clary G. M. Co. is being built on the South Bank mine at Indian creek, near Sheepranch.——Work at the Ohio mine on Indian creek, near Esmeralda, is under the superintendency of W. L. Driver of Murphys. At present there is a force of eight men at work, and this will be increased as the work advances sufficiently to advantageously work a larger number of men.

Contra Costa County.

The smelter trust, of which D. Guggenheim of New York, now in San Francisco, is the head, is considering plans for establishing a smelting plant at a point, yet to be selected, on the bay shore between San Francisco and Port Costa. It is proposed to have the works convenient to the Southern Pacific and Santa Fe railroads. It has been realized that the Selby smelter is inadequate for the business which the trust intends to develop on this coast. It was announced recently by D. Guggenheim that his company would enlarge the works at Port Costa, but since then the officials of the trust have been made to realize that the site of the works is not of sufficient size to permit the improvements contemplated. In consequence it has been decided to erect another and larger works, similar to those at Tacoma, at a point farther south, where connections can be made with both the Southern Pacific and the Santa Fe lines. It is very likely that before purchasing a site the trust officials will secure title to many pieces of land adjacent to the bay shore in order to obviate the possibility of farmers protesting against the establishment of the new works.

El Dorado County.

Half of Grizzly Flat was destroyed by fire July 18.

Kern County.

For the first time since 1897, when, by an act of the Legislature, mining districts were abolished, Kern county is to have an organized mining district, that of Amalie. This district was first organized in 1895, and did not take advantage of the new laws when the Legislature of 1899 repealed the act of 1897. Since that time all locations of Amalie, as of other districts in the county, have been filed with the county recorder.

Mariposa County.

G. Dwart, treasurer of the Alice G. M. Co., and C. Ollinger, president and general manager, purchased the Alice mine from Carroll & McCrossen last December. The mine is in Hunter's valley near Merced river, near Mariposa. The old shaft is being repaired and enlarged. It is 85 feet deep and will be sunk 90 feet farther, when drifts will be run. After the mine has been developed it is the intention to build a mill. —— The California-Tennessee G. M. Co. are building a hoist and 10-stamp mill at Indian gulch. The hoist will be run by gasoline, the mill by steam. The mill is expected to begin crushing on July 26th. The shaft at the mine is down 200 feet.

Nevada County.

New concentrators and a canvas plant are to be put in at the 16 to 1 mine near Washington. F. M. Egan of Sacramento, president of the company, is at the mine. There is talk of putting in a chlorination plant at the mine, also to put in a new hoist, preparatory to sinking. J. H. English is superintendent.

The Majestic mine, in Rough and Ready district, has been started under the management of W. G. Dround. The shaft is being unwatered preparatory to sinking from the 250-foot level.——At Cherokee Flat, the Morning Star is grading for its projected mill. Its new shaft is down 100 feet, and, in addition, the owners intend to sink the old shaft several hundred feet deeper.

It is reported that tributers, headed by H. J. Stewart, have started work at the Union Hill mine, near Grass Valley. The pumps are unwatering the mine. The company will furnish material and keep the pumps running, working on a percentage basis with the men. The crew expects to go down the creek 1200 feet and sink a new shaft.——The Neversweat mine, at Willow Valley, is to be developed by C. Fischer and J. F. Dietrich of Gold Hill, Nev. They are extending two of the three tunnels on the mine. The lower, or drain tunnel, will be driven in along the ledge.——The hoist on the old Spanish mine, in Woods ravine, has been sold to the Esperance M. Co. of French Corral, who will move it to their mine.

Never before in history has Cherokee and Badger Hill had brighter prospects ahead than at present. The Morning Star mine has some forty men at work in the mine, grading for the mill and doing other work, and the Badger Hill Gravel Co. is figuring on sinking a shaft to tap the gravel channel. It is believed that the property will pay to work by the drifting process. Many years ago the Badger Hill was operated through the hydraulicking process and it paid handsome dividends. There is still a great bank of gravel left, and the owners, the Bloomfield Co., are now preparing to start a shaft and run drifts. The shaft at the Morning Star is now down about 100 feet and the ledge still holds good. It is their intention soon to open the old shaft, to the west from the new one, which is about 170 feet deep. There is a hoisting and pumping rig on the old shaft.

Placer County.

The Tadpole mine, 5 miles above Westville, is reported to be working four men, and ore will be crushed at the Alameda mill, at Black canyon, until the mine is thoroughly tested and prospected.——L. C. Trent, president of the Dairy Farm mine, 7 miles north of Lincoln, intends to build a railroad from the Dairy Farm mine to the main line of the Southern Pacific Co.——The Blue Jay mine, in the Dairy Farm district, owned by Price, is said to be showing up well.——The machinery at the Bellevue mine, near Ophir, has been started by Buchanan & Lozano.

Shasta County.

It is reported that the Afterthought smelter at Ingot is in successful operation under the direction of S. E. Bretherton.

A company organized with T. Shonts, head of the Panama Canal Commission, as a stockholder and director, has purchased the Boulder mine, near Castella.

The Delta Con. has bought the Delta and the Bacchus mines, 6 miles from Delta. The Delta mine was purchased from F. M. Johnson of San Francisco and the Bacchus from E. F. Fitzpatrick of Redwood City. The acquisition of these mines by the Delta Con. will mean the reopening of the Dog Creek gold regions and a railroad and smelter may be built within a year.

Sierra County.

The Downieville Messenger reports that work is steadily progressing at the White Bear mine, near Downieville, with twenty-five men, under the superintendency of W. J. Belcher. Power drills have recently been put in to facilitate the running of the hard rock tunnel to open up the channel to the north.—For the last twelve months the crew at the Exchange mine, near Monte Cristo, owned by J. Peckwith, T. Peckwith and H. Spaulding, Jr., have been enlarging the tunnel and constructing an airway alongside the tunnel, and reopening an old air shaft. This work is now about completed and they are ready to begin the extraction of gravel, of which they have a large body already developed. The channel is said to be the continuation of the White Bear channel.——At the Papoose mine in Jim Crow canyon, near Downieville, W. H. Corbiere, who has a bond on the property, has struck the ledge in a new tunnel, below the upper workings.——At Happy Hollow, near Port Wine, twenty-five men are employed, under the management of A. F. Eaton of San Jose, who has been reappointed manager of the Tabor mine at Gibsonville.——Rich sulphurets have been struck at the Last Resort mine at Downieville. F. E. Wilber, vice-president, is expected from Guthrie, Okla., August 1 to make an examination of the property.

At the annual meeting of the Poker Flat G. M. & M. Co. of Poker Flat, near Table Rock, the following officers and directors were elected: President, O. P. Cooper, Guthrie, Okla.; vice-president, C. H. Molter, Berkeley; secretary, F. P. Roddy; treasurer and manager, E. L. Blincoe; directors, J. Duke, Guthrie, Okla.; J. B. Lassiat, Downieville; C. Berg, San Francisco. The company is reducing their capital stock from 1,000,000 shares to 100,000. The further work of the mine will be conducted by Mr. Blincoe.

Work is to be started at the Herkimer gravel mine, near Poker Flat, Table Rock P. O., owned by H. L. Huntington and W. P. Sawyer, both of Nevada City. H. Fowler is to run a tunnel to tap the channel 800 feet in.

Siskiyou County.

The mill at the Mabel mine on Mill creek, near Scott

Bar, 15 miles from Montague, is crushing good ore. W. H. Parker has a cyanide plant at the mill with which he is working the tailings pile.——At Humbug creek the Mono Co. is building a 25-ton mill and cyanide plant.——Superintendent Tibbetts of the Headwaters mine, near Humbug, is running a 400-foot crosscut tunnel to strike the ledge at lower depth.

Sutter County.

It is reported that a prospecting drill is to be placed on T. L. Smith's land near Yuba City as a result of preliminary tests on the gold-bearing gravels.

Trinity County.

W. Stover, who has bonded the Beaudry mine, at Minersville, near Weaver, intends to work the low ground with a hydraulic elevator.——Lorenz Bros. have bought the Wallace mine, on Steiner's Flat, 3 miles from Douglas City, from J. C. and L. J. Wallace.

Tuolumne County.

(Special Correspondence).—The double-compartment shaft of the Black Hawk mine, at Soulsbyville, is down 100 feet and a crosscut is being driven to cut the ledge. Superintendent R. H. Hendricks has eight men at work.

Soulsbyville, July 19.

Work is to be resumed at the Del Monte mine, near Groveland.——A new steel hoist is being put up at the Arrow mine, west of Soulsbyville.——The stamps added to the mill at the Longfellow have commenced pounding on good ore. The shaft has been enlarged and retimbered and drifting is being done on the 300, 450 and 600 levels.

J. M. Merrill will start work at the Cosmopolite mine, near Groveland. A small stamp mill will be put in at once. W. Waldron is superintendent.

COLORADO.

(Special Correspondence).—The American Mining Congress, with headquarters in Denver, will hold a meeting to decide on future work for the association. One of the questions to come before the meeting will be the raising of sufficient money to build suitable headquarters for the congress. It is understood the method for raising the necessary capital will be by subscription and sale of stock in the association. It is stated, by parties who are in a position to know, that several leading mining men of the State and country at large have come forward with good subscriptions and that the building will be an assured fact. The congress expects to expend $500,000 on the building. It is also the intention of the association to secure a large display of minerals from different sections.

The report comes from the Cripple Creek district that a number of assayers in the district have been placed under arrest for receiving stolen ore from the "high graders." With some assayers this seems to be the height of their ambition to act as a fence for the ore thieves. Were it not for the fact that some of the assayers make it a part of their "professional duty" to handle that class of work, the operators would not find it so difficult to weed out the high graders in the mines. It is said that assayers who follow the vocation of buying high-grade ores that have been stolen make a small fortune out of the work each year.

The State will have a bill of about $2500 to settle with the citizens of Telluride on account of "lost arms" which the militia took from the citizens during the recent strike in that vicinity and which have not been returned to the owners.

The anti-boycott measure passed at the last meeting of the Legislature is to take effect some time during this month and is intended to stop boycotting, picketing and blacklisting. The law is intended to work in favor of both employer and employe. Under the new law the employer will not be permitted to blacklist employes and employes will not be permitted to boycott the employer.

It is understood the Government will not take action against the Moffat road for right-of-way through Gore canyon and that the suit recently started against the road will be dropped. From indications the Moffat road will not be enjoined from building their line through the canyon.

It is the opinion of a prominent mining engineer that should the merger of the railroads take place in the Cripple Creek district and the transportation charges raised it will be a good thing for Cripple Creek and vicinity, as the operators will then begin to develop different processes for handling the low-grade material and thereby avoid heavy shipping charges.

Denver, July 17.

Clear Creek County.

At Idaho Springs the Columbia mine, on Chicago mountain, the western extension of which forms the junction with the Great Republican vein, has resumed after lying idle for nearly five years. It is being worked by a pool of Idaho Springs men, including J. G. Roberts, W. G. Arkills (manager of the Star tunnel), E. R. Lumley, M. C. Potter, R. R. Graham, J. Nelson and J. W. Anderson.

It is reported that W. Rogers, general manager of the Santiago mine, in the Argentine district, has bought the old Clear Creek mill, in the south end of Georgetown. The entire plant will be overhauled and new and modern machinery will be put in.

Manager Wilcox of the Waldorf Co., operating in Argentine district, near Georgetown, has made a good strike at the junction of the Paymaster and Commonwealth veins through a 75-foot lateral drift from the main tunnel. The junction is 690 feet below the lowest of the upper workings, which will enable the manager to drive seven levels, 100 feet apart, and open rich ground. The Wilcox tunnel will be continued on its projected line to cut the Mendham, Wheeling Johnson, Independence and other veins at a depth of 1700 feet below the old shaft workings. The first of the veins will be cut 1000 feet beyond the present heading, and the others a short distance ahead of the Mendham. The building is finished and the machinery on the ground ready for installation and will be ready to run within two months. It will be a duplicate of the Stevens mill. From the dumps and stopes of the Stevens mine they are taking formerly rejected stuff, milling at a cost of 93 cents a ton average and getting out of it $8000 to $10,000 a month. They are putting in twelve machine drills into the Tobin mine and in the ore bodies of the big tunnel. Much of this is high grade which will be sent to the smelters direct, the lower being reserved for milling.

The Ramsdale claims on Lincoln mountain have been sold to G. W. Teagarden and A. B. Montgomery of Georgetown, representing Eastern capitalists, for $35,000. This property was owned by H. G. Haeseler and H. J. Crist of Georgetown and W. Schauer of Longmont. The Ramsdale group is in the new gold belt of upper Clear Creek. The crosscut has been driven 450 feet, with 150 feet of drifting on the Ramsdale lode. In addition to this a number of shafts have been sunk on the various lodes belonging to the group. It is the purpose of the new purchasers to put in heavy machinery within the next month and a concentrator is also discussed. Other property owners of Lincoln mountain are making arrangements for the resumption of work.

The new conveyor has arrived at the Mendota mill at Silver Plume and operations at the mill have been resumed on material from the dump, as it is desired to treat as much of the dump stuff as possible during the summer months. In the winter bad weather will not interfere with getting the ore out of the mine for concentration, and some work is being carried on in the mine for the purpose of getting the old workings in shape for running the stopes and taking down the streaks of low-grade ore that were left when the lead streaks were worked out, as there was no money in zinc ore then, while it now proves to be very profitable where the ore can be concentrated.

The Silver Standard says that what seems to be needed for the development of the mineral resources of McClellan mountain is the driving of a tunnel from the Silver Plume side of it similar to the enterprises that are being carried on in the East Argentine district for the development and economical working of the veins there. The most advantageous location for such a tunnel would seem to be in the territory embraced in the holdings of the Silver Plume Mines & Tunnel Co., the group of claims owned by Aldrich, the Daisy group and J. W. Boughton's claims.

El Paso County.

F. F. Castello has been elected president of the Colorado Springs Mining Stock Exchange; J. A. Hayes, first vice-president; J. R. McKinnie, second vice-president; J. A. Connell, third vice-president, and W. P. Kinney, secretary and treasurer.

Fremont County.

Engineers have finished the preliminary survey of the Great Western railway, connecting the Great Western coal mines with Canon City, a distance of 5 miles. This is believed to be the preliminary step toward building south to Trinidad and from that point south to El Paso, Tex.

Gilpin County.

It is reported that work will be started at Golden Rod M. & M. Co.'s mines, up Silver creek, near Central City, August 1, by which time the water will have subsided.——At the Mascot shaft of the Boston-Occidental M. Co. at American City the shaft has passed the 300-foot point and good headway is being made in deepening it. The shaft is being sunk vertical, is 8x10 feet in the clear and is of two compartments, and will cut the vein at a depth of 370 feet, as the vein is dipping north. The 280-foot crosscut is in 30 feet and is being extended to the vein. At the 200-foot level the vein is 16 feet wide. The work is in charge of Foreman S. Reid.——F. Ingram and L. J. Mountz, owners of the Jim tunnel property on Elk creek, near Central City, have run the tunnel in 200 feet.——The foundation work on the drying room for the Boston-Occidental M. Co., on Colorado hill, has been completed and the contract for the new building has been given to G. Converse, who has commenced work.——Manager L. J. Mountz of the Cyrene Gold Mines Co., operating in the Twelve Mile section, is asking for bids for sinking the main shaft down another lift of 100 feet and for drifting 100 feet. The main shaft is down 130 feet and in the lower levels a good body of ore of a concentrating and smelting character has been disclosed.

The United Mining & Exploration Co., operating the Modoc mine, on Quartz hill, has put in a boiler and small air compressor. Free-milling ore has been opened in the 200-foot workings, and it is the intention of the company to upraise from the workings, to make a cage shaft to handle the increasing production.——The Pioneer tunnel of the Decatur Gold M., M. & T. Co., in Moon gulch, under the management of W. M. Ashmore, is in 630 feet.

Gunnison County.

E. V. Neelands, superintendent of the Black Queen mine, is pushing the work at the new Belle mill at Crystal.——A. Burnett and G. Tays are getting ready for work at the Copper King mine, near Marble.——In the Tin Cup mining district the Gold Cup mine, operated by I. L. Johnson, has started the new drainage and transportation tunnel projected to run a mile, under the 500 acres controlled by the Gold Cup Co. and other properties.——On the Blistered Horn tunnel, near Tin Cup, operated by Andrew Lejune to develop depths of the Jimmy Mack mine, the tunnel is in 1400 feet.——L. Cavnah, as manager of the West Gold Hill property of Tin Cup, has been operating a cyanide mill of 100-ton capacity, treating fifty tons a day during the spring, and apparently making it a success. Recently an accident to the 2400-foot tramway has shut down the mill for a time, but it will probably start again this month.

The Cumberland mine, one of the Raymond group of Pitkin, is shipping.——W. Scott is unwatering the Williams shaft, near Pitkin, preparatory to opening the lower levels.——G. Kellogg of the Chloride mine, near Pitkin, is having the mine unwatered. Negotiations are pending for the lease of the Mono mill, which will be used to treat the ore from the Chloride by cyanide.——The Gold Cross M. & M. Co. has bought seventy-seven acres of the patented timber tract of S. Dickinson, which lies near their workings west of Bowerman.

Lake County.

In Sayers' gulch, near Twin Lakes, J. A. Storm is developing the Bedford group of ten claims.——A. Kindel and associates are operating the First Discovery and have a very promising prospect.——M. Sargent expects to resume development on the Ida May group.——Preparations will be made to commence sinking a new shaft on the Diamond Joe group, of which W. E. N. Wright is the superintendent. This property is on the eastern slope of Mount Ewing.

The Parson shaft, lower Rock hill, Leadville, is down 200 feet and is entering the lake bedding. Trouble is being experienced with water, the shaft making 200 gallons per minute. The trouble is not so much from the flow of water as from the sand that gets into the valves of the pumps, making sinking slow.

Trouble has been had at No. 1 shaft of the Resurrection mine, of Leadville, on account of an extra flow of water, but the pumps at No. 3 shaft were started and the water has been lowered sufficiently to permit of work being carried on.——The Silent Friend shaft is down 400 feet and another lift is being sunk to catch the ore shoot, which is dipping rapidly.——Prospect work has been resumed on the Gold Basin, near Leadville.

Mineral County.

The Creede United Mines Co. has bought the Big Kanawha Leasing Co. and the Humphreys T. & M. Co., including the mill, all three concerns being consolidated under the Creede United Mines Co. According to G. Davis, the manager, they expect to mine and mill 6000 tons of ore monthly and will make improvements in the mill. About 175 men are employed in the mine and mill. The mill is turning out 600 to 800 tons of concentrates monthly and is making fine recoveries of zinc and other associated values.

San Juan County.

D. E. Carmichael and J. H. Kramer have started work at the Silver Ledge mine and mill near Silverton.——The tunnel being run to cut the Bullion King vein, near Silverton, has been driven 600 feet by Manager A. J. Aurand.

Work is progressing on the new branch railroad from Howardsville to the Green Mountain M. Co. property. The railroad will be 2 miles long, its construction costing $50,000 per mile.

San Miguel County.

R. J. McCarthy has started work near Ophir.——G. Southard, M. K. Monroe and J. C. Ferguson have taken a lease on the Osceola mine, near Ophir.

Summit County.

Kaiser & Madron, operating the Germania on Little mountain, near Breckenridge, have a carload of silver-lead ore to ship.——At the Abundance G. M. & M. Co. on Mineral hill, near Breckenridge, drifting is being done with satisfactory results on the 18-inch streak of carbonate ore which was recently cut in the south crosscut at 70 feet from the 150-foot station of the shaft.——The winze sunk in the 11-foot vein of the Colorado & Wyoming Development Co. from the main tunnel lead has had considerable difficulty in sinking on account of seepage water.——Condon & Shrock, who are operating the Morning Star on Mount Baldy, above Breckenridge, by a tunnel, have opened a nice shoot of lead-silver ore.——The big new $50,000 gold dredging boat of the Reliance Gold Dredging Co., below Breckenridge, is ready to start. Drilling tests, made with a churn drill, have shown the ground which the dredge will work to be rich in coarse and fine gold.

The main tunnel of the North American Mines Co., near Frisco, is in 160 feet and is expected to cut the Red Lion vein soon. The company has twelve men at work.——At the Old Union M. & M. Co.'s property, the main tunnel is being put into shape for stoping ore for the mill, which will be started up on a continuous run next month.——The French Creek M. Co., under the management of M. G. Evans, is driving a prospect and development tunnel in the north slope of Mount Baldy, near Breckenridge.——The bedrock flume of the Mekka Co. in French gulch is approaching the elevator pit, which it will drain and convert into a convenient working space. Riffle blocks are being placed in the flume.

The Reliance Gold Co.'s dredge has started digging gravel in French gulch, near Breckenridge.——The Midnight placer, in Brown's gulch, near the Cashier, is running under the superintendency of John Sweeney. A new 1000-foot flume has been completed.——At Frisco, the Mary Verna Co. is employing fourteen men. The main work is the driving of No. 3 tunnel, from above the railroad track. This is in 175 feet, and the rock is very hard. An air compressor and machine drill will be put in soon.

Teller County.

It is reported that the final details for the commencement of driving the new Cripple Creek drainage tunnel have been perfected and actual operations will be started within the next two months. A. C. Jacquith, engineer in charge, has located the territory where the portal of the tunnel will be. There is no question of ample dumping room. It will lower the water 741 feet below the present drainage tunnel level. Two years will be required to drive it through. The total cost, when completed, will be $750,000. The El Paso shaft is to be sunk, as well as an intermediate shaft, which will permit of four headings being worked.——A big ore strike is reported on the Lady Stith on Globe hill, Cripple Creek, under lease to G. L. Keener.——Superintendent Nichols of the Midget mine on Gold hill, Cripple Creek, is working the narrow seams profitably.——The Dorothy vein, between the eighth and ninth levels of the Gold Coin mine of Battle mountain, Cripple Creek, is being worked by McBird & Higgins, who have struck a good ore body which they are stoping.——On Copper mountain, 2 miles north of Cripple Creek, R. Blanchard is working a mine in the Bill Nye claim of the Copper Mountain Co. at a depth of 180 feet.

A mining deed has been filed whereby the Katinka M. Co. transferred a part of its property to the Morning Glory G. M. Co. The deed conveying this property is without doubt the outcome of the suit brought a few months ago by the Morning Glory Co. asking $50,000 damages for ore that was alleged to have been wrongfully extracted by the Katinka Co. This suit followed closely the suit of the Morning Glory against the Mary McKinney, which suit was settled by arbitration. The ground transferred covers the Aileen-Katinka vein within the surface boundaries of the Aileen, August Flower and Chicken Hawk claims.——The lessees oper-

ating on the Unexpected claim belonging to the Central Con., near Windy Point, are working in ore and sending out occasional shipments. —— Jenkins and associates, operating Block 251 of the Stratton estate's property, on Bull hill, are breaking 4 feet of ore at a depth of 100 feet.——W. R. Rock has sold his holdings in the Gold Sovereign Co. of Cripple Creek to A. Rapp and associates.

Sinking is to be resumed at the Nugget shaft of the Legal M. Co. by R. M. Lesher of the Kimball Investment Co. Work was discontinued two months ago at a depth of 300 feet on account of water. The recent discoveries in the Mary Nevin, north of the Nugget, have revived interest. Preparations have been made to handle the water. ——The Irene Leasing Co. proposes to crosscut east from the shaft of the Prince Albert, on Beacon hill, Cripple Creek.

The effort on the part of the mine owners of Cripple Creek district to weed out ore thieves and questionable assay shops took a new turn when several operators, whose names are being temporarily withheld, caused warrants to be sworn out against ten assayers—five in Cripple Creek and five in Victor. Each is charged with aiding and abetting the theft of valuable gold ore from the various mines in the camp. The mine owners believe that there is a well organized gang of ore thieves operating in the district and that the assayers who are accused have been acting as "fences." The operators say that at least $1,000,000 worth of ore is stolen from the mines every year.

IDAHO.

Blaine County.

J. Peterson, managing owner of the Idaho-Muldoon mines at Muldoon, has bought machinery for a concentrating mill of fifty tons daily capacity. He expects to start the mill by October 15. The mill is to be composed of a rock breaker, rolls, screens, sizers and tables. No jigs are to be used, and it is to be operated wholly by water power.

Boise County.

Manager G. Z. Edwards expects that the new cyanide plant at the Lincoln mine, near Pearl, will be finished by September 1.——It is reported that the Iowa G. M. & M. Co. has purchased the Gold Hill mine at Quartzburg.——A roller mill and cyanide plant are to be built on the old Gold Hill dump.

Custer County.

The Lost Packer M. Co. at Loon Creek, west of Custer, expect that the new 100-ton smelter will be completed by September 1. The company has constructed over 20 miles of wagon road during the past year. J. A. Czizek is manager.——The Mount Estes M. Co., of which J. A. Czizek is also manager, is working the Montana on Estes mountain, 7 miles northeast of Custer. They are running a tunnel to tap the vein and expect to tap it in about 460 feet. The tunnel is in 450 feet. The machinery has been received and is being set in place. Most of the mines in this part of the country have been worked only to the water level.

Elmore County.

The Tahoma mill at Atlanta is being overhauled. It is expected that ten stamps will be operating by August 15, and twenty more are to be put in. J. C. Biedelman of New York is testing the ores from the Tahoma and General Petitt as to their adaptability to the cyanide process.

Idaho County.

President Nevin, of the Iron Springs M. Co., corroborates the report of the rich strike on the White Rose, on Rapid river, in the Thunder Mountain district. An engine and hoist have been placed on the shaft and sinking is in progress.

A. M. Ringeling, in charge of the Silver King mill at Warren, reports that the Silver King has ordered pan amalgamators and will put them in. This has been necessary to save the values. The losses which were being sustained has caused the stamps to be idle all this season, but twenty men have been kept busy by Manager L. C. Massie, putting in ore chutes, raises and overhauling the mine.——At the Keystone, where Mr. Ringeling also had charge of the milling, the 2-stamp mill has been running steadily.——R. and C. Lockwood are opening new placer ground at the head of Willey gulch, near Warren.

Shoshone County.

The dredger which began operations on the ground at the mouth of Trail creek, Delta, has reached the upper end of the company's ground, having carried up a breast of ground between 200 and 300 feet wide. It is now making the turn to come back.——The Charles Dickens lead mine on Moon gulch, below Osburn, is being worked, with A. B. Gritman in charge.——The Success M. Co. of Wallace have finished a connection in the old Granite mine between Nos. 2 and 3 tunnels. A winze had been sunk in ore from the No. 2, which is 250 feet from the surface, while the No. 3 is 413 feet below the No. 2. For the purpose of providing a proper circulation of air and of permitting the working of the mine through the No. 3 tunnel, a connection was necessary. An upraise was started from the No. 3 to connect with the winze, which was full of water. This has been completed in safety. C. F. O. Merriam was the engineer and O. Linn the foreman.

The California Con. mines on Gorge gulch, Nine Mile creek, 2 miles from Wallace, are being operated under bond by the Pittsburg Lead M. Co., with A. D. Marshal as superintendent and manager. At present the No. 3 level is being opened up to furnish ore for the 200-ton mill, which is connected with No. 3 level by an aerial tram. When No. 3 has been opened up work will be resumed in the No. 4 level, which is now in 1700 feet and intended to be the main working tunnel. The mill and tramway are being overhauled and improved.——A large body of lead-silver ore has been struck at a depth of 400 feet in the shaft being sunk to connect No. 5 and No. 6 tunnels of the Morning mine at Mullan.

Washington County.

C. H. Denison, superintendent and manager of the Iron Springs mine at Iron springs, reports that work is being done on four claims with fifty men. Work is to be started on the new cyanide plant soon. It is reported that the Iron Springs Company has secured the Rankin mill, of which J. D. Thorn has charge.

ILLINOIS.

The Illinois State Bureau of Labor Statistics has completed the redistricting of the State into nine districts. Under the old law there have been seven mining districts in Illinois. The last Legislature passed a law making the districts ten in number and the bureau has completed the redistricting. Only the coal producing counties are given and the new arrangement is as follows: First district—Grundy, Kankakee, La Salle, Will. Second district—Bureau, Henry, Knox, Mercer, Rock Island, Warren. Third district—Livingston, Marshall, Peoria, Putnam, Stark, Woodford. Fourth district—Fulton, Hancock, McDonough, McLean, Tazewell. Fifth district—Edgar, Macon, Vermilion. Sixth district—Brown, Cass, Logan, Menard, Sangamon, Schuyler. Seventh district—Calhoun, Christian, Green, Jersey, Macoupin, Montgomery, Morgan, Scott, Shelby. Eighth district—Bond, Madison, St. Clair. Ninth district—Clinton, Franklin, Hamilton, Jefferson, Marion, Perry, Randolph, Washington. Tenth district—Gallatin, Jackson, Johnson, Saline, Williamson.

MICHIGAN.

The production of the Copper Range Con. Co. for June decreased 10.000 pounds of copper, as compared with the June, 1904, production. In June, 1905, the three mines of the company produced 4,534,000 pounds of the metal, as against 4,544,000 pounds the year preceding. The Champion production was 1,838,000 pounds.

MINNESOTA.

Aitkin County.

Immense iron ore deposits are being prospected in the Cuyuna range, near Deerwood. Shafts are being sunk as the result of bore hole indications. Work is being done by the Oreland M. Co., under the direction of Cuyler Adams, the discoverer of the range. Pickard, Mather & Co. of Cleveland, Ohio, have started a shaft on land leased from the Oreland Co. The course of the belt, as indicated by the magnetic needle, is covered with an alluvial deposit 40 to 180 feet deep. The ores thus far discovered are non-bessemer, high in phosphorus, free from sulphur and titanium and not excessive in silica. Some manganese is found.

MONTANA.

Granite County

In Garnet district P. Mussigbrod of Warm Springs is giving forty lessees work on his property. —— S. I. Ritchey, owner of the Nancy Hanks and Tiger mines, near Garnet, shipped from the Tiger side of the Nancy Hanks last month a carload of ore that yielded $20.000.

J. H. Miller of Phillipsburg has taken over the Londonderry mine, in the Smart Creek district, on a lease and bond for California capitalists whom he represents. The mine has been owned by W. E. Albright. Development work is to be started at once.——Development work has been started upon the Copper State and Red Metal mines, in the Smart Creek district, by the Butte interests, which recently assumed control of these properties upon a $50,000 bond. The sinking of a shaft has started, with three 8-hour shifts.

Jefferson County.

Edwards Bros. have taken a lease and bond on the Atlanta, on the range between Cataract and Wickes. They are unwatering one of the shafts and will then crosscut to the lead from the 130-foot point.

Lewis and Clarke County.

The report of the Montana M. Co. of Marysville shows that crushing at the Drumlummon mine during the past year amounted to 6096 tons, as compared with the normal crushing of 80,000 tons of five years ago. The cleaning up of this worked-out mine is going on as before. The tailings plant yield has been steadily falling in value for several years, and while five years ago the tailings used to produce a value of nearly $3 per ton, they now yield but $1.99, and produce a net profit of 80 cents per ton, as against nearly $1.35 per ton.

Madison County.

A company has been formed to develop the Mountain Cliff mine on Mineral hill, near Pony. A tunnel is to be run from the Fitzgerald Fraction to open up the Mountain Cliff vein.——H. Walter, owner of the Yellow Mountain claims in Potosi canyon, near Pony, has bonded them to a Butte company, who intend to put in a concentrator at the mine and treat the ore at the property.

The Lennstrende-Buck Co. have the machinery, stamps, battery, etc., on the ground at their mine beyond the Garnet. The timbers for the frame work are being hauled for the 5-stamp mill. —— The Big Four M. Co. are to resume operations near Pony. This property is owned by A. J. Walrath of Bozeman and C. Vanderhook. A. J. McCormick has charge. An 800-foot tunnel is to be driven to crosscut the veins at a depth of 600 feet. —— The Clipper-Boss Tweed property at Pony, under lease to Elling & Morris, is shipping ore averaging $40 per ton to the smelter at East Helena. The great body of the ore is milling and is sent to the Strawberry 10-stamp mill above Pony.

Silver Bow County.

(Special Correspondence).—The Butte district in June produced a total of 31,290,000 pounds of copper, an excess over the May production of 3,690,000 pounds, or on an average of 123,000 pounds a day more than the daily average for May. It was a new record for Butte mines, every one of which was run to full capacity. The grade of ore shipped was of a generally higher value, and the new North Butte Company more than doubled its output. The following are the figures of the daily output of ore and the amount of copper produced therefrom:

	Tons of Ore.	Pounds of Copper.
Boston & Montana	3,000	225,000
Anaconda, Washoe, Parrot, Trenton	7,000	490,000
United Copper	2,000	140,000
Clark mines	1,500	108,000
North Butte	800	80,000
Totals	14.300	1,043,000

Butte, July 17.

The Pittsmont smelter at Butte has been started with 9000 tons of ore in the bins. Manager R. L. Baggaley has been stoping in the Donner vein since June 27. The flow of water in the lower workings has been controlled by the two new electric pumps.——Work has been resumed at the Jennie Dell mine at Butte.

NEVADA.

Esmeralda County.

A fire at Columbia, July 15th, destroyed business property worth $100,000. The origin of the fire is unknown.

The Diamondfield M. Co. and the Black Butte Co. of Goldfield have consolidated to avoid a lawsuit, as the ledges of the two companies dip towards each other.

Lincoln County.

The Good Springs Smelting & Developing Co. has been formed under the laws of Massachusetts with A. H. Gates, Chicago, president; G. F. Nealley, Haverhill, Mass., treasurer; these with P. A. Dyar, G. W. Hinkley and J. W. Wharton, all of Boston, and C. H. Raymond and C. E. McCarthy of Haverhill constitute the board of directors and the incorporators.

Washoe County.

A rich strike is reported in the Emma L mine, north of Olinghouse. The Emma L strike was made at the 195-foot level. D. Wetmore and W. Golding are owners.

OREGON.

Baker County.

J. A. Panting, owner of the Gold Hill mine at Durkee, is making arrangements for starting work.

Instead of building a new 10-stamp mill below the old millsite of the Connor Creek property, it is stated that P. Basche of Baker City, who has a bond on the mine, is remodeling the old plant, having added ten additional stamps, taken out twenty-five of the old light stamps and put the remaining ten in shape for effective work. As the present mill is above the portal of the lower crosscut, from which ore will be delivered, an elevating device will be necessary to deliver the ore into the mill bins.——The Oregon Lime & Plaster Co., 5 miles from Huntington, is employing thirty men and is handling a heavy tonnage of lime and gypsum.——Ed. Rea and E. P. Torrey have taken the contract for building a cyanide and concentrating plant to handle the Bonanza mill dump, contemplating both concentrating and cyanidation. The tailings from the Bonanza have been impounded for two years and will make a reserve for work. Manager Albert Geiser of Sumpter has twenty-five stamps dropping.

Crook County.

Building has commenced in the construction of the Almaden mercury plant, 28 miles from Prineville. The Almaden Furnace Co. has been organized to do this work, which is under the direction of C. Fitzgerald. The plant will have ten tons capacity. The New Almaden G. & Q. M. Co., which owns the mercury property, will resume development when the furnace is in working order.

Douglas County.

At a meeting of the Bohemia Mine Owners' Association steps were taken to interest smelter men in Bohemia camp. One mining man stated that in case interested parties put up a smelter he would sign a contract to deliver fifty tons of ore per day. With this amount of ore from one man, it is considered an assured fact that a smelter would pay if once put in operation. Men who are now doing nothing with their properties would proceed to active development. A new wagon road is surveyed into Bohemia and work will be commenced soon. The road extends from Glenwood, on the county road, to Shane's Saddle, and will open up a very productive part of Bohemia. The road is not over 8% grade in any place, and is 2⅛ miles long.——It is reported that the Combination mine, on Martain creek, owned by Sheridan & Co., will be reopened soon. This property consists of seven claims in the southern part of the district, and some very rich ore has been taken out. The ore is base and a smelting proposition.——The Great Eastern property, on China, Bear and Sailor's Gulch creeks, consists of nineteen claims and shows bodies of high-grade smelting ore. This mine, from its No. 1 group on China creek, could ship twenty tons of ore to the smelter per day. A wagon road up Martain creek, a distance of 3 miles, would put this property on a shipping basis, as there are large ore reserves.——The Star Con. property is 4 miles up Martain creek. A 5-stamp mill is on the property, but is not running. The ore goes into a sulphide as depth is gained, and it is said to be a good cyaniding proposition.——The Twin Rocks property of eleven claims, 3 miles south of Bohemia, is owned by Illinois and Oregon men. Lewis Hartley is in charge.——Manager F. J. Hard has started the 10-stamp mill of the Vesuvius mine at Bohemia. The plant was thoroughly overhauled before the stamps began to drop, and the aerial tram was retensioned after the winter's idleness, so that the mechanical plant is in shape for best results.

Jackson County.

The granite quarry on Griffin creek, 4 miles east of Jacksonville, owned by E. P. Geary of Portland, has been leased by S. and W. B. Penniston of Ashland, who will open it and begin quarrying rock. The granite is light, mottled with gray, and takes a high polish.——J. M. McPhee, one of the new owners of the Alice property, near Gold Hill, is arranging for heavier work. The Alice is on Galice creek, near the Foots Creek district.

Malheur County.

In the Mormon Basin district the Summit M. Co. started its new stamp mill on July 5, only five stamps out of ten being run. The mill is crushing ore taken from the ledge opened up last fall.——The Tarbell group, which took out ore during the winter and spring, is treating it at the Commercial M. Co.'s mill near by.——W. S. Newberry, manager of the Morning Star group, in Mormon basin, intends to resume operations soon.——At the Gold Coin in Mormon basin, on the summit of the divide between Rye valley and Burnt river, Ayers & White of Pendleton and Durkee of the town of Durkee are building a 10-stamp mill.

SOUTH DAKOTA.

Pennington County.

The Canton M. Co., northwest of Hill City, has closed down its mine for the present. The main shaft is now down 150 feet. Logs are being cut for further mine timbering and for the lumber for the mill, the foundation of which is almost completed. A. Anderson, manager, has placed an order for a 35-ton mill. Work will be resumed when it is put in.

UTAH.

Grand County.

J. R. Emmitt of Moab and Mr. Butterwood of Salt Lake City have been arranging with the stockholders of the Moab Irrigation Co. for the use of the water of the North Fork of Mill creek. They propose to take the water out on Wilson mesa, 20 miles above Moab, there use it for placer mining and then return the water to the regular channel, so it can be used for irrigation purposes. They agree to return as much water as they take out, and also to build a reservoir at some convenient place above Moab, where the water can be settled. The reservoir, besides being a place for settling the water, will enable the irrigation company to store the early water and use it late in the season, when water is scarce.

Juab County

W. Ball, D. A. Depue and J. T. Hayes have taken a lease on the dump at the Eureka Hill mine at Eureka. They will begin work with teams and scrapers, and will remove a few feet of waste in order to reach the low-grade ore which was put on the waste dump many years ago. They believe they can ship ore from this dump at a profit. There are a number of leasers in the upper workings of the Eureka Hill. The Eureka Hill M. Co. is not doing anything with the lower levels of the mine at this time, but may decide to lease the entire workings.

Salt Lake County.

W. J. Craig, manager of the Kennebec mine at Alta, has started work on the intermediate tunnel which is intended to tap the ore bodies under the old workings of the mine. Work will be continued in the lower tunnel.

The Bingham Con. M. Co. has determined to construct a reverberatory furnace and roasting plant to handle the fine ore and flue dust, which has previously been a waste product at the company's location. The plant, the plans of which have been matured by the company's engineers after a long study of the various similar plants in other copper producing districts, is also expected to do away with the flue fumes nuisance, with which all the companies have more or less trouble, because of the damage done neighboring ranches. The plant will cost $60,000 and construction will be started immediately. The company has had the construction of this plant under consideration for a long time. The officers of the Bingham have made a thorough inspection of the similar plants of the Amalgamated Co. in Butte and will have the advantage of the advice of the engineers of that company in the erection of the concentrator. When the matter was first brought under consideration it was determined to have the roasting plant at the mouth of the Mascot tunnel, but this was changed later and it is now the plan to have the roaster at the smelter site. At the Dalton and Lark all the ore is being moved through the tunnel, which is connected with the present openings by short drifts. This has made a difference of almost $1 a ton in the cost of handling the ore. Ore bodies have been opened up in the lower workings that give promise of permanency and good values. The Eagle & Blue Bell has shown improvement.

The Phœnix mine at Bingham is shipping thirty tons of first-class ore daily. From sixty-five to seventy-five tons of milling ore is being taken out daily and is being stored at the mine awaiting treatment at the Kempton mill. The winze from the tunnel level has been sunk 65 feet. Superintendent Gebhardt is working three shifts, employing sixty men.——Superintendent L. G. Morser of the Mystic Shrine at Bingham reports improvement in the ore body in the Shrine, as it grows larger with development. The character of the ore is also changing, carrying less lead and more copper.——The Utah C. Co. have built a dam in the Jordan river to impound their tailings and prevent damage to land below the mill.

Summit County.

Manager Turner of the West Quincy property at Park City reports that the drift now being run from the Little Bell shaft is in 2300 feet and has been in West Quincy ground for some time. It is expected to tap the shaft in two months. So far no trouble has been experienced from water, and when completed the drift will drain the mine so that there will be no further expense of pumping.

Ed. Kopp of Park City has taken a lease on the Ontario tailings dump below the mill, and intends running it all through the mill to secure the values which it contains. When work was first commenced the tailings were hauled to the mill by horse power, but Kopp has put a 5 H. P. electric motor near the mouth of the mill tunnel, together with a small engine, by means of which the tailings will be hauled to the tunnel entrance.——At the Nelson property in Elkhorn district, near Park City, the new shaft is down 50 feet. J. Nelson has charge.

Tooele County.

The Sundown, the Bethel and other mining properties in Camp Floyd district have been sold to Denman Blanchard of Boston for $37,500. The sale was made under an order of sale in the suit of Mercantile Trust Co. vs. Overland M. Co. et al. The property is equipped with a fine milling plant and is near Sunshine.——The Stockton G. M. Co. has secured rights in the canyon below their mill, so that the tailings controversy has been settled. Manager Trenam is also building settling ponds to prevent the tailings running down the canyon. When these are finished the mill will be started.

WASHINGTON.

Cowlitz County.

R. C. Lange, secretary of the Spirit Lake Power & Mining Co. of Chehalis, has returned from a trip to Europe, where he placed 200,000 shares of stock in his company. He intends to begin development on the shores of Spirit Lake, near St. Helens. It is intended to put in a water power plant on Union creek and put in an air compressor and drills and drive 3000 feet of tunnel.

Stevens County.

The engine and five cars for the Chewelah Copper King M. Co. are transporting ore from the mine to the railroad.

WYOMING.

Carbon County.

B. W. Law, manager of the Four Mile Dredging Co., near Saratoga, has stopped work because the ground containing the gold has become exhausted and the values too low to keep the big dredge working.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District

Boundary ore shipments for the week ending July 15 were: Granby mines to Granby smelter, 12,522 tons; Mother Lode to British Columbia copper smelter, 2720 tons; Mountain Rose to British Columbia copper smelter, 198 tons; Emma to Nelson smelter, 231 tons; Oro Denoro to Granby smelter, 99 tons. Total for the week, 15,770 tons; total for the year to date, 492,243 tons. Boundary smelters treated this week as follows: Granby smelter, 12,850 tons; British Columbia copper smelter, 3435 tons; total for week, 16,285 tons; total for the year to date, 504,250 tons.

A Greenwood report of July 15 says: At the British Columbia Copper Co.'s smelter, shortly after a new head feeder had taken his position supplying that vacated by the regular man off on holiday, several men of the day shift succeeded in inducing some of the furnace feeders of one of the furnaces to quit work on the ground that the new man was taking another man's job. As one furnace cannot provide enough matte for a converter, the better sense of the men from the tamping floor prevailed and they, with several of the regular furnace force, assisted by Mr. McAllister and Mr. Williams, the assistant superintendent, drew off the furnace and cleaned up. To-day the smelter closed down, although a good ma y men are at work. The mine work at Mother Lode is going on as usual and furnaces will be blown in again as soon as new men can be obtained.

It is reported that good ore has been reached in the 400-foot tunnel of the Seattle mine, near Greenwood, being operated under bond by W. T. Hunter. This 3-foot vein was struck about 340 feet from the portal.——On or about the 1st of August, it is the intention to blow out all six of the furnaces at the Granby smelter at Greenwood for two or three days, for the purpose of connecting up the two new and larger furnaces now being installed, as well as the new flue dust chamber and new smokestack.

The deal by which the Dominion Copper Co. financed the Montreal & Boston Consolidated is as follows: The Montreal & Boston found that it owed $186,789 to the Dominion Copper Co.; $90,000 to two trustees for money advanced, and other liabilities of $43,000, making a total of $320,000. This sum could not be raised by sale of stock, so an arrangement was made by which the Montreal & Boston sold to the Dominion Copper Co., exchanging shares on the basis of one of the Montreal & Boston Co. for one of the Dominion Copper Co. In this way the Dominion Copper Co. will take 1,242,724 shares of the Montreal & Boston, share for share, through the trust company. The Dominion Co. agrees to assume and pay debts of the Montreal & Boston, and to do this and provide a working capital will issue $1,000,000 in bonds bearing 6% and running ten years. Shareholders who subscribe will get them at 90% of the par value; in addition will be given two shares of the Dominion Co. as a bonus. Thus the buyers of $700,000 bonds, all of the bonds to be placed on the market, will receive 1,400,000 shares of Dominion Co.

Cassiar District.

An unverified press dispatch says that silver ore, running $1100 to the ton, has been struck on property being opened on Windy Arm, 6 miles from Carcross, in the Atlin district. The management has sent to Tacoma for an aerial tramway to cost $125,000, which will be used in conveying the ore from the ledge to the steamers on the lake. The steamers will carry the ore to the White Pass trains at Carcross, whence it will be shipped by rail to Skagway, thence by ocean steamer to the Selby and Tacoma smelters. The Atlin mining division is all that part of British Columbia north and west of the divide between the watersheds of the Taku river on the south and east and that of Atlin lake on the north and west.

East Kootenay District.

In addition to mining in the stopes of the Sullivan mine at Kimberley, from which 140 tons per day is taken, J. Finley is prospecting and is keeping his development work ahead. —— For the month ended June 30 the output of the St. Eugene mine at Moyie was 2750 tons of concentrates. There are 300 men on the payroll. The machinery for the new 30-drill air compressor is being put in and an effort will be made to have it running by August 1. The company is behind with development work, and as soon as this machinery is ready to run an additional 100 men will be put to work. This will bring the wages paid monthly up to nearly $40,000.

Rossland District.

Figures showing the payroll of Rossland for July prove that the disbursement for labor was $144,400 during that time, of which $83,200 was for the mines. There is great activity in Rossland at present, and the promise for the remainder of the year is brighter, as much new work is in progress.

J. Labarth, superintendent of the Trail smelter, has started one of the lead stacks. Ore from the St. Eugene and other mines are expected to keep the lead stack in steady operation. Labarth states that the lead refinery will soon be enlarged to turn out fifty tons of pig lead a day. There is a growing market for the lead. The corroding works in Montreal consume considerable, while the larger portion is marketed in Japan and China.

Slocan District.

Slocan ore shipments for the week ended July 15 were: Silver-lead – Payne, 22 tons; American Boy, 21; Last Chance, 20. Zinc, 240 tons. —— C. Hanson has been working on the Bessie property on Lemon creek, near Slocan City. —— Mining conditions have taken an encouraging look throughout the Silverton district. Leasing is coming more into vogue. Test trials are being made on the Emily Edith ore at the Wakefield mill, and if successful will be the basis for more extended work on the properties under control of Mr. Davys. On the Baby Ruth, P. Grant and R. Spencer are sacking ore. For the short time these lessees have been working, the property is certainly paying rich.

Vancouver Island.

(Special Correspondence).—Tyee Copper Co.'s smelter ran 13 days and treated 1988 tons of Tyee ore during June, giving a return, after deduction of freight and refining charges, of $30,950.

Duncans Station, July 15.

MEXICO.

The recent action of Mexico in abolishing the free zone along the boundary line is having an injurious effect on the merchants, both of Mexico and the United States. Mining interests are much affected, for where machinery was formerly admitted free of duty, now full price has to be paid. This has resulted in such a heavy increase in operating expenses that it is said that several of the large mines in Mexico near the line have been forced to shut down.

Regarding asphaltum and petroleum in Mexico, the Mining Journal says that they are found on the Gulf slope, in the States of Tamaulipas, Vera Cruz and Tabasco, while on the high plateau they are found in Mexico, Puebla, Guanajuato and Queretaro, and on the Pacific slope in Oaxaca, Morelos, Michoacan and Jalisco. On the shores of Laguna Madre, and on those of the Morelos, San Andres and Champoyan lakes, petroleum flows plentifully from many springs, and mineral tar and asphaltum frequently run in a molten state over the ground under the action of the sun's rays, the same phenomenon occurring at many points along the margin of the Tamesin river. Vera Cruz contains these mineral compounds in perhaps greater abundance than Tamaulipas, the principal beds lying near Jalapa, in the municipality of Panuco, Minatitlan of the Jalacingo canton, near the bridge called Quilate, municipality of Atzatlan, and in that of the Tlapacoyam, on the Vega lands. The asphaltum deposits in the canton of Jalapa are at a short distance from the Chicuasi Rancheria, in the municipality of Artopam. They are of the basaltic formation, which predominates throughout the canton of Jalapa, and in some spots the clefts in the basalt—vertical and horizontal alike—serve as outlets for the tar, which in great quantities covers the rocks. Petroleum is also visible in some cavities of the rocks, where it is mixed with water. At the town of Moloacan there is asphaltum on the margin of an arroyo tributary to the Coatzacoalcos. In Aginche and Copacao, of the jurisdiction of Panuco, in the same State, are large beds of asphaltum, and others in Tanelum. There are petroleum springs in Chinameca, near Gila lake; in the hacienda of Chapapote, on the banks of the Tuxpan river, and at many other points. Asphalt and petroleum are abundant in Tabasco, one of the principal deposits being at Estancia Vieja, 12 miles from San Juan Bautista, where the asphalt and petroleum are mingled, mineral tar predominating. Petroleum of a grayish color is plentiful in the district of Macuspana. Tests of petroleum taken almost from the surface have yielded 50% of lubricating oil. These springs are on the shore of a small lake which empties into the Macuspana river, and the latter into the Grijalva, so that the oil could be easily transported, both lake and rivers being navigable for vessels of small draught. Near Macuspana, at Las Templaderas, asphaltum is also plentiful, and by pressing the ground with the foot it oozes to the surface through numerous cracks. Northeast of Macuspana, at Tortuguero, under a thin layer of sulphate of strontium, fluid petroleum is found so clear in quality that it might be taken for naphtha. This liquid is very inflammable, for when making some experiments it took fire the moment a flame was brought near it. The region of mineral oil in Tabasco extends over 62 square miles. Chiapas also possesses asphaltum beds, the best known being those of San Diego de la Reforma, San Pedro Chenalho, San Miguel Mitontic and Villa de Teopisca. The most abundant, as well as the purest, is that at Chenalho. Among the petroleum springs of the central tableland, mention may first be made of those in the villa of Guadalupe Hidalgo, distant about half an hour's journey from the national capital. These springs have never been utilized, for the reason that they are situated in the very streets of the town, and that the indemnity paid for working them would probably be more than would be justified by the returns. Puebla has petroleum springs and beds of merchantable asphalt, of which the most valuable are in the district of Tetela, municipality of Tenampulco, on the Coroneles plateau, in the district of Huanchinango, in the municipalities of Jalpan and Tehuantepec, and on the hacienda of San Diego. Petroleum is found at La Estrella, north of Puebla, on the San Diego hill. Guanajuato has good mines of asphaltum, and it is said that others exist in the district of Caderyta, in Queretaro. There are productive springs of petroleum in Oaxaca, the oil being in places very clear and transparent, especially in the district of Pochutla. The petroleum deposits of Pochutla cover a surface of nearly 50 square miles, and some places the oil runs freely over the ground. In the district of Jonactepec, State of Morelos, petroleum shows itself at various points. Both asphalt and petroleum exist at a number of places in Michoacan, the chief one being Cucumatlan, in the jurisdiction of Sahuayo. The picturesque lake of Chapala, in Jalisco, contains petroleum springs, and on its waters float layers of asphaltum. In Colima, about 42 miles from the capital, have been found beds of a substance which seems to be asphaltum in some places, and in others bituminous coal, burning with an intensely blue flame and exhaling the peculiar odor of asphaltum. In the barranca of Zacualpan is also a mine of the same substance.

Jalisco.

At the annual meeting of the Boston & Mexico Gold & Copper M. Co., whose properties, consisting of thirty-two claims, are near Ameca, C. P. Winslow, Boston, was elected president; J. G. Peters, Boston, vice-president; W. H. Loughrey, Boston, secretary, and E. Gilmore, North Easton, Mass., treasurer. It was stated that there was sufficient money in the treasury to warrant sending the superintendent, E. N. Everett, to resume work upon the property.——Copper-silver mines near San Antonio de las Moran, in the Ayutla district, are to be worked by the Paloma M. Co. The principal mines of the group are the La Puerta, La Falda, Chapuza and Providencia. The mines were formerly the property of E. Fitzpatrick and W. W. Dodd, who are now stockholders in the new company. Considerable ore has been shipped from the properties and a concentrating plant with a capacity of twenty-five tons was built some time ago. The company expects to put in reduction machinery.

Sonora.

(Special Correspondence).—The San Bernardo M. Co., which is the owner of the Santo Domingo mine in Aduana, near Alamos, J. R. Hendra, superintendent, have the new boiler, an engine and gallows frame in place and in working order. The shaft has been drained to the 200-foot level and timbered where it was required. A new ladderway has been put from top to bottom and the sinking of the shaft commenced. The shaft will be sunk 100 feet and then crosscut the lode, and then commence driving north to get under the old workings, which will require 400 feet of drifting.——The adjoining property on the north is the Zambona, owned by the Zambona Dev. Co., A. Yaeger superintendent. The work is being pushed changing the machinery in the mill and mine. The mill is expected to be in operation by August 1. —— On the south of the Santo Domingo is La Quintera, owned by a French company. —— The district of Alamos needs a railroad.

Alamos, July 15.

The La Cobriza mine, in Altar district, near Puerto, owned by W. T. Stewart and A. H. Parker of El Paso, has been sold to F. C. Emery of same city for $12,000.

Books Received.

As extracts from "Mineral Resources of the United States for 1904," the United States Geological Survey has issued "The Production of Iron Ores in 1904," by John Birkinbine, and "The Production of Tin in 1904," by J. H. Pratt.

As a part of the "Geologic Atlas of the United States," the United States Geological Survey has issued Folio 125, "Rural Valley Folio, Pennsylvania." This describes the coal, iron and gas resources and geology of a part of the Appalachian field.

As extracts from the "Mineral Resources of the United States for 1904," the United States Geological Survey publishes "Peat in the United States in 1904" by H. H. Hindshaw, "Production of Sulphur and Pyrite" by J. H. Pratt, "Production of Manganese Ores" by John Birkinbine, and "Production of Abrasive Materials" by J. H. Pratt.

Those having to do with peat and waste fuels may be interested in an exposition of their utilization as given in "Briquets and Patent Fuels," by P. R. Bjorling. The book contains many suggestions as to manufacture and materials of briquet fuels, an industry that has received some development in this country since this book was written. While the chapter on bond or binding materials may be a good guide to inventors, much of the material in the rest of the book has been superseded by recent practice and is interesting chiefly as a matter of history. It is published by the Rebman Co., 1123 Broadway, New York City.

The widespread importance of coke as a fuel has received fitting notice in a second edition of "Coke," by John Fulton. This masterly treatise presents the subject clearly and logically, omits the unessentials and appears to present all that is necessary for an understanding of the details of manufacture. The chapter on the preparation of coal for the manufacture of coke takes up the necessity for preparing coal in order to remove impurities before making blast furnace coke, and then describes the crushing appliances, with costs of the crushing plant. Both the bee hive oven and the retort and by-product saving coke ovens are fully described in construction and manipulation. This section is particularly interesting because of authentic cost statements and because it details operating plants. The present condition of the fuel briqueting industry is admirably summarized in the concluding chapter. The book is published by the International Text Book Co. of Scranton, Pa., and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of $5.

The California State Mining Bureau has issued a bulletin on "Gold Dredging in California." A history of gold dredging in California, by J. E. Doolittle, opens the text of the volume. The subjects treated are the area of dredger gravel, geology of that area and its agriculture; the yield of gold dredging for 1903; the forms, power and styles of dredgers; kinds and styles of screens, sluices, etc.; composition of the crew of a dredger; working costs; prospecting and examination of conditions and prospecting machinery; the Oroville, Yuba, Bear River, Folsom, Calaveras, Plumas, Shasta, Trinity and Siskiyou dredging districts, etc. In addition there is considerable matter with some full-page illustrations of the California State Mining Bureau. An interesting chapter in the book treats of the restoration of gold-dredged lands to agricultural uses, and claims that this is not only feasible, but profitable, and that these reclaimed lands after the dredger is through with them can be made of higher average value than before. At the beginning of this year the dredgers at work in this State were: Oroville district, 28; Calaveras, 1; Folsom, 8; Shasta, 2; Trinity, 1; Siskiyou, 2; Yuba, 2; or 44, as against 31 in 1903.

Commercial Paragraphs.

THE Ernest Wiener Co., making a specialty of mine equipment and railroad material, has opened offices at 68 Broadway, New York City.

THE Bucyrus Co. of South Milwaukee, Wis., is building forty-one steam shovels, three railroad wrecking cranes and one railroad pile driver for work at Panama.

HARRON, RICKARD & MCCONE have established a new machinery house in Los Angeles, Cal., at 164-168 North Los Angeles street, which will be run in connection with their old established San Francisco business, 21-23 Fremont street.

THE Davenport Locomotive Works, Davenport, Iowa, are publishing a series of pamphlets describing their industrial locomotives which graphically portray their salient points. Any of this illustrated descriptive series will be sent anywhere on request.

THE officers of the Crocker-Wheeler Co., manufacturers of electric motors and generators, whose main office and works are at Ampere, N. J., have been re-elected for the ensuing year. The regular quarterly dividend of 1½% has been declared and the affairs of the company are reported to be in a flourishing condition.

THE DeRemer Water Wheel Co., Denver, Colorado, have shipped to the Salida Light, Water & Power Co., Salida, Colo., three 32-inch DeRemer water wheels, strung on one shaft and direct connected to generator, provided with the DeRemer bronze cut-off hoods, and governor for regulation, designed to operate under an effective head of 400 feet and to develop 350 H. P. each unit; also a 3-foot DeRemer water wheel to the Success M. Co., Wallace, Idaho. This latter is intended to develop 75 H. P. under a 430-foot head and 100 cubic feet of water.

Latest Market Reports.

SAN FRANCISCO, July 21, 1905.

METALS.

SILVER. — Per oz., Troy: London, 27¼d (standard ounce, 925 fine); New York, bar silver, 59½c, refined (1000 fine); San Francisco, 59½c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, $15.00; Lake, 1 to 3 casks, $15.00@15.12½; Electrolytic, 1 to 3 casks, $15.00; Casting, 1 to 3 casks, $14.50@14.75. San Francisco: $16.00. Mill copper plates, $17.00; bars, 18@24c. London: £67 6s 3d spot per ton.

LEAD.—New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.42½; San Francisco, $3.70, carload lots; 4¼c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¼c; pig, $4.85. London: £13 15s ℔ long ton.

SPELTER.—New York, $5.30; St. Louis, $5.18; London, £24 ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $31.40@31.60; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, ℔ lb., 35@37½c. London, £145.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@82c ℔ gram.

QUICKSILVER.—New York, $41.00@$41.50, large lots; London, £7 7s 6d; San Francisco, local, $38.50@39.00 ℔ flask of 75 lbs.; Denver, $42.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20.75c; San Francisco, Plumbers', 100-lb. lots, 17.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.60; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@$23.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 12c; Hallett's, 13c; San Francisco, 1000-lb. lots, 11c; 300@500-lbs. 12c; 100-lb. lots, 13c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ℔ set; 14 oz., 40s., 9¾c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2¼@2½c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5½c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 64c; cs., 69c; raw, bbl., 62c; cs., 67c; Lucol oil, boiled, bbl., 54c; cs., 59c; raw-bbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 17¼c; Astral, 17¼c; Star, 17¼c; Extra Star, 20¼c; Eocene, 19¼c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20¼c; cs., 24c; Mineral Sperm, cs., 26¼c; Deodorized Stove Gasoline, bulk, 14¼c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12¼c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

MOLYBDENUM.—Best, $2.75 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

URANIUM.—Oxide, ℔ lb., $3.50.

MERCURY.—Bichloride, ℔ lb., 77c.

TUNGSTEN.—Best, ℔ lb., $1.25.

PHOSPHORUS.—American, ℔ lb., 70c.

SODIUM.—Metal, ℔ lb., 50c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¼c; less than 500 lbs., 8c.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MAGNESIUM.—Pure, N. Y., $1.60.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JULY 11, 1905.

794,371.—STRAINER—J. G. Anson, S. F.
794,481.—FUEL—D. M. Balch, Coronado, Cal.
794,211 —DRIVING MECHANISM—W. J. Bell, Los Angeles, Cal.
794,275.—STARTING ENGINES—W. J. Bell, Los Angeles, Cal.
794,400.—DOOR SECURER—M. Farrell, S. F.
794,457.—RESTRAINING DEVICE—J. Gaiter, Livermore, Cal.
794,626.—COIN DISTRIBUTER—C. H. Hall, Fresno, Cal.
794,221.—BLANK TRIMMER—J. H. Haskins, San Diego, Cal.
794,303.—LEDGER SHEET HOLDER—A. D. Inglis, Sacramento, Cal.
794,230.—ELASTIC TIRE—E. Keup, S. F.
794,183.—GARMENT FASTENER—Mary E. Kintz, Tacoma, Wash.
794,238.—BOUGIE—S. L. Kistler, Los Angeles, Cal.
794,361.—WEED CUTTER—E. M. Lambson, Walla Walla, Wash.
794,461.—CHAIR—P. Mackey, Jamestown, Cal.
794,308.—CASING GEAR—E. B. Noble, Los Angeles, Cal.
794,341.—HORSE COLLAR—C. P. Randolph, Los Angeles, Cal.
794 691.—CAN SOLDERING MACHINE—G. J. Stewart, Los Angeles, Cal.
794,692 —CAN SOLDERING MACHINE—G. J. Stewart, Los Angeles, Cal.
794,476.—PUNCHING MACHINE—J. Wilderman, S. F.
37,481.—DESIGN—E. S. Cheney, Oakland, Cal.
37,482.—DESIGN—E. C. Hurlbert, St. Johns, Or.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

RESTRAINING DEVICE.—No. 794,457. July 11, 1905 John Gaiter, Livermore, Cal. This invention relates to a device for restraining insane or unruly persons without the use of the severe straight jacket apparatus. Its object is to provide a device which will perfectly restrain the persons and at the same time allow them the greatest possible amount of liberty, while preventing them from injuring themselves or others. It consists of a main body band with securing straps and buckles, wrist cuffs, straps by which said cuffs are adjustably connected with the first-named straps, ring attachments to the lower sides of the wrist cuffs, and straps by which the arms may be pinioned in a substantially extended position.

CHAIR.—No. 794,461. July 11, 1905. Peter Mackey, Jamestown, Cal. This invention relates to an improvement in chairs especially designed for children's use. Its object is to provide a chair for the use of children, which is capable of being converted for a variety of different purposes. It consists of a base having an upwardly extending back, an upper seat portion having a slot or channel adapted to fit over said back and cleats extending down upon each side of the top of the lower portion, said cleats having the lower edges curved to form rockers.

MINING AND SCIENTIFIC PRESS.

Whole No. 2349.—VOLUME XCI. Number 5. SAN FRANCISCO, CAL., SATURDAY, JULY 29, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Open Cut Mining.

A frequent inquiry is how cheap can mining be done, or how low a grade of ore will pay. A moment's thought will make it apparent that it altogether depends upon circumstances what grade of ore may be mined and treated at a profit. A small vein of ore must necessarily be high grade to pay the cost of mining alone, though the cost of milling or smelting may not be so greatly in advance of the cost of treatment of the low-grade ore from a large vein. In fact, the cost of treating a free-milling gold ore from a small vein would in most instances be lower than the cost of treatment of a complex ore from a large vein. It is evident, therefore, that the great difference in cost is usually in mining the ore and not in its treatment after it has been mined and delivered at the metallurgical works. When contemplating the probable cost of mining, there are so many factors to be considered that it is not always possible to tell within narrow limits what the cost will be. Usually the cost is diminished somewhat after mining has been thoroughly established and various methods tried. The system of mining at first adopted may be a proper one, but in most cases the careful superintendent can see where an improvement may be made or a cost lessened. The tonnage daily required by the mill is carefully gauged and the proper number of men are employed to furnish this requisite supply. More men than are necessary increase the cost of mining; and fewer men than this number are no advantage, and likewise cause an increase in expense per ton. The human capability of a man is limited; he may be urged to perform unusual tasks for a time through substantial encouragement in the way of a bonus or other reward, or he may exert himself for a time to a greater degree than he is able to maintain for other reasons. Occasionally men on opposite shifts, through friendly rivalry, make an effort to outdo each other in the amount of ore broken and sent to mill. These friendly contests are commonly encouraged by the management. The cheapest mining can undoubtedly be done by the open-cut method. Those unfamiliar with open-cut methods usually conceive that it can only be carried on in a vein or deposit of enormous extent, but the open-cut system can be advantageously employed in veins of comparatively narrow dimensions—30 feet, or thereabouts—by providing underground stopes into which the overburden of the hanging wall may be sent for filling, thus making cheaply available a larger amount of vein rock at low cost. The open-cut system is also applicable to flat sheets of ore, as shown in the accompanying engraving. Here a sheet or shoot of gold ore, lying almost horizontal, is being blasted down in amounts from 500 to 3000 tons at a round and the ore loaded into cars which are made up into a train and hauled to the mill by a locomotive. If the deposit were of greater thickness it would perhaps pay to run a tunnel at a lower level and connect it with the cut by a series of raises, so that the broken ore could be handled by gravity, but the comparatively limited vertical extent of this ore body does not justify such method. It is not unlikely that the cost of handling the broken ore might be reduced somewhat by the employment of a steam shovel. Here again must be considered the cost of installation and also of operation, and these questions must be determined by the magnitude of the deposit or vein. If there is a very large amount to be handled it would doubtless pay to put in a steam shovel; if the quantity be small it would probably not justify the expense of the steam shovel for the first cost of the plant and the operating expense may absorb all that might otherwise have been profit.

Mining by the Open Cut Method in South Dakota.

Pumping Water for Placer Mining.

There are instances where water may be pumped from a large body of water or a well for placer mining and the operation still prove profitable. Where the height and distance to which the water is to be delivered are not too great, this method of securing a head is perfectly feasible. The accompanying illustration is that of a dismantled pumping plant situated on the bank of the Colorado river, in Picacho basin, California, about 30 miles north of Yuma. Here nearly half a million dollars was expended in pumping machinery, shaft sinking on the bank of the river and the construction of a pipe line. At the head of this line, 5 miles back from the river and 500 feet above it, a wooden stave tank was built, having a capacity of about 4000 gallons. Into this the water was pumped in a feeble, small stream, the pumps being unable to meet the requirements. As a consequence, the entire scheme was abandoned—another failure due to inefficient engineering advice.

Pumping Water for Placer Mining.

Pipe Line Construction in a Forest, Sea Line, Alaska. (See Page 79.)

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THE long continued dispute between the mine operators and the miners in Illinois coal mines over the "Shot-firers bill" was finally submitted to Judge Gray as arbitrator on the disputed points, and he wisely decided that the operators and miners should share the expense. Under this decision the operators must pay the cost of inspection and the miners must pay the cost of firing the shots. As a result, the mines are again resuming operations.

THE relative value of pure potassium cyanide, sodium cyanide and the double salt of sodium and potassium cyanide, in the cyanide process, is now receiving considerable attention. Sodium cyanide contains cyanogen to the extent of 125% to 130% of that measured in terms of potassium cyanide, but some cyanide operators who have used sodium cyanide now say that the extraction and general results are less satisfactory with this chemical than when potassium cyanide or the double salt of potassium and cyanide is used. There are others, however, who speak strongly in favor of sodium cyanide. It is not unlikely that the different classes of ore that these operators have had to deal with are in a measure responsible for the variable results with the different chemicals employed.

WHILE a mining engineer who has a commission to make a mine examination for a client may expect that those employed about the property will undertake to place the situation in the best possible light, it is not incumbent upon the engineer to accept as truth all that is told him, nor to discredit all he hears, but to ascertain for himself the facts. It is not a bad idea on the part of the examining engineer to cultivate the foreman or some other person in authority at the mine and to learn where the rich places are, if any exist, and to then investigate the poor ones on his own account. Experience in mine examination has taught that it is unsafe to accept any statement that may be made by any person concerning the property, for one cannot tell what influences may be back of any statement, either for or against the mine.

The Business Man as a Mining Engineer.

Success in business is sometimes responsible for men overestimating their capacity to manage the affairs of a business with which they are not familiar. This is not infrequently the case in mining. It is not an uncommon thing to see a number of business men associate themselves for the purpose of purchasing and operating a mining property, and this association often takes corporate form. A mine is bought, a superintendent and manager appointed—usually one of their number or some one whom they all know to possess business experience, and who has made a success of merchandising or, perhaps, in politics, but whose mining knowledge is confined to such paragraphs as have come to his notice in the daily papers. The newly created mine manager provides himself with a copy of the miner's "vade mecum," or a text book or two, and starts for the mine, where he is enabled to size up the situation with rare judgment, born of business experience, aided by an industrious perusal of the books he has bought, while en route to the mine. As few mines are of consequence without a mill or a smelter, he solicits bids from several manufacturers for the construction of a "first-class, up-to-date" mill. Having accepted one of the bids, the lowest, and placed the order with the mill founders, he turns his attention to the mine. A tunnel, perhaps, exposes a vein apparently 100 feet wide. This, he is satisfied, should be able to supply a large mill with an enormous amount of ore for years. Some more development work is done and it is then discovered that there is another outcrop on a distant part of the property, on which no work has been done. Men are placed at work on this and a shaft sunk 40 feet or more in the ore. By this time the mill machinery begins to arrive at the mine. The question of site has not been seriously considered, but a flat bench at the side of the gulch is selected, this being the only level bit of ground in the vicinity. True, it is up the gulch some distance above the mouth of the tunnel, but this is not material, as "the ore can be hoisted up an inclined tram into the mill cheaper than the cost of grading the hillside below the tunnel." All energies are now directed to mill construction, and at the end of ninety days the mill is completed under contract, and milling operations commenced. It is then discovered that the water supply is insufficient, but this can be developed further. In the meantime exploration in the tunnel has developed the fact that the vein has been crosscut diagonally and the vein is but 30 feet wide, instead of 100—bad, but it might be worse. In a few months the tailings outside the mill on the flat begin to give trouble. A bulkhead has to be built to prevent their running back into the mill. Soon the ore shoot begins to show signs of playing out at the ends. The foreman, working under directions, has a hard time to keep the mill supplied with ore. The new development in the shaft has not come up to expectations, and only one level is open on the main vein. After a struggling existence for a few weeks longer, the mill running on part time, the mine can no longer keep the mill going, and, hanging up one battery after another, the mill is finally shut down for several months, to await the development of the mine. During this period the general expenses are heavy and the outlook is unpromising. In time, the mill is again started up, and after several years of this sort of "seesaw" operation the property is either placed on a substantial basis, through the manager learning by experience at the expense of the stockholders, or it is closed altogether. How different all might have been had a competent engineer been engaged in the first place. Thousands of dollars would have been saved in equipment and thousands more in operation, but neither the stockholders nor the manager knew this. It may seem that the above is an exaggerated instance, but such is, in fact, not the case. It is, indeed, a very much better outcome of a bad situation than usually results under similar conditions, and is due largely to the fact that the mine is really better than the average and will stand considerable bad management and still pay a profit.

It is true that the technical mining engineer is not always a good business man, and failures are sometimes due to this lack of business experience, where success might have resulted, but in most instances the mining engineer has sufficient acumen to surround himself with a staff of specialists, as assistants, and among these will be found at least one who is competent to look after the commercial features of the concern. On the whole, as between the business man as a mining engineer, and the mining engineer as a business man, the proposition is largely in favor of the latter.

A New Interior Sea.

In the center of the Colorado desert, in southern California, an unusual spectacle may now be seen. For several months past the Colorado river has been running through a crevasse in its banks a few miles below Fort Yuma, the breach being caused by the digging of an irrigation canal from the adjacent country through the river bank, without providing it with the necessary head gates. This was done last spring during a comparatively low stage of the river, and at that time a considerable volume of water flowed from the river into the artificial irrigation ditch, known as the Imperial canal. With the coming of the summer floods due to the melting snows in the Rocky mountains, the breach widened and grew deeper until, it is stated, a large part of the Colorado river is pouring through the gap and that thus far all engineering efforts to check it and close the cut have proved unavailing. The water has flowed into an old channel known variously as New river and Hardey's, Colo., and has already covered the salt marshes and works at Salton, and has now commenced to submerge the tracks of the Southern Pacific Railroad. There are in this region nearly 4000 square miles of country below the level of the break in the bank of the river, and much of this is below the level of the sea. There seems a reasonable probability of this old lake, possibly at one time an arm of the Gulf of California, becoming a sheet of fresh water of considerable extent. It already covers many square miles of territory, and it is interesting to contemplate what may be the final outcome of this accidental formation of a new interior sea. It may have a noticeable effect upon the climatic conditions in that section, but it is scarcely likely that its influence will be felt beyond the mountains on the north and west of the basin.

THE annual report of the Calumet & Hecla Copper Mining Co., at Houghton, Mich., has recently been published for the year ending April 30, 1905. The statement of the company's assets and liabilities are undoubtedly satisfactory to stockholders, but the report deals with its operations and their cost in such a broad way that little knowledge of conditions other than those of a general character can be gained from reading the report. It shows an increase in production over the previous year, and the outlook for the future is stated to be promising. During the year four dividends were disbursed—three of $10 each and one of $15. It is also stated that by making changes in the old mills—modernizing them—that their capacity has been increased; but no details of stamping or mining operations and cost are given. This is in line with the policy pursued by this and some other great companies for many years, and it is to be regretted that such is the case, for much might be learned through comparison by mine managers everywhere if these important figures were available.

THE paper of T. H. Oxnam, appearing in the last Bulletin of the Transactions of the American Institute of Mining Engineers, on cyaniding of silver-gold ores at Palmarejo, Mexico, (the first installment of which appears elsewhere herein) cannot fail to be of interest to cyanide operators throughout the world. It has been known that silver was soluble in cyanide solutions, but practical application of this knowledge has been limited. In a few of the instances where the process has been tried, the difficulties have been so great that only moderately successful results have been obtained. In the instance above referred to, however, the author appears to have solved most of the problems and demonstrated the complete adaptation of the process to certain conditions.

IT has been officially announced that the inauguration of the Simplon railroad, which will unite Switzerland and Italy through the Simplon tunnel, the first of the two sections of which was recently completed, will take place October 10, 1905.

CONCENTRATES.

THE greenish appearance of some vitreous quartz from a gold vein is due to the inclusion of minute particles of chlorite.

✤✤✤✤

NUMEROUS ASSAYERS agree that there is a greater loss by cupellation in assaying telluride gold ores than with almost any other kind of ore.

✤✤✤✤

IT is stated that the rate of increase in temperature in some of the deep Victorian mines of Australia, down to 3000 feet depth, is 1° F. for every 75 feet.

✤✤✤✤

TWO nozzles are used on a water wheel of small diameter where high speed is required. The power of the wheel is thus doubled, though twice the amount of water is required.

✤✤✤✤

THE demand for pyritous ores for the manufacture of sulphur and sulphuric acid is increasing in the United States. In 1904 the sulphur and sulphur content of pyrite produced in the United States was 220,104 long tons.

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THE United States Geological Survey reports ("Mineral Resources, 1903," issued in 1904) that the commercial production of tungsten ores during 1903 amounted to 292 tons of 2000 pounds, valued at $43,639, or about $150 per ton.

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IT would be sufficient to simply drain the coarse concentrates before shipping, but it would be more economical to dry the finer concentrates in revolving cylinders or on drying floors. When fine ore is to be shipped, it is advisable to leave 2% or 3% of moisture, to prevent loss of dust.

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ZINC DUST is worth wholesale in New York City $0.05½@0.05¾ per pound. Zinc dust or fume is collected from dust chambers and stacks connected with zinc reduction furnaces, and consists chiefly of metallic zinc in the form of fine globules. It usually contains a small percentage of impurities.

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THE owner of an unpatented placer or quartz claim which is being properly held by compliance with the mining laws—Federal, State and local—is entitled to everything on the surface, in the way of timber, and vegetation of every description, as much so as though the claim were patented.

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THE business of quarrying marble has become closely associated with the installation of electrical plants throughout the United States. Marble is largely used as a mounting or backing for electrical switchboards, and marble quarries are required to supply a large amount of this kind of material.

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IRON is made from the various kinds and grades of iron ore by smelting in the blast furnace, by which it is converted into pig iron. Some of the processes are direct in their operation, and others require remelting and various other manipulations in the transformation from iron ore to wrought iron or steel.

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IMPACT wheels are not recommended for low heads—under 40 feet—except where a small amount of power is required. Sometimes more than one wheel is mounted on the same shaft. For heads exceeding 100 feet the impulse wheel is superior to any other. Turbines give the best results with large volume of water under low head.

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IT is said the copper deposits at Rio Tinto, Spain, were worked by the Romans over 2000 years ago, and by the Phœnicians centuries before them. The superficial ores were doubtless far richer than the sulphide ores worked to-day. These mines are on what are believed to be the most extensive copper deposits in the world.

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IN the manufacture of high grade self-hardening steels the elements employed to produce an extraordinary hardness is about as follows: Carbon, 0.40% to 2.19%; chromium, 0.00% to 6%; tungsten, 3.44% to 24%; silica, 0.21% to 3%. Molybdenum may be substituted for tungsten, when 1% of molybdenum replaces 2% of the tungsten.

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THE installation of a larger fan acting as an exhaust may improve the air circulation of a mine. Blowing fans are often inefficient, the development of the mine having outgrown the ventilating plant. A fan which will satisfactorily ventilate 5000 feet of mine workings may prove totally inefficient to supply air to twice this amount of development.

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THERE is not a very great difference between the Huntington-Heberlein process and the Carmichael-Bradford process. The former uses quicklime with the sulphide lead charge and the latter substitutes calcined gypsum. The process has been tried in an experimental way with raw copper sulphide concentrates at Anaconda, Mont., and is said to be a success.

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WHAT is known as the Frasch process of mining sulphur is in operation at the sulphur deposits in Louisiana, and consists in melting the sulphur in place in the deposit by means of hot water and then pumping the sulphur from a sump or well to the surface. This method of mining sulphur was invented by H. Frasch, president of the Union Sulphur Company of Louisiana.

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ROCK DRILLS may be heated by means of petroleum oil blast in a furnace of proper construction. Such a furnace offers many advantages over the coal or charcoal method. It is cleaner, usually less expensive, the temperature can be regulated to a nicety, and there is less steel burned in the oil furnace than in the ordinary forge. There is no loss of time in getting up heat and no ashes to be removed.

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COMPRESSED AIR as a means for driving mining pumps has many advantages over steam for the reason that it does away with the heat radiated from the pipe line, and from the pump itself, and the exhaust from the pump aids ventilation to a considerable extent, and under most conditions the loss of efficiency in the steam line, due to condensation, is greater than the loss of air pressure, due to cooling of the air current in the pipe line.

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MORE firebricks are usually used in the construction of a reverberatory furnace than are actually necessary. Some fuels make a much hotter fire than others. Petroleum with steam blast makes an extremely hot fire, and must be kept under control. It is not uncommon to see the bricks inside a furnace glazed from fusion due to the high heat. Such high temperatures are sometimes detrimental to the best results in roasting ore, converting iron, lead, copper, etc., into small metallic globules, which inclose minute particles of gold and silver, and unfit the ore for subsequent treatment.

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DOUBTLESS a signal code for the use of miners imprisoned underground could be devised. It is a well-known fact that sound travels a long distance through rock, and particularly through hard rock. The hammering on a rock wall can often be heard 200 feet or more. The strokes of a machine drill can frequently be heard 400 feet or more, and a sharp "click," which is characteristic of a distant blast, under favorable conditions can be heard more than 1200 feet. Miners frequently signal each other underground by hammering on the rocks, but, so far as known to "Concentrates," no code of such signals is in existence.

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UP to April 30, 1904, the United States Geological Survey had completed the topographic survey in California of 67,148 square miles out of a total of 158,360. In Colorado, at the same date, 35,101 square miles had been completed out of a total of 103,925. In Montana, 42,628 square miles had been completed out of a total of 146,080. In Idaho, 14,933 square miles had been completed out of a total of 84,800. In Nevada, 28,953 square miles had been completed out of 110,700. In Arizona, 60,813 were completed out of 113,020. The relative amount of area surveyed in the mining States ranged from one-third to one-half the total area of each State, Utah having nearly three-fourths, there being completed 62,628 out of 84,970 square miles.

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ACETYLENE GAS is a gas resulting from the addition of water to the chemical known as calcium carbide. The gas is a hydro-carbon (C_2H_2). It is used in lighting, to some extent in heating for culinary purposes, and more recently has been employed in gas engines. One pound of calcium carbide (worth in large lots about 7 cents per pound on the Pacific coast) with one-half pound of water, will evolve 5¾ cubic feet of acetylene gas. It is stated to have a heat capacity of over 18,000 B. T. U. per pound, or 1259 per cubic foot, at 14½ cubic feet per pound. About 12½ volumes of air are required to burn it. Acetylene lamps are very useful in mines, and the powerful light given by such lamps makes it possible to see the backs of high stopes, or to look some distance down shafts. It is superior for shaft inspection.

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THERE is much that is somewhat mysterious about the explosion of nitro-powders, gun cotton and other high-grade explosives, but it is agreed by all careful observers that when nitro-powder is surrounded by a medium such as air, water or rock, the explosive force is exerted equally in all directions, but manifests itself chiefly in the direction of the least resistance. That is, if a blast is fired in a drill hole the gases formed by the explosion, in their efforts to escape, will tear away a portion of the rock surrounding the drill hole. When dynamite is placed on top of a rock it will shatter the rock if it be not too large. If the same amount of powder is placed under the rock, and in contact with it, it will also shatter the rock, showing that the explosive force is exerted in an upward as well as in a downward direction. The impression that many have that the explosive force of nitro-glycerine and dynamite is downward only is erroneous.

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SILVER-LEAD ORES occur in many formations, but the most noted mining districts of the world where ores of this class occur are mostly in limestone formation, associated with porphyry intrusions, in the form of dikes and sheets. Some noted examples are Leadville and Aspen districts of Colorado, Eureka district of Nevada, Tombstone of Arizona, Little Cottonwood canyon of Utah, Santa Eulalia, Sierra Mojada, and a number of other districts of Mexico. Besides these, there are scores of other places of less note where silver-lead ores occur abundantly in limestone. A notable exception is the mines of the Cœur d'Alene district, Idaho, where the ores occur in quartzite. Silver-lead ores occur in schist, sandstone, granite, andesite and many other kinds of rock—sedimentary, metamorphic and eruptive—but its most frequent occurrence is in limestone. The lead-zinc mines of Missouri, Kansas, Arkansas, Iowa, Illinois and Wisconsin are wholly in limestone.

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SOME MONTHS AGO the experiment of treating cinnabar ores in White-Howell furnaces was tried at the Socrates quicksilver mine, Sonoma county, Cal. Two of these furnaces were installed. The larger of the two was 27 feet in length and 5 feet 8 inches in diameter, lined with fire brick. After several months trial it was decided that the furnace was not as well adapted to the work as the ordinary type of quicksilver reduction furnace. It was found that the ore was not exposed to the heat for a sufficiently long period to reduce all of the contained mercury. At the Socrates mine there is considerable metallic quicksilver in the ore, and this was readily vaporized and recovered in the usual manner, but the reduction of the cinnabar was found far from complete owing to the comparatively short exposure to the heat. When the furnace was set so as to give the necessary heat and time to effect complete reduction, the capacity of the furnace fell so low as to make the expense of the process prohibitive. The company is now building a large furnace of the Scott type, the rotary furnaces having been abandoned.

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THERE are a number of minerals which deposit a white coating on charcoal before the blowpipe. If the coating is deposited at some distance from the assay and is readily dissipated by directing the flame toward it, it is probably arsenic. If the white coating forms nearer the assay, it is more likely to be antimony. With antimony there is usually the formation of globules of metal which emit fumes for some time after the flame is removed, and, on further cooling, the metallic beads are surrounded by crystals of antimony oxide. If the coating on the coal is yellow while hot but white on cooling, the mineral is zinc. Tin also produces a yellow coating, but it is of a much lighter tint than that produced by zinc. The coating about tin is close to the assay, and it is not volatilized by the flame when once deposited. Lead gives a lemon-yellow color hot and a sulphur-yellow color cold, the coating quickly disappearing on application of the flame, which it colors blue. Bismuth gives a brilliant dark orange-yellow colored coating hot, fading to lemon-yellow on cooling. Cadmium gives an orange-brown color hot, changing to orange-yellow when cold. All charcoal used in blowpipe analysis should be tested without any mineral, to see that no color is produced by the blowpipe flame. Some kinds of coal are covered with a white coating and others by a brown color when cooled after ignition.

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WHERE there are no mechanical means for sampling ore in a mill, as suggested herein in a recent issue, the most reliable samples can be taken in a mine. If it is desired to supplement this with mill samples of headings, these samples should be taken from the chute leading from the bins to the feeder hoppers, this place offering the best opportunities for fair samples. They should be taken with a square shovel, and the shovel should reach the bottom of the stream of ore. The amount taken each time should not be less than 10 pounds (and more is better), and these should be taken at least hourly. This would mean twenty-four samples of 10 pounds each during each day—or 240 pounds of rock. This can be mixed and cut down on the cam floor and the surplus shoveled into the chute again. A 5-stamp battery ordinarily crushes from 12 to 25 tons per day of twenty-four hours, so that the entire sample only weighs from 1% to 0.5% of the amount passing through the battery. The "cutting down" can be quickly done with a shovel after mixing on canvas, by the quartering method. A small rock breaker and sample grinder combined are of great utility in carrying out this idea. The most important samples are those of the tailings. When the tailings are low, the bullion and concentrates should indicate the value of the ore if the millman is honest.

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WHERE a man owns a fraction—that is, a mining location less than the full length—and the neighboring land is unlocated, he may file an additional location certificate taking in enough additional land to make his location a full 1500-foot claim. Such additional certificates are usually provided for by statute, but the courts have held that this may be done even in States such as California, which have no statute on the point. It can not be done to the prejudice of existing rights of others. On the same principle is the case where the owner of the fraction owns another and contiguous fraction, each fraction alone being only 750 feet in length. As he might abandon one fraction, and then enlarge the other within the above rule, the law will permit him to accomplish this in a single step, on the principle that the law will not force a man to circuity of proceeding. He should select one of the fractional locations (preferably the older one) and file a certificate enlarging it so as to take in the other. This would operate as a relocation rather than as an amendment and can be done only if existing rights of others are not prejudiced. No change upon the ground is necessary if the name of the claim selected for enlargement is not changed, and the claim was originally perfectly regular; the old monuments already on the ground may be used. Thereafter annual labor would be required as for one claim only.

The Ancient Channel at Gibsonville, Cal.

Written for the MINING AND SCIENTIFIC PRESS by SAMUEL C. WIEL.

White cuts along hillsides are familiar in many of the mining counties of California, indicating generally ancient gravel deposits—usually deposits that have been hydraulicked. Famous among these is the deposit about Gibsonville and La Porte, in Sierra county. Work was begun there in the fifties. Such names as Poorman's Gulch, Poverty Flat and Whiskey Diggings are left to indicate the early scramble for locations. Each man worked for himself or with a few partners.

Company work on a systematic scale came much later, but to-day work has been entirely turned over to corporations. A few Chinamen still work the diggings for gold that nets them a day's wages. Survivors of the early days will tell you they are barely making a living, though they can remember when they took out $40 to $50 a day. The work on the gravel is being done now by corporations such as the Belleview, the New Bunker Hill, and others.

These gravels, around Gibsonville, are the remains of an old river, of Neocene time, now covered by lava. They crop out on the surface in all sorts of places, wherever erosion has removed the overlying rock (the lava cap) with which the ancient channels are usually covered. The miners call these exposures "blowouts," and "spills," as though some subterranean force had there squeezed the gravel to the surface. One old miner founded a theory of the entire phenomena of ancient gravels on this idea. He told the writer that these buried gravels never were the beds of streams, but were ordinary rocks broken up at great depths and squeezed through to the surface, the rounding of the gravel being due to a wearing away in the process. The exposures in a general way are not found on the hilltops, but in the canyons or gulches, or on the sides of gulches, where erosion has been greatest and has removed more of the lava than elsewhere.

Having found a "blowout," in the early days, it was hydraulicked. The gravels paid well that way; but legislation has since made this method of mining almost prohibitive. At Gibsonville one hydraulic mine is at work still, but at the expense of three impounding dams. These log dams, expensive at the start, are now almost filled up, necessitating the expense of raising them. There is considerable low-grade gravel left in the ancient Gibsonville channel, especially on the rims, where tributaries probably entered; but the possibility of working these profitably has been legislated away.

The channel between La Porte and Gibsonville is covered with andesitic breccia of the later Tertiary. The river deposit under this lava has been penetrated at the Thistle shaft, about 4 miles southeast of La Porte. Work on this shaft was difficult because of a considerable inflow of water. To avoid this difficulty in the shaft, a long bedrock tunnel known as the Belleview has recently been completed by the same company. It is said that their perseverance has been rewarded by striking a wide pay channel running $3 a car. The Yankee Hill gravel, near Slate creek, on the road from La Porte to St. Louis is perhaps a part of the La Porte channel, but there remains some doubt about it. From Gibsonville the gravel may be followed continuously through Whiskey Diggings to Hepisdam, formerly prosperous camps, but now in decay, where the channel disappears under the lava. From La Porte to Gibsonville the average present grade of the bed of the Neocene river is about 80 feet to the mile; from Gibsonville to Whiskey Diggings, about 250 feet to the mile; and from the latter place to Hepisdam, a distance of over a mile, about 400 feet to the mile. These measurements, while not accurate, have a comparative value. "As the character of the gravel and of the old channel does not appear to have changed in this distance, the rapid increase in grade is in all probability to be ascribed to subsequent differential elevation toward the east," says Turner.

By hydraulicking and washing along a stretch 2 miles long in a southwesterly and northeasterly line, the continuity of the gravels has been proved. For that length a strip, sometimes a thousand feet wide, has been exposed, washed clear of the lava covering, and down to bedrock. At the northeasterly end of this line the lava cap was early found too thick for hydraulicking and about a mile from Gibsonville the Hepisdam drift mine was started, tunneling under the lava. This mine, now known as the North America, is said to have taken out between $800,000 and $1,000,000. The gravel maintained the same character as that in the works below. They had the misfortune of running out of bedrock with their tunnel, into the gravel and above it, rendering their tunnel finally too high to handle the gravel, a frequent cause of misfortune in drift mining. It was the custom of this mine to raise from their bedrock tunnel into the gravel and take out all the gravel indiscriminately, to a height of about 4 feet above bedrock, and yet the gravel taken thus would run between $1.50 and $2 a car.

The line of the ancient channel appears now continuously for about 2 miles on the surface. The covering being washed away, it looks from the hills like a fairly straight white line of quartz gravel and boulders, disappearing under the lava at the North America dump. From here on it can be traced in the same (northeasterly) direction by the air shafts of that mine, beyond the summit of the ridge of lava that covers it. On the other (eastern) side of this ridge lies the New Bunker Hill drift mine, where the gravel is similar in character. From there on, beyond the Bunker Hill, the continuity of the channel is doubtful. Deep canyons come in, whose erosion probably cut out the ancient channel. There are, however, two masses of white quartz gravel at the north and west base of Blue Nose at the edge of the lava, about 500 feet below the Bunker Hill tunnel, which may be downthrown portions of the Hepisdam river deposit. That extensive faulting has occurred

Looking for Nuggets in the Sluice of a Placer Mine, Sierra County, Cal.

Cleaning Up the Sluices of the Bunker Hill Mine, Sierra County, Cal.

about Blue Nose is evident. That the region about Blue Nose was formerly one of volcanic activity, where the lavas issued, is also apparent according to Turner, though there is no evidence of faulting in the Bunker Hill tunnels.

Much of the lava about Blue Nose is massive andesite, in part dikes, occupying fissures in the bedrock. A little over a mile northeast of Mount Fillmore is some gravel under the andesite, and both andesite and gravel are cut by basalt dikes.

The New Bunker Hill, while undoubtedly on the same ancient channel system as the North America, is probably on a tributary and not on the main channel. They have met a series of benches running, not in the direction of the Gibsonville channel, but across it; and it is hoped, by following in the direction of these benches, to demonstrate conclusively that the Gibsonville channel crosses their ground. The New Bunker Hill, like the rest of the drift mines in this neighborhood, was started by following a "blowout" which was found at the head of Hopkins creek. Work here is being done more carefully now than in the old days. Instead of breasting out broadly over the bedrock, a prospect dump is used. Carloads of gravel are separately washed and only the pay streak is followed.

All the ancient gravels contain free gold. Pieces worth over $50 are not frequent; but pieces worth $20, or so, are frequently found and are called "slugs." In washing, the slugs are usually found in the upper 20 feet of the flume. At the Bunker Hill, the flume extends far down the creek, mercury being used in the lowest flume to catch the smaller particles, but not in the upper flumes. The tailings contain practically nothing, and even the Chinamen do not undertake to wash the tailings.

The character of the gravel in this ancient channel is interesting. The gravel deposit is very wide, in some places reaching 1000 feet—very different from the mountain streams found there to-day; it would seem more comparable to lower streams like the Sacramento river. At one time it was a popular theory that the ancient gravels throughout the Sierra region were a part of a single great river, but a closer geological study has caused this idea to be discarded, and it has been shown that there were numerous ancient rivers, independent of each other. There are so many of these large ancient channels in California, moreover, that it is unlikely that they bear any relation whatever to any single stream of the present day. So large were these streams that one would expect the deposit to be fine grained and the gravel regular and small; but, on the contrary, the gravel is as irregular as in narrow mountain torrents of the present day. The deposit varies from clay and fine sand to boulders the size of a house. At the Bunker Hill these huge boulders on bedrock often give trouble in mining. The gold will sometimes lie on one side of them, as though they had some favorable influence in causing its deposit; but they give difficulty in handling material.

From these huge boulders the gravel grades down in size. It is very irregular in shape, and decidedly angular. It is not as rounded as one would expect of material coming from a distance, and this indicates that the formation of this channel must have been comparatively rapid, or that the part at present exposed is not far from its source. The larger boulders are almost invariably white quartz; yet no quartz veins have been found from which such huge pieces could have come; probably they have long since been eroded away. The conditions suggest the possibility of ice having been a factor in the creation of this channel.

No evidence of faulting or disturbance has been found in the Bunker Hill, though on other channels the gravel has been lost through faulting, or has been cut off by dikes and igneous intrusions of various kinds. In the North America, on this channel, a fault is said to have been met with, which caused the channel to drop below the level of the bedrock tunnel of that mine, and rendered its tunnel useless. The Bunker Hill tunnel was driven at a lower level, to allow for this fault, as the Bunker Hill is directly up stream from the North America. The quartz boulders frequently break up and splinter when blasted, which may be due to the pressure of consolidation under the weight of overlying material.

For ventilation, air shafts are raised to the surface at intervals along the tunnel. These shafts cut layers of gravel, sand and pipe clay; the upper layers of gravel containing much less gold than the lower or bedrock gravel; and only the bedrock gravel is worked. Water is conveyed by ditch to these air shafts, and, in falling through them, produces a strong current of air for ventilation. The bedrock is usually the Mariposa slate of the Jurassic period—a bluish black, soft material, that sometimes swells on exposure to air, and occasionally makes heavy timbering necessary.

Tantalite for Incandescent Lamps.

Recently Dr. Feuerbach delivered a lecture before the joint session of the technical and electrotechnical associations of Frankfort, Germany, in which he said, in part, that endeavors have constantly been made to construct lamps of greater light-giving efficiency, for the present efficiency is only 1%, 99% of the energy used being converted into heat. As it was known that the light-giving efficiency increases with the increase of the temperature, it was the general desire to use for threads in the lamps metals which have a very high melting point, instead of carbon threads. The tantalite incandescent lamp is the result of years of experiment. Tantalite occurs in nature in various minerals. There are two groups of tantalite ores—tantalite and columbite. The tantalite ores, which are found in Australia and Scandinavia, contain tantalate of iron and tantalate of manganese. The columbite ores contain, in addition to tantalite, niobate of iron and of manganese, and were first found in New England. From these ores tantalite is first separated as tantalitic acid, which is converted into a double fluoride of tantalite and potassium, from which tantalite is finally derived as a pure element.

Tantalite as a metal was first found by the Englishman Hatchet in 1801. As the real discoverer of this element, however, must be named Eckeberg, who made investigations in 1802. Berzelius was enabled, in 1824, to free tantalite of its associated element,

but even he did not succeed in obtaining pure tantalite.

Dr. von Bolton first succeeded in obtaining pure tantalite. Tantalite is a heavy mineral with a gray metallic luster, extremely resistant to acids and alkalies. Only fluoric acid affects it. Its specific weight is 16.8. Pure tantalite has the hardness of soft steel, but possesses a much greater tensile strength. It can be worked into thin sheets and extremely fine wires. Its melting point lies between 2250° to 2300° Celsius. Through repeated annealing it acquires such hardness that tantalite sheets withstand even a diamond borer.

The technical use of large quantities of tantalite is at present impracticable, as one pound of this element still costs nearly $5000. Of what importance the chemical and physical properties of tantalite are for the industries is shown by the fact that Siemens & Halske, for the various processes of manufacture and use of tantalite, have taken out more than 200 patents in Germany and other countries. The incandescent lamp with a tantalite instead of a carbon thread has various advantages over other means of lighting. The tantalite lamp requires only one-half the current of ordinary incandescent lamps of equal light power. With the same strength of current the tantalite lamps give double the light of the carbon incandescent lamp, and the light is much whiter. The lamp is pear-shaped, like the ordinary incandescent lamp, and the thread has a length of 650 millimeters (25.59 inches) and is 0.5 millimeter (0.197 inch) in diameter. The lamp can be placed in any position. The medium life of a tantalite lamp is from four to a hundred light hours.

Splicing Transmission Rope.

Rope transmission is an important factor in the operation of many mines. Ropes are employed in the transmission of power in mills and about mines, and a more extended use of this economical means of handling power and distributing it to desired points is certain to follow a more thorough understanding of the methods of application and its advantages. One of the important features in rope transmission is the splicing of the ropes. This must be properly done or the operation of the plant cannot be satisfactory. The splicing of a transmission rope is not a difficult matter when understood. As a matter of course, by frequent repetitions of the operation the workman becomes more expert and the result of the improvement, which is the outcome of experience, is observable in the more enduring quality of the splices. The C. W. Hunt Co., of 45 Broadway, New York City, have recently issued a catalogue, No. 054, entitled "Manila Rope," which contains much valuable information on rope transmission and on ropes and their use generally. Incorporated in this handsome little volume are a number of cuts, which show clearly the methods of splicing. The following description and illustrations are published through courtesy of the C. W. Hunt Co.:

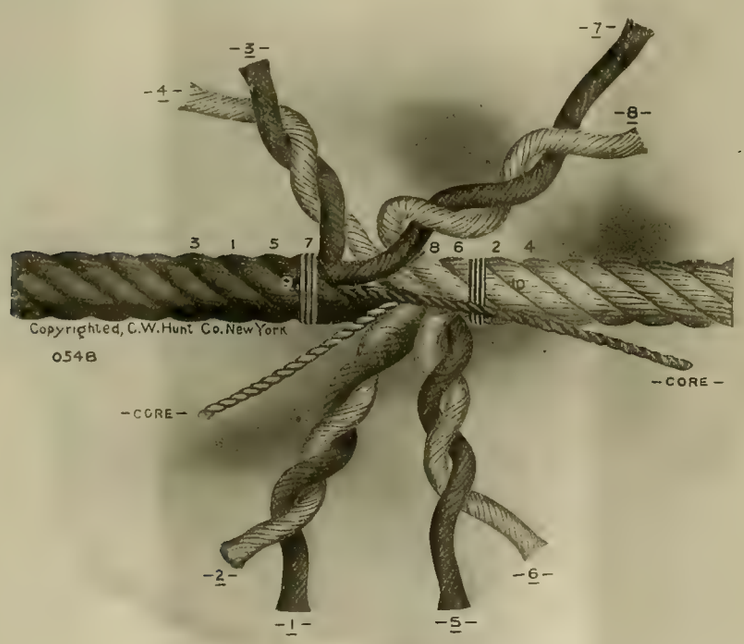


Fig. 1.

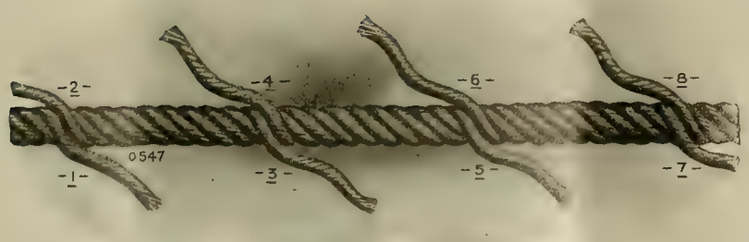


Fig. 2.

SPLICING.—To properly splice a rope or tie a knot that will not slip is a simple operation, and it would be supposed that almost any workman would be able to do either, but the difficulty of getting the splices put in a rope in manufacturing establishments has been a serious drawback in introducing the use of rope for the transmission of power. There is but little information on splicing a transmission rope in technical literature, and as ordinary rope splices are not suitable for this purpose, the following description and cuts will serve a useful purpose.

Fig. 3.

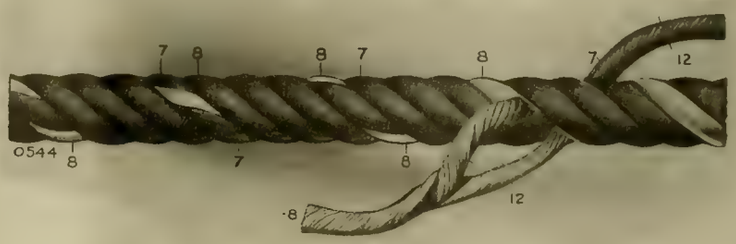


Fig. 4.

The splice in a transmission rope is not only the weakest part, but is the first to fail when the rope is worn out. If the splice is not long enough the rope will fail by breakage or pulling out of the splice. If the splice is improperly made it will be larger than the rope and the projecting parts will wear on the pulleys and the rope fail from the cutting off of the outer threads of the strands.

If it is desired to profit by the experience of others, do not put in a "short splice" or an ordinary "long splice," or get an "old sailor" to do the work, but have a handy man follow implicitly the directions given below for a splice in a four-strand transmission rope.

We have had accurate engravings made of each successive operation in splicing a 1¼-inch manila rope, and also of the most common knots. Each engraving was made from a full-size specimen, and accurately shows the position of the parts.

Tie a piece of twine, 9 and 10, around the rope to be spliced about 6 feet from each end. Then unlay the strands of each end back to the twine.

Butt the ropes together and twist each corresponding pair of strands loosely, to keep them from being tangled, as shown in engraving, Fig. 1.

The twine 10 is now cut, and the strand 8 unlaid, and strand 7 carefully laid in its place for a distance of 4½ feet from the junction.

The strand 6 is next unlaid about 1½ feet, and strand 5 laid in its place.

The ends of the cores are now cut off so they just meet.

Unlay strand 1, 4½ feet, laying strand 2 in its place.

Unlay strand 3, 1½ feet, laying in strand 4.

Cut all the strands off to a length of about 20 inches, for convenience in manipulation.

The rope now assumes the form shown in Fig. 2, with the meeting points of the strands 3 feet apart.

Each pair of strands is successively subjected to the following operation:

From the point of meeting of the strands 8 and 7, unlay each one three turns; split both the strand 8 and the strand 7 in halves as far back as they are now unlaid, and the end of each half strand "whipped" with a small piece of twine.

The half of the strand 7 is now laid in three turns, and the half of 8 also laid in three turns. The half strands now meet and are tied in a simple knot, 11 (Fig. 3), making the rope at this point its original size.

The rope is opened with a marlin spike, and the half strand of 7 worked around the half strand of 8 by passing the end of the half strand 7 through the rope, as shown in the engraving, drawn taut, and again worked around this half strand until it reaches

the half strand 13 that was not laid in. The half strand 13 is now split, and the half strand 7 drawn through the opening thus made, and then tucked under the two adjacent strands, as shown in Fig. 4. The other half of the strand 8 is now wound around the other half strand 7 in the same manner. After each pair of strands have been treated in this manner, the ends are cut off at 12, leaving them about 4 inches long. After a few days' wear they will draw into the body of the rope or wear off, so that the locality of the splice can scarcely be detected.

The Ore Deposits of Mount Lyell.*

NUMBER III.

Written by J. W. GREGORY.

It is, of course, obvious that the Iron Blow was not formed by the simple alteration of the pyrites by surface waters and air; for in that case the iron would have been present as a hydrous oxide of iron, such as limonite, instead of as hematite. Apparently limonite only occurred where the hematite had been acted upon by surface waters. It is accordingly most natural to regard the Iron Blow as some type of lode, formed under conditions which have led to the deposition of red hematite from iron solutions. The iron was probably leached from pyrites in the underlying rocks, and was precipitated along the fault lines, where the ascending waters, containing iron salts, met other solutions which had worked their way downward through the conglomerates. The position of the Iron Blow beside the pyritic mass is only natural, for the conditions which favored the ascent of the solutions which deposited the pyrites, also enabled the ascent of the other. The anhydrous hematite was naturally also deposited where the conglomerates have been faulted down against the schists; for the surface waters could pass through the porous conglomerates, and thus mix at some depth with the ferruginous waters and precipitate their contents.

F. D. Power has suggested that the Iron Blow is a segregation lode, thereby showing that he fully recognized that it was not formed by the mere decomposition of the pyrites. The striking difference between the ores of the Iron Blow and the pyritic masses is the poverty of the ironstone in copper and silver. These metals may have been once present in it; but they, being more easily removed as soluble sulphates, have been entirely leached out and carried down. The rich shoots of silver-copper ore found at the southern end of the pyritic mass of Mount Lyell probably derived their contents from the leaching of the Iron Blow. These bonanzas or enrichments are secondary enrichments, formed by water working its way downward through the ores and leaching out the more soluble salts; the metals in these salts were deposited again lower down, along the drainage lines in shoots, which thinned out below, as they got further from the source of supply.

The iron gossan of the Iron Blow was, therefore, probably formed from pyrites by the conversion of the iron sulphide into ferrous sulphate and of the enclosed copper and silver into cupric and silver sulphates. As a solution of ferrous sulphate is a solvent for gold, that metal also was removed at the same time. The solution then percolated into the schist of the hanging wall side, where further chemical changes took place. The ferrous sulphate was decomposed and the iron precipitated as ferric oxide (Fe_2O_3); the gold was immediately precipitated. The sulphate of barium, which had also been introduced at the same time, was precipitated along with the iron and gold, forming the barytic hematite of the Iron Blow. The copper and silver were perhaps precipitated in the hematite, and, being more soluble, have been subsequently removed by leaching processes, and then concentrated on the margin of the hematite. It appears, however, to be more probable that the copper-silver ores were deposited at the same time as the hematite, but at a slightly lower level, owing to their greater solubility. This conclusion is supported by the fact that the hematite shows little evidence of subsequent percolation. Had water passed through it, the oxide would, in all probability, have been altered into limonite.

Peters estimated, after the most exhaustive and careful process of sampling, that the Mount Lyell ore would yield an assay value of copper 4½%, silver 3 ounces and gold 2½ dwts. He estimated the width as 300 feet; the length actually traced at that time was 950 feet. Limiting the payable ore to a width of 200 feet, thus excluding the low-grade ores on the hanging wall, and taking the weight of the ores as 280 pounds per cubic foot, he calculated that there would be 9,200,000 tons; deducting half that amount for contingencies, he estimated there were 4,600,000 tons of ore above the workings existing at that date, and above the level of the tunnel which it was then proposed to carry through the ridge to the smelting works at Queenstown. Actual work has, however, proved that the average of the ore used up to the end of September, 1902, was considerably poorer; 1,320,134 tons had then been smelted, which yielded an average assay value of copper 2.92%, silver 2.74 ounces and gold .097 ounce (that is 1.94 dwts.)

THE SOUTH LYELL MINE.—The South Lyell mine is in a lease situated due south of the Mount Lyell mine, and in this lease a considerable body of low-grade pyritic ore has been found. A shaft was sunk at a point in line with the Iron Blow of the Mount Lyell mine, in expectation of reaching the continuation of the Mount Lyell "lode." The mouth of the shaft is at the level of 1368 feet above the sea; it reached pyrites at 844 feet above sea level, and continued through it to 720 feet above sea level, or 648 feet below the mouth of the shaft. This mass of pyrites, with an apparent thickness in the shaft of 124 feet, has been proved by subsequent work to be a large pyritic body, 140 feet long and 70 feet wide, running from north 50° west to south 50° east. It must be cut off abruptly above, as, if it had continued upward at the same dip as in the shaft, it should have been passed through by a diamond drill bore made from the No. 5 to the No. 6 level of the Mount Lyell Co. The absence of any extension from the South Lyell ore body in that bore shows that it ends abruptly above, just as the pyritic body of Mount Lyell ends abruptly below. The ore of the two mines is remarkably similar in character. Their distance from one another is approximately that of the throw of the great thrust plane which has brought the conglomerates between the schists in the Mount Lyell mine. Hence the evidence renders it probable that we have to seek for the subterranean source of the Mount Lyell ores through the South Lyell ore mass. The ores of the South Lyell mine on the footwall, just above the schist, are enriched with fahlore, due probably to the leaching from the ores along the hanging wall, and the deposition of the material on the lower side of the deposit. The South Lyell ore mass contains one large intrusion of schist. The average ore contains .5% to .6% of copper, and has been mined for use as fuel in the smelting of the acid ores from the North Lyell mine.

The mass of ore could be most economically worked by driving from the Mount Lyell mine. The ore is cut through by a fault, which left the pyrites polished like a mirror; a specimen of the slickensided pyrites from this fault is preserved in the Hobart museum.

THE NORTH LYELL MINE.—I was unfortunately unable on either of my visits to Mount Lyell to examine the underground workings of either the North Lyell or Lyell Blocks mines. An inspection, however, of the surface workings and subsequent information, kindly given to me by W. T. Batchelor, shows that both mines are associated with extensive faults.

The North Lyell mine is situated at the extreme head of the Linda valley, beside some bold crags of conglomerate, which rise on the ridge which forms the divide between the Linda and Queen valleys. The mine occurs close by the contact between the schists and conglomerates, the junction of which is complicated by an elaborate series of faults. The ore has been worked by a deep open cut, the bottom of which is 1647 feet above sea level. The contact of the schist and conglomerate is part of the Great Lyell fault, which has a general trend from north to south; but opposite the main ore body a cross fault breaks across the Great fault, throwing the southern part to the northwest. This face of the cross fault is well shown in the open cut, where the ore has been removed from the north of it, leaving exposed a bumpy, wavy surface of conglomerate.

The ground included in the lease of the North Lyell Co. is probably more faulted and disturbed than any other equal area in the Lyell field. The mine includes at least five distinct ore beds, four of which are enclosed in schist and occur in the bays or angles between the Great Lyell fault and the transverse faults. The so-called eastern ore body, on the other hand, occurs to the east of the Great fault, and its ore is different in character and position from that in the ore bodies along the main fault. The eastern ore is a siliceous pyritic material carrying copper; it contains much organic matter, and has conglomerates on its northern side. The main ore body and those associated with it occur enclosed in schists. They are disconnected shoots of ore, formed of bornite, in siliceous schists. The largest body is known as the main ore body, and was once thought to have been part of the second largest body, which has been almost worked out by an open cut.

THE GENESIS OF THE ORES.—The determination of the genesis of the Mount Lyell ores is necessary both in estimation of the future history of the field and in the determination of the most economic method of working it. Upon the first discovery of the Iron Blow and its adjacent pyrites they were regarded as ordinary mineral lodes. The strike of the main deposit having been determined, it was, therefore, natural to expect that other deposits of copper ore should occur along the continuation of the Mount Lyell line. Great encouragement was given to this view by the discovery of the fahlbands, which certainly extend in long bands through the schists, and also by the wide distribution of alluvial gold in the field, which, it was rightly inferred, was mainly derived from the decomposition of auriferous copper-bearing pyrites. Though the only payable gold deposits were those found on the slopes below the Mount Lyell mine, enough was found elsewhere to support the hope of the wide distribution of the copper ores. The land, both north and south of the mine, was, therefore, taken up by companies and searched for the continuation of the Mount Lyell lode.

Thus the South Lyell Co. acquired a lease immediately to the south of the Mount Lyell mine, and sank a shaft at a point selected solely because it was on the extension of the longer axis of the Mount Lyell ore body.

Most of the early literature of the field and of the prospectuses that were issued by the various mining companies expressed the belief that the field was traversed by parallel series of copper-bearing lodes. Thus the prospectuses of the South Mount Lyell Co. stated that a large proportion of the Mount Lyell lode was already proved within its boundary, and it was also proved that the whole ore body is directly entering it. The Mount Lyell Blocks Co. claimed that its lode is in all probability the same as that which traverses the North Mount Lyell. The Great Southern Mount Lyell Mining Syndicate claimed for its 300 acres "that three distinct lodes, as well as in all probability the Great Mount Lyell lode, occur across its northeastern corner." The prospectus of the Copper Mines of Mount Lyell West Co. claimed that its Kelly shaft and Razorback lode would be found to be the continuation of the North Consolidated and Extended main lode.

It was accordingly a great blow to the founders of the so-called "parasite companies" when Peters announced his famous swamp formation theory. Peters held that the pyrites had been formed by the reduction of copper sulphate solutions by the action of the organic agents in a swamp. The theory was probably suggested by the well-known deposit of iron ore at the Mesa de los Pinos, near Rio Tinto, which has unquestionably been formed by the reduction of ferrous sulphate solutions derived from the pyrites of the Rio Tinto mine. This method of origin is certainly theoretically possible. Peters' theory of the formation of the Mount Lyell ores is as follows:

"These deposits are believed by those who have studied them most carefully to have been formed before the period of mountain building began in this country, and when the layers of schist that are now nearly vertical were in the same horizontal position in which they were originally laid down, these schists, or neighboring rocks, containing particles of iron pyrites carrying the valuable metals, as is exceedingly common with all varieties of sedimentary rocks. The waters flowing through the gradually decayed and dissolved pyrites, as one can see it to-day in most any district, and the streams flowing into some lagoon or bog hole, came in contact with the peaty, organic acids that are always found in the waters of swamps, and that have the peculiarity of throwing down the metals out of their solutions. These metals were thus precipitated in the same state that they were originally in the rock, but in a massive, concentrated form, instead of being disseminated in minute particles throughout the rocks. In time the slowly growing mass of pyrites filled the swamp hole, or, more probably, a chain of holes, of great horizontal extent in comparison with their depth. The country was slowly covered with the pebbles that now form the conglomerates, or the mud that we now see in the shape of slates or schists, and the pyrite beds were buried hundreds of feet under these newer rocks. When the mountains were elevated these layers of rocks were tilted into their present highly sloping position, and if the upturned edges happened to break across one of these hidden deposits of pyrites, it was brought to the light of day."

From this hypothesis it follows that such swamp deposits might occur at irregular intervals through the sedimentary series, and need not be confined along great fissure lines due to subsequent earth movements. Other similar masses of pyrites might occur wherever the swamp conditions had been repeated during the formation of the sedimentary rock series of the district. Peters, by a hypothetical section across the country, illustrated his conclusions that the swamp deposits would be irregularly distributed, and the only chance of finding them would be where they actually outcropped at the surface. If his hypothesis had been established it might have been possible to define the limits within which these pyritic lenses would be found. For they would occur only in the bands of rock which enclose the swamp deposits. Therefore, by tracking the outcrop of the bands of fresh water strata the possible limits of the copper ores would be directly determined.

Peters' theory, though it was adopted by many writers on the Lyell field—for example, Montgomery and McNamara Russell—has not been confirmed by subsequent work. Further ore deposits have been found, but all those of any importance occur in association with a series of powerful faults and near the junction of the conglomerates and the schists. Hence arose the contact theory, which during recent years has been generally held upon the field.

Contact ore deposits are generally regarded as those which have been formed by the contact of igneous rocks against some different rock, such as, for example, the lead ore deposits of Leadville, Colo., due to the contact of beds of porphyry against beds of limestone. Thus Kemp, in his "Ore Deposits of the United States and Canada" (1900, p. 58), in his classification of ore deposits gives as the essential feature of contact deposits that "igneous rocks always form one wall," and on page 69 says that "this form of deposit becomes then an attendant

*Abstract Trans. Aus. Ins. Min. Engrs.

phenomenon, or even a variety of contact metamorphism."

In this strict sense the Mount Lyell ores cannot be regarded as contact deposits, as they are not due to contact with intrusive igneous rocks. But if the term contact be used in a much wider sense, then it is not without some justification, for the great pyritic masses appear to be indirectly due to the fracturing of the schists, where they have been crushed against the harder masses of conglomerate.

The first point that must be determined is the source of the ores; and here it is natural first to turn to the fahlbands, so widely scattered through the schist series. They were regarded, both by Peters and Haber, as of primary origin, whereas Haber regarded the pyritic masses on the other hand as secondary. This view was a natural corollary to the prevalent theory of the formation of ore deposits by lateral secretion; for, according to Peters, the ores in the great pyritic masses were obtained by the leaching of the disseminated pyrites from the decomposing rocks beside his swamps. Haber expressly states that "the fahlbands are to be regarded in any case as primary ore formations. On the other hand, the nature of the pyritic ore bodies indicates for them a secondary origin." Microscopic evidence, however, clearly shows that the pyritic minerals in the schists are as truly secondary as they are in the pyritic mass.

In the second place, the minerals present in the ore masses have very sharply defined crystallographic outlines, and are often built up as loose skeleton crystals, showing that they have crystallized in situ after the foliation of the schists. It may be suggested that the ores were formed by organic deposition and then were recrystallized, and that this recrystallization has destroyed the evidence of their original nature. Even then we should expect a much greater variation in the composition of the ore near the margin of the pyritic mass. Montgomery logically inferred from the swamp theory that the ore mass would increase in size below, as the uniformity of the material showed that the ore then exposed was not near the margin of the pyritic mass. He reasonably expected that there would be alternations of pyrites and mechanical sediments on the margin, due to the gradual increase in the deposition of the pyrites, and later on to its decrease.

A third and more conclusive argument against the primary nature of the pyrites is the clear evidence in parts of the mine that the pyrites have been formed metasomatically by the replacement, molecule by molecule, of the original rock by pyrites.

The swamp theory is untenable when it is admitted that the rocks in which the pyrites occur are not a continuous sequence, and that the schists and rocks beside the great ore masses have been faulted together. The pyritic masses have been deposited not only later than the deposition of the rocks, but also later than the formation of the chief faults.

That the ores in the fahlbands and pyritic masses are of approximately the same origin was suggested by Peters owing to their similar composition. It is well, therefore, to compare the composition of these two types of ores. The assay value of the ore at the Mount Lyell mine may be divided into three distinct types, the low-grade pyrites that pays to work only as a fuel, the payable pyrites, and the stoping ores. Their metallic contents are as follows:

	LOW GRADE ORES.		PAYABLE
	Between Levels 4 and 5.	Below Level 5.	ORES.
Copper, %.....	.64	.57	2.92
Silver, ozs. per ton.....	2.15	1.74	2 74
Gold, oz. per ton.....	.048	.04	097
	STOPING ORES.		
Copper, %.....		10.94	4 55
Silver, ozs. per ton.....		6.23	3.58
Gold, oz. per ton.....		.022	.119

The composition of the fahlband ores may be illustrated by the analysis of unusually rich ore from the Lower Reserve tunnel, and of the metal-bearing flux of the Royal Tharsis:

LOWER RESERVE ORE.		ROYAL THARSIS FLUX.	
Copper, %.....	6.96	Copper, %.....	1.68
Silver, oz. per ton.....	.36	Silver, oz. per ton.....	.24
Gold, oz. per ton.....	.008	Gold, oz. per ton.....	.026

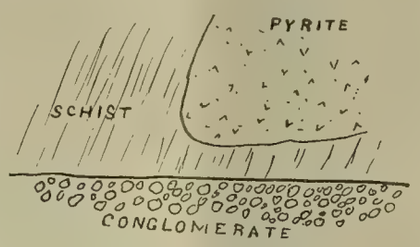
The relative ratios of copper, gold and silver in the metal-bearing fluxes and in the pyritic ores of the Mount Lyell mine have been recalculated in the company's laboratory, and Mr. Sticht tells me that Mount Lyell ores are much richer in gold and silver than the mineral in the fahlbands. This appears to me natural, if the pyritic masses have been formed by secondary concentration.

Whether the ores were formed after the rocks in which they occur (that is, are epactic, to use the term of Louis), or were formed later (the symphytic of the same author, or the hysteromorphs of Posepny), may be conclusively determined by considering their relations to the faults. It is perfectly certain that the faults of the district are later than the formation either of the schists or conglomerates. If, therefore, the ores were formed later than the faults, then they cannot have been contemporaneous with the surrounding rocks. The ore deposits at the South Tharsis mine, the North Lyell mine, and the Mount Lyell mine are all certainly in part later than the faults.

The most striking geological feature of the Mount Lyell mineral field is its great fault system, and an examination of the distribution of the ores shows that they are in every case closely connected with the faults. These faults were not all made by the same earth movement; they were no doubt formed at different dates, extending over a considerable period of time. The deposition of the ores was probably going on simultaneously with the development of this complex fault system. Hence in one place the ores have been earlier than the faults and elsewhere they are later.

Many minor faults traverse the Mount Lyell ore body, and some of them disturb the general uniformity of its composition. Two faults were conspicuous on the floor of the open cut in January, 1903. One of them and another on the hanging wall side of the ore body were filled with black carbonaceous clay, formed as a fault rock. Some of this type of material contains some native copper and is rich in silver. An interesting chimney of enriched ore near the southeastern corner of the open cut also owed its origin to fault action, for faults ran close beside it, in places separating the 9% ore of the enrichment from the 1% ore outside. The rich ore passed a little beyond the faults, as if the enrichment had taken place along the faults and worked from them in both directions.

These faults traverse only the pyrites. Those on the floor of the open cut were unquestionably later than the formation of the ore. The faults beside the enrichment, on the other hand, were probably earlier than at least the completion of the ore body. In the lowest level of the mine there are some interesting sections, which show that the superposition of the schists on the conglomerate occurs along lines of faulting, and that the foliation of the schists is cut across transversely by the conglomerates, as shown



Unconformability at Mount Lyell Mine.

in the accompanying sketch. They are, therefore, younger, not only than the formation of the schists, but are also younger than the date at which the schists were foliated.

(TO BE CONTINUED.)

Methods and Costs of Placer Mining in Alaska.

Placer mining in Alaska is affected by conditions which are not combined in any other field familiar to American miners. Many an old placer miner of California has come to grief in the Northern clime because he was unacquainted with the peculiar conditions that exist there. During the last three years the United States Geological Survey has received numerous requests for information regarding the cost of operating gold-bearing alluvial deposits in Alaska and the best means of working the claims in the various districts. To collect data for a report which should embody such information, the Geological Survey sent C. W. Purington, a mining engineer of Denver, Colo., to Alaska during the field season of 1904. Accompanied by Sidney Paige, Mr. Purington visited the Juneau, Atlin, Klondike, Birch Creek, Fairbanks and Seward Peninsula districts, stopping on the return trip at the gold-dredging field of Oroville, Cal. The results of Mr. Purington's investigations are now available in the form of a Survey bulletin (No. 263) which is entitled, "Methods and Costs of Gravel and Placer Mining in Alaska." This work includes data concerning districts not visited by Mr. Purington or his assistant, notably the Porcupine, Christochina, Cook Inlet, Forty-mile and Rampart districts, and remote parts of the Seward Peninsula; but all such information has been collected from reliable sources, especially from members of the Geological Survey who have made investigations in those portions of Alaska.

In each district a study was made of the water resources—the most important factor in placer and hydraulic mining—and of the cost of building and maintaining ditches, flumes and storage reservoirs for the purpose of using water under pressure. The important development of ditch building in the Seward Peninsula receives particular attention in the report.

The quantity and quality of timber in the mining districts is discussed by Mr. Purington with reference to its use for fuel, for the construction of flumes and sluice boxes and for timbering drift mines. It is an unwelcome fact that the important placer districts of the Northwest do not contain a great amount of timber.

The questions of wages and cost of living have been considered from both the viewpoint of the laborer and his employer. While the rate of pay for miners appears attractively high, the cost of living and the expenses of transportation to and from the country have to be considered, as well as the shortness of the active season and the low rate of winter wages.

The main objects of this report have been to determine the most expeditious way of getting out the auriferous material—gravel, sand or bedrock—and the cost of so doing; the best methods of hydraulic mining; the cost of removing overburden under each set of conditions and of handling the tailings; the capacity and cost of installing mechanical methods; the cost, capacity and adaptability of the methods employed to thaw frozen gravel, and the most feasible method of mining in little-developed districts.

While many of the figures presented in this bulletin are subject to fluctuation, yet, as a comparative study of mining methods, Mr. Purington's report will be a valuable and permanent contribution to mining literature. It is published for general distribution and may be obtained free of charge on application to the Director of the United States Geological Survey, Washington, D. C.

The Machine Drill in Mining.

NUMBER III.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS.

Within the past two years a new and important factor has been introduced into the mining field in the form of a small machine drill, which at first sight seems like a toy, as compared with even the smaller of the ordinary type of machine drills, with which we are familiar. Some years ago a so-called pneumatic hammer was introduced into the machine shops of the country. This tool was used as a chipping, and then as a calking hammer, and later came to be extensively employed as a riveting tool. It was then modified to be employed as an instrument for cutting and dressing stone. From these uses it was but a step to converting the pneumatic hammer into a rock drill. Its particular field of usefulness was in block-holing and in cutting hitches on rock walls, or in drilling shallow holes for squaring up rock work. From these useful functions the drill has been applied on still broader lines and it is now being employed as a rock drill on regular work, in shafts, tunnel work, stopes and everywhere that rock drills are used. Just what will be the eventual outcome of this new type of drill it is almost too early to undertake to predict, but the indications are that it has come to stay. There are several of these small drills on the market already, and others may be anticipated. At first the drill was small and was intended to be used in the same manner as the riveting hammer, being held in the hand of the operator, but that its usefulness for general work would be limited in this form soon became evident, and the drill was enlarged somewhat, mounted on a bar, either horizontal or vertical, and in this form is adaptable to any class of mining work. A new attachment of one of these drills is that of a device which keeps the bit up to the rock by direct air pressure. The steel used is generally hollow and the exhaust passes down the hollow drill steel and blows the drillings away as fast as made by the cutting bit. In some types water is forced through the hollow steel, which washes away the drillings while preventing all dust. In others a spray is arranged to dampen the drillings as they come from the mouth of the drill hole, thus settling the dust. These small drills weigh but sixteen to eighteen pounds, and the air consumption per minute is said to be small—less than 20 cubic feet of free air per minute, at a pressure of 80 to 100 pounds per square inch. It strikes over 2000 blows per minute, and under favorable conditions will drill from 100 to 150 feet per shift of holes, of a maximum length of 3 feet, cutting a hole about 1 inch in diameter. It is said that holes can be drilled with ease much deeper than 3 feet, but this is approximately the limit of rapid operation, in the present stage of development of this interesting type of machine.

Although this small pneumatic-hammer drill has attracted much attention of late, and has been introduced in mines and is now being tried under all sorts of conditions, it is not likely that it will for a long time, if ever, displace the larger type of machine drills which have for years been so successfully operated in all parts of the world. The efficiency and adaptability of the old type of machine drill is well understood, and miners, as a class, do not look with favor upon radical innovations, though they are susceptible to the process of evolution, and can be readily led by stages to favorably consider and adopt a type of machine with which they are at first wholly unacquainted. The advantages of the pneumatic-hammer drill lie chiefly in its easy portability and light weight, and this will no doubt quickly make it popular for certain classes of mining and quarry work, where the handling of large machines is more or less difficult. It has few working parts; is easily kept in order, and has many good points in its favor, but it will, notwithstanding this, have to earn its way and overcome the prejudice of miners against making radical changes of any kind in their methods of work.

Cyaniding Silver-Gold Ores of the Palmarejo Mine, Chihuahua, Mexico.*

Written by T. H. OXNAM.

INTRODUCTION.—The predominating value of the ores now being treated by the Palmarejo & Mexican Gold Fields, Ltd., is silver, although some gold is also carried.

The present method of treatment consists of wet crushing and concentrating, followed by the cyanidation of the unroasted sands and slimes. The sands are treated by leaching and the so-called accumulated slimes by a system of agitation and decantation.

It is only within very recent years that the cyanidation of unroasted silver ores has been commercially successful. In fact, at the time operations were begun at the cyanide plant at Chinipas, February, 1902, I knew of no other leaching plant treating similar ores successfully. The cyanide treatment of the Palmarejo ores differs but little from the ordinary practice in cyaniding gold ores, and perhaps but little, if any, new information concerning the metallurgy of silver is to be gleaned from it.

PALMAREJO MINE. — The Palmarejo mines are located in the southwestern part of the State of Chihuahua, Mexico, on the foothills of the Sierra Madre mountains, at an elevation of 3200 feet. The mills, 12 miles distant, are situated on the Chinipas river, near the town of Chinipas, which is about 150 miles northeast of Agiabampo, on the Gulf of California. Supplies are shipped via this port, as this route is the best and most direct to the property.

The ore bodies in the Palmarejo mines have been deposited along a series of rock fractures, caused by an intrusion of eruptive rock. The most important of these fractures or fissures, both in width and value, are the Prieta and Blanca veins, which intersect each other on the surface at a point called the Descubridora, or discovery, and underground in the main working tunnel (Socorro) about 800 feet from its entrance. (See Fig. 1.)

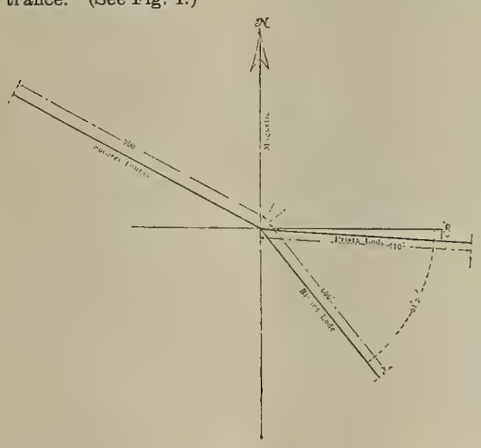


Fig. 1.

From the junction of the two veins the Prieta strikes almost due east and the Blanca south, 51° 30′ east, dipping at an angle of 50° to the west.

The Prieta vein in places is fully 75 feet wide between walls. The ore, however, is frequently in two sections, known as the foot wall and hanging wall sections of the vein, with a horse of country rock from 10 to 30 feet thick between them.

Stoping has been done on both the foot wall and the hanging wall sections on the course or strike of the vein for 2000 feet in length, and, while the values are continuous, the better grade of ore makes in chimneys or shoots varying from 75 feet to 300 feet in length.

The Blanca vein, which varies from 4 feet to 12 feet in width, has been mined for a distance of 850 feet. At the junction of the veins the bonanza of the mine was found, which has been worked for more than 800 feet in depth and has yielded an enormous amount of money.

The records in the office of the company show that these mines have been worked for more than a century.

The ore delivered to the mill consists essentially of a siliceous matrix, throughout which is disseminated a small percentage of pyrite. Black manganese oxide and calcite are present in varying proportions, and very small quantities of antimony and arsenic, together with traces of bismuth, also occur. Occasionally traces of copper and zinc are found.

The major portion of the silver occurs in the form of argentite, though a certain amount of stephanite is present and occasionally small patches of chlorobromide and native silver.

The main storage bin of the Palmarejo group of mines is connected with the mill by means of a narrow gauge railroad 12.5 miles long. The mill is about 1300 feet lower than this ore bin, consequently the entire road is on a moderately heavy grade—the heaviest slightly exceeding 4.5%. The gauge of the road is 30 inches; two weights of rails are employed, one being 35-pound and the other 25-pound per yard. Two English locomotives are in service; one a 22-ton engine hauling fourteen cars and the other an 18-ton engine hauling nine cars. Each ore car has a carrying capacity of 4.5 tons. Under normal conditions, from 4 to 4.5 hours are required for making a round trip.

MILL AND CYANIDE PLANT.—The 50-stamp mill and cyanide plant is situated on the edge of the Chinipas river, about 1.5 mile eastward of Chinipas, at a place known locally as El Zapote. Water power furnished by the Chinipas river is used to run the mill, slime plant and machine shop. A masonry conduit about 11 miles long conducts the water to a penstock a short distance above the mill, thence through a steel pipe about 1100 feet long, tapering from 48 inches in diameter at the penstock to 24 inches in diameter in the wheel pits, to four 6-foot Pelton wheels under a 97.5-foot head.

OLD SYSTEM OF MILLING.—The mill was originally erected as a dry crushing, roasting and pan amalgamation plant and was operated as such until the middle of October, 1901. On my first visit to this property, December, 1900, the mill operations and methods of ore treatment were substantially as follows:

The ore was drawn from the main storage bin at the top of the mill over iron grizzlies to the five 7x10-inch Blake crushers, running 250 revolutions per minute. From the large storage bin beneath the crushers the ore, after the addition of 5% by weight each of salt and sulphurets, was conveyed to three White–Howell cylindrical driers, each 18 feet long and ordinarily rotated at six revolutions per minute, the speed given them, however, naturally depending upon the percentage of moisture contained in the ore passing through them at the time. Two driers easily handled the quantity of ore crushed by the stamps, even in the rainy season.

Each drier discharged into a small storage bin, from which the ore was conveyed in half-ton cars to the hoppers of ten Challenge ore feeders. The stamps when equipped with new shoes weighed 850 pounds and dropped from 4 to 7 inches, according to the condition of the shoes and dies, at a speed of from 85 to 90 drops per minute. Both the shoes and dies were cast on the premises, in the foundry of the company. Mortars were of the wide, double-discharge pattern, and 20-mesh brass-wire screens were used. The stamp duty was from 1.25 to 1.5 ton per twenty-four hours.

The dry pulp, discharged through the battery screens, was carried by means of a series of belt conveyors and elevators to three revolving cylindrical roasters of the White–Howell type, lined with firebrick made in the vicinity. These roasters were 27 feet long, 2 feet 9 inches inside diameter at the feed and 3 feet 6 inches inside diameter at the discharge, and were rotated at an average speed of three revolutions per minute. The roasted ore was wheeled in cars to a large brick storage pit, where it was allowed to remain for from eighteen to thirty-six hours, after which it was drawn out on the cooling floor and sprinkled down with a hose.

Daily tests made on average samples of the roasted product, taken as it left the roasters, showed that about 80% of the silver was rendered soluble in sodium hyposulphite. When cooled sufficiently to handle, the roasted material was shoveled or raked into cars and trammed into twenty amalgamating pans of the McCone pattern, each 5 feet in diameter. The usual charge consisted of 2800 pounds of ore, 150 pounds of quicksilver, 15 pounds of salt and 1.7 pound of bluestone. The quicksilver, salt and bluestone were added as soon as a pan was charged. The pans were run at an average speed of sixty-eight revolutions per minute and were kept at a temperature of from 100° to 110° F. by means of steam added through a small pipe directly to the material being treated. After from six to eight hours' treatment, the pans were discharged into 8-foot settlers, each two pans being provided with one settler. From the settlers the tailings were discharged into 10-foot agitators, one agitator receiving the discharge from two settlers. These agitators, however, for some time previously had not been used as agitators proper and were serving merely as mercury traps. The tailings escaping from the agitators were carried by the water race to the Chinipas river.

While the process of treatment outlined above has given very satisfactory results with many ores of similar nature to the Palmarejo ores, though perhaps in districts more favorably situated for freighting facilities, it had never proved to be a commercial success on the ores of this company, due chiefly to the unusually high working expenses. Owing to the isolated position of this property, freighting expenses were a very heavy item, as, in addition to steamer or railroad transportation to the nearest seaport, practically all of the freight had to be transported by wagon for a distance of 110 miles, of which the last 60 miles into the property is by way of rugged mountain trails, permitting only mule-back transportation. It can thus be readily seen that the freighting cost alone proved a very considerable item. Due largely to this reason, combined with the fact that the quantity treated was comparatively low, the expenses of maintenance and repairs per ton treated were very high.

A considerable percentage of the ore passing through the roasters was carried into the dust chambers and flues, a portion of which escaped and was entirely lost. The material caught in the flues and dust chambers was periodically removed and treated in the pans without further roasting. This semi-roasted flue dust was given a longer and special treatment, but the extraction obtained from it was always considerably lower than that obtained on the well-roasted material.

Another very serious source of loss was in the volatilization of a considerable portion of the silver content during the roasting. During the year ending June 30, 1901, more than 22,000 tons of ore were crushed in the mill, comprising 20,000 tons of ore and 1000 tons each of salt and sulphurets. Five per cent of the weight of the ore was lost as moisture in passing through the driers and an additional 6% by weight was lost between the batteries and the pans, such percentage being due almost entirely to losses by volatilization and dusting while passing through the roasters. The assay results for this year showed that approximately 12% of the total silver content contained in the ore was lost by volatilization during roasting. The total working cost for this period was $24.20 per ton, divided approximately as follows: Mining, $8.12; milling, $14.32; ditch, 60 cents; railway, $1.16; total, $24.20. The average assay for the year of the ore as delivered to the mill was 30 ounces of silver. The average of the ore as charged into the pans was 25.4 ounces of silver. It was always considered practically useless to send to the mill ore which carried less than 30 ounces of silver per ton. The average extraction of silver for the year as indicated by bullion returns was approximately 77% of the value of the material panned, this being equivalent to 66% of the total silver value of the ore crushed Ordinarily the ore was not assayed for gold and no special attention was given to effect its recovery. While a part of the gold was caught and saved in the pans, it is more than probable that the major portion contained in the ore was entirely lost.

(TO BE CONTINUED.)

*Trans. Amer. Inst. Min. Engrs.

The Production of Pyrite.

"The demand for pyrite has increased very largely throughout the United States and many European countries during the last few years," says Dr. Joseph Hyde Pratt of the United States Geological Survey in a recent report on the production of sulphur and pyrite in 1904. It is used in the wood pulp industry as well as in the manufacture of fertilizers. Owing to the steady increase in the demand, it is not improbable that prices will gradually advance for the best qualities of ore.

The chief domestic sources of supply of pyrite are deposits in Virginia, California and Massachusetts. Smaller amounts are obtained from Alabama, Georgia, Indiana, New Jersey and Ohio. The deposits in these States do not supply the demand for pyrite, and a considerably greater quantity is usually imported each year than is produced in this country. The chief sources of supply of the imported pyrite are the celebrated Rio Tinto and Tharsis mines of the Huelva district in Spain, the San Domingo mine at Pomaron, Portugal, and the Tilt Cove mines of Pilley's Island, Newfoundland.

The pyrite industry in Spain has now reached a point where the shipping facilities are inadequate to handle the product. In order to increase the shipping facilities at the port of Huelva and to expedite the loading of steamers, the Spanish Government is erecting a new dock at that port. Although these Spanish deposits are enormous and new bodies of ore have been uncovered during the last year or two, there is still such a large and steady drain upon them that some of the European countries are beginning to look elsewhere for supplies of pyrite. On account of the rapid increase in the manufacture of fertilizer in Spain, Italy and France, these countries are making large demands upon the Spanish pyrite for use in the preparation of sulphuric acid.

New deposits of pyrite in Alabama have recently become available through the completion of the Eastern Railroad of Alabama from Talladega to Pyriton. For this material there should be a large demand at Nashville, Tenn., as a source of raw material for its fertilizer factories. These Nashville factories are already advantageously located with reference to the Tennessee phosphate fields, so that, with easy access to the Alabama pyrite deposits secured, they should be able to compete readily with any other fertilizer plant.

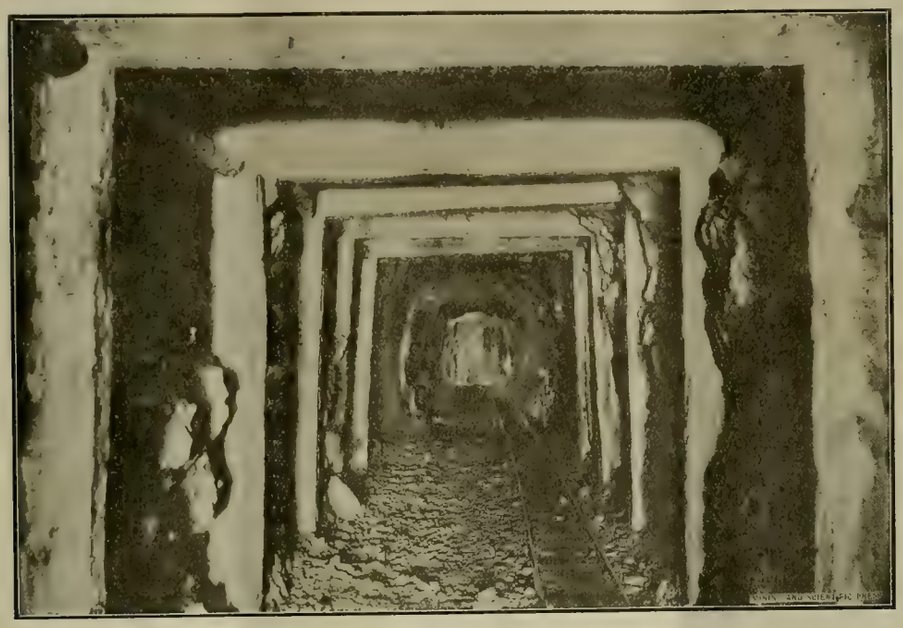
The anxiety felt in European countries regarding a source of supply of pyrite should stimulate prospecting for pyrite deposits in this country. It would be well to know accurately what are the future sources of supply of this mineral in the United States, in case the foreign sources of supply should begin to give out or there should be too heavy a demand made upon them by European consumers.

There was a slight decrease in the production of pyrite for the manufacture of sulphuric acid in the

United States during 1904, but a very large increase in the production of natural sulphur, the combined production amounting to 333,542 long tons, valued at $3,460,863, as compared with 233,127 long tons, valued at $1,109,818, the production of 1903, an increase of 100,415 tons in quantity and of $2,351,045 in value. This exceptionally large increase in value as compared with the increase in tonnage is due to the very large increase in the production of sulphur. A considerable quantity of pyrite is also mined for pyritic and allied smelting and for use as a flux, which would increase the output by 75,000 to 100,000 tons. Over one-half of the total production of pyrite was obtained from Virginia. The average price received for the 1904 production was $3.86 a ton, an increase of 24 cents as compared with $3 62, the average price received for the 1903 production.

Tunnel Construction.

In tunnel construction there is a great diversity of methods, both in breaking the rock and in timbering the ground after the excavation has been made. In some tunnels the character of the rock passed through requires close and heavy timbering, with lagging top and sides. In other cases the timbers may safely be spaced 5 feet from center to center and lagging employed only overhead, as in the case here illustrated. Often the roof only requires support, the walls standing without lagging. Where the excavation has been made in a flat, sedimentary formation, caps have sometimes been inserted after the manner of stulls and tightly wedged, the lagging being driven overhead to support any loose ground that may occur. The method is not in common use, however, and in only a few places can it be rendered secure.



Drainage Tunnel, East Argentine District, Colo.

In soft and swelling ground, the practice is to spread the legs of each set abnormally so that they stand at an angle of 40° to 45° with the horizon. This has a tendency to keep them in position and aids somewhat in resisting the crushing force of the slowly moving ground, but usually this expedient only affords temporary relief and the timbers have frequently to be renewed, or the ground cut away to ease the pressure on the timbers. In many tunnels, after getting beyond the zone of weathered rock, no timbers are required, the rock being sufficiently hard to stand without timbers. In other instances rock which at first stands well, after a time, begins to disintegrate and numerous falls of the back occur. When these are of frequent occurrence, it is usually cheaper to timber all of that portion of the tunnel in which these falls occur, for, having commenced, they are more than likely to recur with increasing frequency, and become a constant menace to life, as well as an annoyance and source of expense. The tunnel here illustrated was originally intended for a double track, though but one line has been placed in position.

Tunneling requires often nearly as much engineering skill and the exercise of as good judgment as shaft sinking. If care is used there is no reason for a tunnel getting out of alignment, though it is a very common thing to see careless work done, the heading swinging from side to side and eventually running at random, first following one rock seam and then another, in the effort to follow easy ground. In one instance it was figured that at least 10% of the cost of mining was saved by following seams "to break to," but the tunnel was driven not less than one-fifth farther than necessary to reach a given point, so as a matter of fact it was really more expensive, and required a greater length of time to reach this point than if the tunnel had been driven perfectly straight.

Ore Deposits of the Cœur d'Alene, Idaho.

NUMBER IV—CONCLUDED.

Written by F. L. Ransome.

Treatment of the Ores.—The Hercules mine ships only crude ore. The Bunker Hill & Sullivan, Last Chance and Hecla mines ship a little crude or picked ore, which in no case exceeds 2% of the total tonnage mined, or 7% of the total shipping product. The greater part of all the ore mined is concentrated in the district to a product containing from 50% to 60% of lead. The number of tons of ore reduced to one ton of concentrates varies. Of the low-grade Gold Hunter ore about twelve tons are required to make a ton of concentrates containing 50% of lead and 55 to 60 ounces of silver. In the Bunker Hill & Sullivan mill 7½ tons of ore, containing from 8% to 16% of lead and from 3.6 to 6.8 ounces of silver to the ton, are concentrated to one ton containing about 55% of lead and 19.5 ounces of silver. From 900 to 1000 tons of ore are treated daily in this mill and about the same quantity in the Morning mill. The combined Standard and Mammoth mills treat from 1000 to 1200 tons daily. The saving effected in the best mills is about 80% of the total market value of the lead and silver.

The ore and concentrates from the Bunker Hill & Sullivan mine go to the Tacoma smelter, owned by the company, where they are smelted with concentrates from the Treadwell mine, on Douglas island. The Hercules ore also goes westward, to the Selby Smelting & Refining Co. in California. The concentrates from the Hecla are shipped to the Ohio & Colorado Smelting & Refining Co. at Salida, Colo. Most of the ore from the other mines goes to the various plants of the American Smelting & Refining Co., particularly to the smelter at East Helena, Mont., although considerable quantities are sent to Denver, Pueblo, Omaha and El Paso.

Cost of Mining and Treatment.—The cost of mining and concentrating per ton of ore stoped ranges from about $2 in the Wardner mines to about $3 in the Canyon Creek mines, where the ore bodies are narrower and where pumping and hoisting are necessary. In the Bunker Hill & Sullivan mine the costs per ton of ore stoped in 1903–4 were as follows:

COSTS IN BUNKER HILL & SULLIVAN MINES.

Mining and concentrating	$1 97
Freight and smelter charges	2 17
Discounts for loss of lead and silver in smelting	60
Total	$4 74

The average assay value of this ore was $6.80 per ton. The freight on ores and concentrates varies from $8 to $12 a ton, according to tenor, and a uniform charge of $8 a ton is made for smelting. Ore of which more than twelve tons is required to make one ton of concentrates containing 50% of lead can rarely be made profitable.

The Gold Deposits.—The only gold-bearing veins that are now productive occur near Murray. The quartz veins on Elk creek apparently produced some gold several years ago, but the workings upon them have long been abandoned and are not accessible. The best known veins near Murray are the Golden Chest, just north of Littlefield, and the Mother Lode group of veins on Ophir mountain, situated on the south side of Prichard creek, between Littlefield and Murray.

With few exceptions the veins of the Murray area belong to the class known as bed veins (Lagergange). They usually follow the stratification planes of the Prichard formation. Occasionally they jump from one plane to another, the two parts of the vein being connected by small stringers across the intervening bed. In the Golden Chest mine there are at least six of these bed veins in a zone 150 feet in width. Their general strike is about north 17° east, and they dip westward at angles ranging from 40° to 45°. These veins are usually a foot or two in width, but in some places a width of 10 feet is attained. They are filled with quartz, often strikingly banded, containing free gold, auriferous pyrite, galena, sphalerite and chalcopyrite, with occasional bunches of scheelite. The best ore is said to have been worth $70 to $90 a ton and was shipped crude. The ore now worked in the 20-stamp mill is of much lower grade, probably not over $7 per ton.

On the north face of Ophir mountain are two bed veins, one 250 to 300 feet vertically above the other. These veins have a general northeast strike, and dip northwest at angles of 18° to 20°. The veins are of the same general character as those of the Golden Chest mine, but contain rather less abundant sulphides. These were formerly worked by the Mother Lode, Occident and Treasure Box mines by flat stopes extending from the surface into the hill. Some pockets of rich ore, containing much free gold, have been found in these mines and were treated in arrastras. The veins as a whole, however, are of rather low grade and have not been stoped for more than a few hundred feet from the surface. Their average width is probably not over 8 inches. Just west of these veins is the Mead vein which strikes about north 15° east and dips easterly at about 75°. This is a fissure vein, cutting the beds of the Prichard formation. Its relation to the bed veins east of it is unknown, as it apparently has not been considered worth while to explore the intersections or junctions of these veins. The Mead vein is said to contain a pay shoot of $25 ore. The vein consists of white quartz with sometimes a little siderite (or other ferruginous carbonate) near the walls and with auriferous pyrite, chalcopyrite and galena in the medial portion. A number of small bed veins have been worked west of Murray, the most noted being the nearly horizontal Buckeye Boy in Dream gulch, which produced about $25,000 in gold from a single small pocket.

Placers.—The older placer deposits of Murray constitute what is locally called the Old Wash and are remnants of an earlier channel of Prichard creek from 250 to 300 feet above the present stream. These gravels, which are in part derived from older gravels deposited still higher above the present valleys, have been hydraulicked near Murray, but have not proved very rich.

Most of the placer gold of the Murray region has come from the bottoms of the existing gulches and has been obtained by simple sluicing, booming, drifting and dredging. The bed of Prichard creek has been worked about a mile west of Murray by a hydraulic elevator, but the depth of the gravel, which averages about 30 feet, has proved in most cases an insurmountable obstacle to successful exploitation. In 1903 three dredgers were at work near Delta, of which one only, at the mouth of Trail creek, was operated at a profit, on gravel running about 10 cents to the yard.

The gravel of Trail creek, near Delta, is from 18 to 20 feet deep, and was formerly worked by sinking shafts to bedrock and then drifting. In this method the water is impounded in a reservoir fitted with an automatic discharge gate. When the reservoir is full the gate opens, and the whole body of water is directed against the gravel in such a manner as to wash it away. A small stream is thus rendered far more effective than if it were continuously employed. When the gravel has been removed to within 2 feet of the bedrock the remainder is shoveled into sluices.

The gold is coarse, nuggets up to 40 ounces having been reported. They are usually somewhat hackly, and often contain particles of quartz. From $15 to $18 an ounce is usually obtained for the placer gold.

The Copper Deposits.—The only productive copper deposit in the region is that of the Snowstorm mine, east of Mullan. The deposit occurs in the Revett quartzite, and consists of an impregnated cupriferous zone, which conforms with the bedding planes. The deposit strikes north 60° west, and dips 65° to the southwest. It has a maximum width of 40 feet. The ore consists of chalcopyrite, bornite, chalcocite, and perhaps other cupriferous sulphides disseminated in small particles through the quartzite and in part oxidized to cuprite and malachite.

The mineralization along the zone is not easily accounted for, as the quartzite is not particularly fissured and is apparently not different in character from the quartzite of the foot wall and hanging wall.

The greater part of the mineralized quartzite contains about 4% of copper, 6 ounces of silver, and 0.1 of an ounce of gold to the ton. The ore shipped is worth from $9 to $10 a ton, and goes to Butte and Tacoma. Smelting and freight charges are $5 a ton,

but the smelters require that the silica shall not fall below 90%. In 1903 a leaching mill was being erected on the South Fork to treat the ore.

GENERAL CONDITIONS OF MINING.—The turbulent condition that existed in the Cœur d'Alene district from 1892 to 1899, and the notoriety given the locality by the deeds of violence then perpetrated, justify a brief account of the present relations of the mine owners to their employes.

Up to 1892 all men working in the mines received $3.50 a day. In the spring of that year the depression in the prices of lead and silver called for retrenchment in operating expenses, and wages were reduced to $3, except for miners, who retained the old rate. The results of this action have already been related. The men struck, but finally returned to work on the mine owners' terms. Shortly after, on the ground that further economy was necessary, wages were reduced to $2.50 a day. The men again struck, and the mines, after a period of idleness, resumed operations with wages at the original rate of $3.50 a day. For the next few years the miners' unions were dominant, and the mines were operated under their rule. The attempt of the Bunker Hill & Sullivan mine to free itself from these restrictions brought about the crisis of 1899, which put an end to the rule of the unions.

At the present time all the prominent companies, with one exception, engage their men through a central employment bureau. The wages paid in the principal mines are as follows:

WAGES PAID IN PRINCIPAL MINES IN CŒUR D'ALENE DISTRICT, IDAHO.

Foreman	$6 00 to $7 00
Locomotive engineers (Morning mine)	6 00
Shift bosses	4 00 to 6 00
Head blacksmiths	4 50
Hoisting engineers	4 00
Blacksmiths	4 00
Timbermen	3 75 to 4 00
Miners, machine men, muckers, millmen and blacksmiths' helpers	3 50
Yard men	3 00

These wages, all things considered, are undeniably good, for the district is readily accessible, has a moderate altitude, and an almost ideal climate. The mines, moreover, have convenient adits and are well equipped and well ventilated. The cost of living, compared with other mining districts in the Rocky mountains, is moderate.

The present conditions in the district appear to be satisfactory to employers and employes. Wages are as high as they were before trouble began, but lawlessness no longer exists, property is secure, and mines can be operated without improper interference. As a result the district enjoys a prosperity which was impossible under former conditions and which is shared by all who are developing its resources.

Power.—The district is well supplied with water, very little of which is allowed to run to waste. The Bunker Hill & Sullivan, Morning, Hunter, Hecla Mammoth and Standard mills are all run by water power for at least part of the year, usually by Pelton wheels under heads up to 900 feet. Water power is also utilized to a considerable extent for compressing air, the Morning mine having a 100-drill Rix compressor driven by Pelton wheels under heads of 1200 to 1500 feet. The Hecla mill and the pumps in the Tiger–Poorman mine are usually run by electricity, locally generated by water power.

Recently electric power, generated at the falls of Spokane, has been brought into the district and is used in running the Tiger–Poorman and Last Chance mills, a 40-drill compressor at the Morning mine, and other machinery. The length of the line from Burke or Mullan to Spokane is about 100 miles. In 1903 this line was carrying 45,000 volts and furnishing 1600 H. P. The cost of this power at the mines is $50 per annum for each horse power. This is cheaper than steam, though the latter power is used at the Tiger–Poorman and Standard–Mammoth mines.

Timber.—All of the large mines require much timbering, and probably few mining regions are better supplied than the Cœur d'Alene district with abundant and cheap material suitable for this purpose. A large part of the timber used is derived from the vicinity of Cœur d'Alene lake. Some is cut in the southeastern corner of the district, and the Hercules mine has its own timber land and sawmill on the north side of Tiger peak.

Engineering in the Wilderness.*

The development of mines in new regions, remote from civilization and from convenient means of transportation, often calls for no little engineering skill on the part of the superintendent and his staff. Roads have to be built through swamps and over mountains; ditches, flumes and pipe lines must be constructed over a rugged country, and it is not always advisable to take the longest way around, as this means usually excessive cost. It is here that engineering knowledge becomes useful. Possessing it, the superintendent is able to judge as to the relative cost of each—the long way around or the short cut, which latter calls for unusual methods of construction and a class of expense not met on the longer route. The accompanying engraving illustrates the point. Here it was necessary to build a pipe line to carry water from one point to another. It was partly through a dense forest of pines. Ditch construction was feasible, but expensive, owing to the character of the country and the necessity of blasting out stumps and roots, a work both slow and expensive. An estimate of the cost of a pipe line was made, and it compared favorably with the ditch proposition, consequently the pipe line was decided upon. The trees felled along the line supplied more than enough material for the construction of a suitable trestle, and on this the pipe line was laid. Less in first cost than a ditch which would deliver the water to the desired point, it requires less expense to maintain, and is a good example of engineering under natural difficulties in Alaska. This construction was built to supply the Sea Level mine with water and power. The pipe line is 4400 feet in length, the pipe being from 22 to 24 inches in diameter.

*See illustration front page.

Government Experiments With Black Sand.

Written for the MINING AND SCIENTIFIC PRESS by WALDON FAWCETT.

The tests and experiments now being made by officials of the United States Geological Survey in an effort to devise means to save all the mineral wealth in the black sands of the Pacific coast come as the culmination of considerable research and investigation, giving attention for the first time to the commercial status of the situation. They are naturally, therefore, of exceptional interest to all mining men. The tests are being conducted at a special concentrating pavilion of the Lewis and Clark Exposition at Portland, Or., which was chosen as a central point and one which, by reason of the fair, will be visited this year by many mining men who are interested in the outcome of these experiments and in the methods employed.

As the result of invitations sent out to mining men, the Government officials have received numerous shipments of sand from Washington, Oregon, California, Idaho, Utah and other States. Samples are also expected from Alaska, where this same class of material is found. All experiments are being made under the direct supervision of Dr. David T. Day of the United States Geological Survey. He states that it is as yet too early to predict regarding results, but that it has already been demonstrated that the methods employed are the correct ones.

At the concentrating pavilion the sand first enters a feeder, from which it is elevated by a belt elevator and delivered to a screen. Thence it passes to a vertical revolving mixing distributer from which it is piped to the four different concentrators, this method insuring an even character of pulp to all machines. A drying furnace constructed in accordance with ordinary modern practice is provided for drying the concentrates as they come from the various concentrators. After the pulp has been dried it is passed through a magnetic separator where the magnetic elements are extracted. After passage through the magnetic separator the material is examined for the platinum and other rare minerals, the securance of which is the especial object of the governmental activities.

Four concentrating tables are in use. All are electrically operated. The Wilfley concentrator is operated by a 2 H. P. Westinghouse motor. Woodbury's concentrating table derives its motive power from a motor of the Crocker–Wheeler type, 1½ H. P. and 500 volts. The Pinder concentrator is operated by a Wagner–Bullock 1½ H. P. motor. The Christonsen concentrator is the fourth. A 3 H. P. motor is provided for the operation of the feeder, elevator, distributer and screen.

The special ores which require grinding are handled by a muller quartz mill working in conjunction with a rock breaker and a sand pump which elevates the pulp to the different concentrators.

The present experiments with the black sand are expected to point the way for a profitable operation of dredgers in many localities where such apparatus were employed in the past, but where the operations did not yield a sufficient return when gold alone was sought. Should the Geological Survey devise means whereby not only the gold, but iron, platinum and all other minerals may be saved, these by-products will supply a satisfactory margin of profit in operations which, under the old conditions, could be conducted only at a loss. Moreover, it has already been demonstrated at the concentrating pavilion that the methods being followed by the Government officials would yield, in addition to the other minerals, an increased amount of gold. The experimental station at Portland has tested considerable quantities of tailings from various dredger districts, and in every instance the increased yield of gold has been, as Dr. Day says, "Too much for the dredger owners to lose."

One of the main purposes of the Geological Survey experiments and the one most prominently mentioned in the preliminary circular sent out from Washington to mine owners is the development of a home source of supply for the platinum market. It has, of course, long been known that platinum existed in commercial quantities in the Pacific coast black sands, but there has been lack of knowledge as to an efficient method of concentration and treatment. At present the United States imports more than 95% of all the platinum used, the annual valuation of the imports being in the neighborhood of $2,000,000, and, inasmuch as the chief source of supply in Russia has been practically closed by the Russo–Japanese war, it is especially desirable that the industry be developed here if possible.

Ranking with, if not exceeding, the platinum project in importance, however, is the partial promise that the present experiments with the black sand will disclose a source of iron ore supply which will foster the development of the iron and steel manufacturing industry on the Pacific coast to considerable proportions. The experimental plant at Portland will, in the course of its operations, secure large quantities of iron ore, and an effort is to be made to induce one or more blast furnaces on the Pacific coast to take the iron ore product from the concentrators at Portland and treat it so that an early conclusion can be arrived at as to the exact value of this raw material to the manufacturing industry.

THE PROSPECTOR.

Any samples of rock or minerals sent to the Prospector Department will be returned at the request of the sender if stamps are enclosed for this purpose. Some of the supposedly valuable minerals sent for identification are without value, but if desired anything sent will be returned.

The three mineral specimens in one paper box from Homestead, Or., marked 1, 2 and 3, are: No. 1, a greatly altered, granular, eruptive rock, presumably diorite or grano-diorite. The feldspars are completely altered into kaolin and calcium carbonate, and the rock has been subjected to considerable pressure, resulting in deformation and an incipient rude cleavage which, by progressing further, would render the rock schistose. The bright, shimmering appearance noticed on some parts of the rock is due to small scales of white talc. The rock has also been silicified somewhat. It shows no mineral—that is, sulphides of the base metals. No. 2 is a siliceous aplite (alaskite) and contains a little pyrite. It may also carry gold. No. 3 is similar to No. 1, but is still further altered, more siliceous, and contains considerable iron sulphide and probably gold also. The green spots are magnesian silicate, similar to mariposite, and contains no copper. This rock, to all intents and purposes, is ore—though apparently low grade.

The minerals from Yuma, Ariz., are: Nos. 1, 2, 3 and 4, fluorite. The color is not material. The most common color is amethystine, but, as in this case, fluor is also white, bluish green and pink. The yellow crystals (No. 5) are wulfenite, molybdate of lead. No. 6 is anglesite lead sulphate.

The mineral from Dillon, Wyo., consisting of sand and bright, shining metallic flakes and grains, is hematite (iron oxide).

The rock sample with sand from Isabella, Cal., is a coarse sandstone carrying much iron oxide. The grains are quartz and the white sand which had accompanied the rock was nearly all lost in transit, due to careless wrapping. Such things as sand and pulverized minerals should be sent in a secure container.

The samples from Sonora, Cal., are determined as follows: No. 1, a talc schist, with a deposition of the yellowish basic ferric sulphate, with earthy material. No. 2 is mostly kaolin. A portion of this sample contains abundant finely disseminated pyrite.

The rock samples from Randsburg, Cal., are all yellowish quartz, with colorless and reddish colored garnets. The black mineral is iron and manganese oxide. The rocks have the appearance of having been picked up on the surface and look as though they may have come from a coarse-grained granite (pegmatite).

The rock specimens from Unuk river, Alaska, are: No. 1, graphitic schist. The original character of the rock is wholly destroyed by metamorphism. No. 2 is typical diorite-porphyrite. The minerals plainly seen are hornblende and black mica (biotite) in a fine ground mass. These characteristics, without the numerous white crystals of soda-lime feldspar, would characterize the rock as mica diorite, but the addition of the porphyritic feldspar crystals classes the rock as a porphyrite.

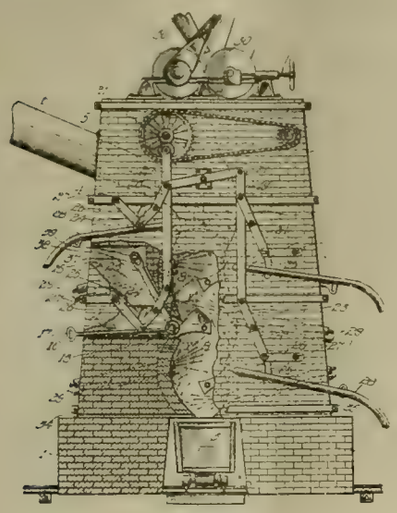
The samples from Havilah, Cal., are: No. 1 is mispickel, the sulpharsenide of iron, with bands of quartz. It may be gold bearing. There is also a small amount of pyrite in the specimen. No. 2 is an altered dike rock, probably originally felsite, now changed to quartz. No. 3 is similar to No. 2, but has not been weathered so much, being evidently from deeper workings. It contains iron sulphide and a small amount of copper sulphide, and considerable arsenical iron sulphide. No. 4 is similar to Nos. 1 and 3, being a siliceous rock altered from a fine-grained eruptive, probably felsite. It contains considerable mispickel.

Mining and Metallurgical Patents.

PATENTS ISSUED JULY 18, 1905.

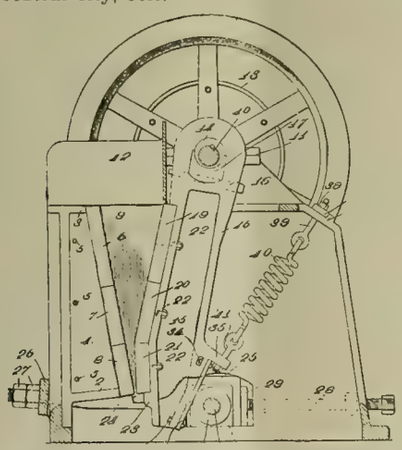
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ROASTING FURNACE.—No. 794,837; J. A. Anker, J. H. Watson and P. Evans, Los Angeles, Cal.



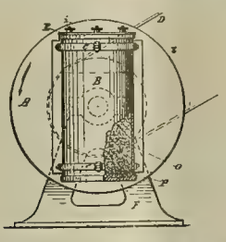
In roasting furnace, vertical sinuous chamber, plurality of retaining shoes projecting into chamber, each retaining shoe having symmetrical portions; tubular shaft extending longitudinally through shoe, wheels on ends of shaft; walls of furnace having recess, inclined rails at bottom of recess, wheels resting on rails, and means for rocking shoes.

ORE OR ROCK CRUSHER.—No. 794,876; E. S. Moulton, Central City, Colo.



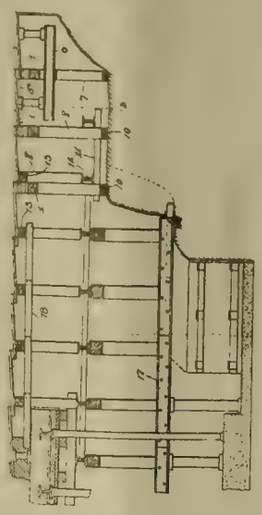
In device of character described, combination with casing, of buffer block secured thereto, crushing plates secured to buffer block, eccentric shaft journaled upon casing, oscillating jaw carried by eccentric shaft, comprising lever member, plurality of crushing plates secured thereto upon one side thereof, removable plate secured to lever member upon opposite side to which plates are secured, flexible member secured to casing and connected with lever member, revoluble member engaging plate carried by lever member and means for moving revoluble member and retaining same in adjusted position.

ART OF TREATING ORE AND GATHERING GOLD OR PRECIOUS METAL DIFFUSED IN THE EMPLOYED MERCURY.—No. 794,552; G. M. Rice, Worcester, Mass.



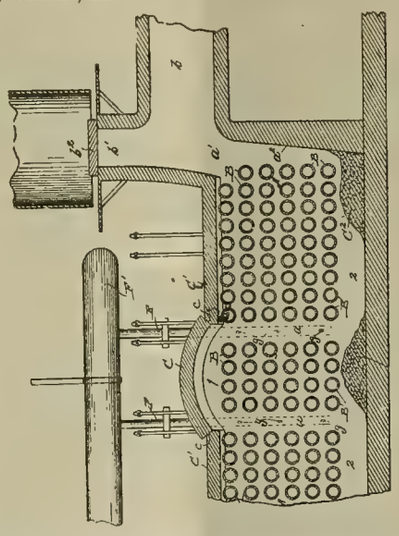
Improvement in art of recovering gold or precious metals from mass of ore under treatment by amalgamation with mercury, which consists in adding to mass of ore previously supplied with water and mercury only quantity equaling about 2% to 5% of weight of mercury of metal capable of being amalgamated by mercury.

METHOD OF TUNNELING.—No. 795,148; J. C. Meem, Brooklyn, N. Y.



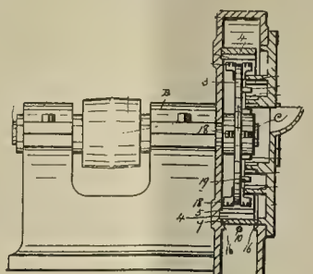
In method of tunnel construction, step consisting in introducing beneath tunnel roof supporting structure having two superposed sets of spacing members, inserting lagging boards through spaces between upper set of spacing members, excavating in front of supporting structure and advancing lagging boards simultaneously with excavation, introducing second supporting structure beneath forward ends of lagging boards when advanced to proper distance, introducing second set of lagging boards through openings between lower spacing members of first supporting structure and between upper spacing members of last supporting structure.

ZINC SMELTING FURNACE.—No. 794,799; E. C. Hegeler, Lasalle, Ill.



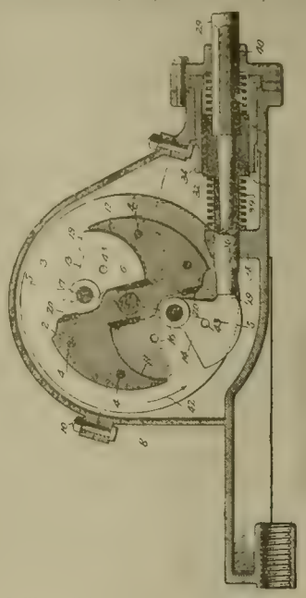
In zinc smelting furnace of class specified, long. horizontal retort chamber through which gases pass unobstructed, except by retorts, in direction of greatest extension and having roof provided with series of recesses, and bottom provided with series of recesses, in combination with retorts arranged between roof and bottom, in space outside recesses.

DISINTEGRATOR.—No. 794,785; W. Cox, Hamilton, Canada.



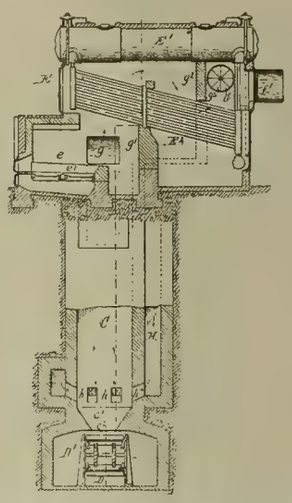
In disintegrator, combination with casing, of an internally corrugated ring in casing having a discharge opening in its lower portion only, guides, sliding gate moving in said guides and having perforated lugs or ears, screw-threaded operating rod journaled in the casing and turning in said perforated lugs, nut between the lugs in which the screw threads of the rod turn, rotary member in the casing, and heaters on said rotary member which are located inside the said ring.

DRILL STRIKING MECHANISM FOR ROCK DRILLING ENGINES.—No. 794,930; L. Durkee, Denver, Colo.



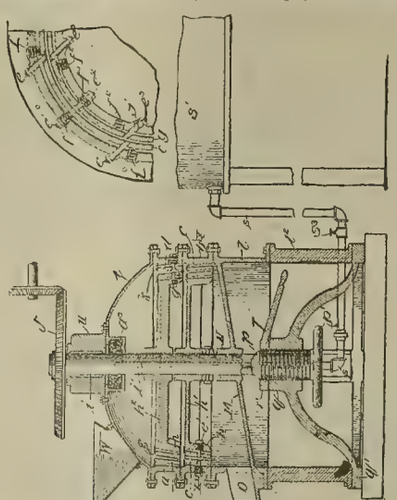
In drill-striking mechanism for rock drills, disk having recesses therein, hammers pivoted in disk beyond axial center, and arranged and adapted to swing out into drill-striking position by centrifugal force and to recede into recesses out of drill-striking relation after drill-striking stroke.

SLAG FURNACE.—No. 795,032; O. S. Garretson, Buffalo, N. Y.



Combination of slag chamber adapted to hold pile of loose congealed slag and having air passages communicating with upper and lower portions, slag-congealing rolls arranged at upper portion of chamber for receiving molten slag, congealing same and delivering congealed slag to chamber, and means for causing air to flow through passages and pile of congealed slag in chamber.

GRINDER.—No. 794,714; F. J. Hoyt, Redlands, Cal.



Combination with flanged and rotatable discs provided with sectors of radially adjustable spring cushioned grinding faces, of opposed non-rotatable spring cushioned radially adjustable grinding faces.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

A dispatch from Dawson announces a stampede to California, Leonard and Rainy creeks in Glacier district, 50 miles west of Dawson, and reached via Forty-mile Roadhouse. Pay dirt on the creeks was struck on the rim. On California and Leonard creeks 15 cents a pan was obtained. On Rainy 4 cents a pan was found. Discoverers were J. Leonard and J. Marcotte. California was stampeded six years ago, but produced nothing at that time.

Regarding the cost of prospecting in different localities, a recent report of the United States Geological Survey says that in the Juneau district prospect shafts must be square set, and cost on an average $6 per foot, and in heavy landslide $20 a foot. In the Porcupine district the cost of a cut 25 by 12 feet and 40 feet deep is $50 per foot, and that of an 8 by 8 foot shaft is $20 per foot. In the Sunrise and Chisna districts ground is prospected by open cuts. A cut 50 feet in length is reported to cost $2000. At Atlin ground is prospected mostly by drifting. On McKee creek tunnels, timbered and lagged, cost $3.50 per foot. On Spruce creek the cost of posts and caps, 10 inches thick and 6 feet long, is 50 cents each; lagging, 10 cents each. On Gold Run thirty 6-inch holes are said to have been drilled to a depth of 32 feet by a churn drill (cost, $3500, laid down), at the rate of $1 a foot. In the Klondike drifts to prospect the bench gravels cost $7 to $8 a foot, timbered, and shafts from $5 to $10 a foot. In timbering, three sets of posts, sill, cap and lagging are put in for $6, and as one-half cord of wood is used to a set the whole cost is $7 per set. In frozen creek ground two men, working three shifts, sunk a pit 5 feet square, 28 feet deep, using about 2 H. P. steam during thirty hours. On Forty-Mile creek, thawing ten hours, two men take out on an average 4 feet a day, the shaft being 5 feet by 3½ feet in dimensions. On American creek prospecting is very difficult, as running water is always found at bedrock, even in the coldest weather. In the Forty-Mile district shafts averaging 3½ by 6 feet, untimbered, cost from $3 to $5 per foot. Seven shafts 4 by 8 feet and 23 feet deep cost $2000. A shaft 7 by 3½ feet and 20 feet deep costs $5 per foot, the thawing being effected by means of wood fires and steam. In the Birch Creek district shafts thawed down by wood fires to a depth not exceeding 20 feet cost $5 per foot. On Mastodon creek, in this district, eleven pits 3 by 6 feet and 20 feet deep, cost $650. Twenty pits 3 by 6 by 13 feet cost $7 per foot. The differences in cost here are due to the varying amount of permanent frost in the ground, prospecting always being cheapest in solidly frozen ground. On Mammoth creek 100 pits 10 feet deep cost $5 per foot. Wood fires were used, 2 feet being sunk each day. No timbering was required, and labor was paid $10 a day. In the Fairbanks district the prospect shafts cost $7 to $10 per foot. Timbering is generally necessary, but very light poles are used either as lagging or cribbing. The best system is to put in 6-foot sets of 3-inch poles, and outside of these to lag with 2-inch poles vertically, filling in solidly between the poles and the muck or gravel with moss. Shafts cribbed with poles horizontally are more likely to get out of plumb. Four shafts sunk on lower Fairbanks creek cost $5 per foot, and were 32, 44, 53 and 54 feet deep. On Cleary creek a shaft 4 by 6½ feet and 75 feet deep (hillside claim), cribbed with 3-inch poles, cost $560. Wood fires were used in thawing. On Pedro creek nineteen pits 3½ by 7 by 12 feet cost $1140, and on an adjoining claim pits 3 by 6 feet and 18 feet deep cost $6 per foot. The light timbering and moss filling used in the Fairbanks mines is to prevent the muck walls from thawing and caving. In the Rampart district thirty pits 3 by 6 feet and 20 feet deep cost from $75 to $100 each. The ground was partly thawed, but required no timbering. In the Nome district, on account of the entire lack of native timber, shafts are cribbed with 1 or 2-inch planking, set close together, no sets being used. On the Snowflake bench claim, on Anvil creek, the cribbing was re-enforced by 2 by 4-inch posts in the corners. Five dollars per foot is the average cost of 4 by 5 shafts, timbered, in unfrozen or partially frozen ground. On Bonanza creek, near Nome, pits in the shallow creek bed, 3 by 7 feet and 7 feet deep, are said to cost 50 cents per foot. The ground is only lightly frozen and requires no timbering. On Ophir creek, in the Council district, it costs on an average $5 to sink pits 7 feet deep. In the northern part of Seward peninsula the ground is solidly frozen. In the Kougarok district pits 35 feet in depth, with steam thawing, cost $8 per foot, and require no timbering. In the Candle or Fairhaven district, adjacent to Kotzebue sound, twenty-eight pits 12 to 15 feet deep cost $4 a foot. It was necessary to thaw to bedrock. The equipment cost $500.

ARIZONA.

Graham County.

Work has been resumed at the Ash Peak mines, near Duncan.

Maricopa County.

(Special Correspondence).—A small mill is being put in by J. E. Maddox on his property in the White Tank mountains, north of Buckeye. Should this prove to be a success, a 5-stamp mill will be put in.

Buckeye, July 24.

(Special Correspondence).—Geo. Hamlin brought in another bar of bullion from the Relief mine. This is about the only producing gold mine in Maricopa county at the present time.——Eastern capitalists are visiting the Mormon Girl mine in the Cave Creek district.——In the Union district a small stamp mill is to be put in on a property north of the old Union mine.——W. E. Williams of Douglas is working a gold property adjoining the Union property.

Phœnix, July 24.

Pinal County.

The Ophir Con. G. & C. M. Co. has been formed to work mines near Twin Buttes. J. B. Daugherty is president and J. T. Dunlap secretary and treasurer.——It is reported that the Saddle Mountain M. Co.'s new 150-ton smelter, near Dudleyville, has been started.

Yavapai County.

The Great Republic M. Co. is putting in a 40 H. P. gasoline engine to continue sinking their shaft on Turkey creek, near Prescott.

J. R. Thomas, of the Black Hills C. Co., has started sinking the main shaft, near Jerome, to a depth of 1000 feet. This shaft is now down to a depth of 350 feet.—— It is stated that the Copper Chief M. Co. will build a smelter on Equator hill, near Jerome.

CALIFORNIA.

Amador County.

At the Climax mine, near Pine Grove, sinking 100 feet deeper and the opening up of levels at this depth show the ledge in undiminished size and richness. The putting up of the 10-stamp mill is being pushed. The company has bought the Reward mill near Pine Grove, and is hauling it to the Climax. The old 2-stamp mill has been sold to parties near West Point.——At the Gold Top gravel claim at Pine Grove men are putting up the necessary flumes to bring water to the mine. Hydraulic operations will be started as soon as the ditch is completed.

Butte County.

Two new dredgers will be built in the Oroville district. One will be on the Jacobs' orchard, with O. B. Perry in charge of the construction, and the other on the Baggett place, south of Oroville. Mr. Baggett has signed a contract for a 7-foot dredger.

Calaveras County.

Work is to be resumed August 1 at the Blue Gravel mine near San Andreas. W. H. Steffler has been chosen secretary vice B. C. Miller resigned.——The Red Gold mine at Murphys is being unwatered preparatory to resuming sinking.

Del Norte County.

It is reported that the company prospecting the gravel near the mouth of Klamath river have found the ground rich enough to warrant working with a dredger, and a small one will be built for further prospects along the river. The gravel bed, where drilling was done, is 75 feet deep.

El Dorado County.

A. F. Buchanan's Zantgraf Extension mine, near Loomis, is producing good ore. E. B. Quigley is superintendent.

F. M. Phelps, superintendent of the Cedar Creek mine, Fairplay district, has commenced work on a 1000-foot tunnel which it is expected will tap the center of the channel.——The Sliger mine, in Greenwood district, has resumed operations under the superintendency of W. H. Grenell of Bath, Placer county.——The Blue Ravine mine, Folsom district, is to be reopened and worked through a new shaft 1 mile from the old works, and preparations are being made to move the machinery to the new location.——At the Rosencrans mine, near Garden Valley, near Placerville, sinking is being pushed with two shifts. A whim has been put in at the shaft which is down 70 feet.——The Alpine mine, Garden Valley, is being developed.

Kern County.

P. Sartiat of Bakersfield has contracted for a 10-stamp mill on the Black Bob mine, in the San Emidio region, near Tejon.

Preparations are being made by the Southern Pacific Co. for improvements on its oil pipe lines in the Kern river fields, which it is expected will facilitate the transportation of oil. Wherever oil is transported through pipes difficulty is experienced, due to the resistance caused by water in the pipes. The new pipes which the railroad company is preparing to put in are rifled like a rifle barrel, the theory being that the revolution of the oil while traveling through the pipes will keep oil, instead of water, at the surface of the pipes through centrifugal force, the oil being the heavier fluid, and that resistance will be overcome. The machine which is to be used for the rifling will arrive at Bakersfield on Aug. 8.

T. McCarthy and others are working a tungsten ledge near Randsburg.

Lassen County.

The Nanney ranch, at Mountain Meadows, has been bonded by a dredging company of Oroville and drilling and prospecting to determine the probable richness of the tract in gold is under way.

Mariposa County.

Edward J. and Eugene J. Mahoney of the Mountain Queen G. M. Co., working claims on Good's gulch, near Mariposa, have a shaft 112 feet deep on the Little Utica. ——Arrangements are being made to drive a tunnel of 400 feet on the Sunshade, the work to be done by contract.

Nevada County.

Superintendent F. B. Hill of the Two Counties mine, north of Nevada City, expects to have the new mill in operation next month.——A project for turning the channel of the Middle Yuba opposite the mill at Delhi has been formed by G. E. Alexander of Denver, Colo.; G. M. Graves of Chicago; J. S. Wilbur of San Francisco; S. Poorman of Alameda, to work a gravel claim.——The Bullion mine in Grass Valley has been troubled with water, but Superintendent G. Mainhart has got the water down to the 1200-foot level and says that the remaining 300 feet will soon be cleared.

Placer County.

(Special Correspondence).—It is reported that the Dairy Farm copper gold mine has been sold to the Guggenheims. The price is not stated, but is thought to be $250,000.

Lincoln, July 25.

The Jupiter mine at Iowa Hill has closed down temporarily.——The gravel at the Buckeye mine, above Forest Hill, is said to be averaging $5 to the car. They have both the blue and the white lead, and it is believed are on the old Morning Star channel.

Plumas County.

(Special Correspondence).—The New York mill at Greenville has been temporarily closed down for repairs. ——The 15-stamp mill at the Droege mill in Indian Valley is running.

Greenville, July 25.

San Bernardino County.

Notices have been sent out by J. H. West of Needles to the desert sections of San Bernardino county asking for such information as may be necessary for the placing of metallic guide posts for the guidance of the prospector that he may find water. The State has appropriated money for the manufacture of the metallic posts and sign boards and the counties are empowered to place the boards.

San Diego County.

C. O. McCarroll of Mesa Grande has sold his tourmaline property of 604 acres to Los Angeles men.

Sierra County.

Work is to be resumed at the Deep Blue gravel mine, near Alleghany, under the management of J. W. Morrell, who has also commenced work at the Mabel mine in American Hill.——Kieffer Bros. have resumed operations on the Gibraltar in the headwaters of Canyon creek, near Table Rock.

Siskiyou County.

A. C. Brokaw of Fort Jones will put in a 10 stamp mill at the Advance.——Most of the hydraulic mines of the Salmon district have been closed down because of lack of water. The average cleanups have been good.

Trinity County.

J. H. Porter has resigned as superintendent of the Fairview mine, Pappoose, and has bonded the Bonanza mine, at Trinity Center, which he will actively develop.

Tuolumne County.

The Republican mine, near Jacksonville, has a small force doing development work, and the mill is closed for the present.——The Longfellow mine, Big Oak Flat, has completed pumping arrangements by which water will be furnished for the mine and mill. A little delay has been caused in the starting of the new ten stamps by the non-arrival of some of the parts.

COLORADO.

The Yankee Con. M., M. & T. Co., at Yankee, have overhauled the mill and plans to put in an aerial tramway, connecting the mine and mill.——The Manhattan tunnel is being worked by contract.——R. McGillvray has thrown up his contract for driving the Central tunnel a mile farther, because of the low bid he made on the work and the unusually hard character of rock in the drift. As a result, the Big Five Co., which owns the tunnel, has closed down the power plant at the mouth. No action will be taken towards the resumption of the work for several weeks, until after the meeting of the stockholders, which will be held during August.

Clear Creek County

The trail to the Arapahoe mines, in East Argentine district, which was badly damaged by snow slides, is being put in shape for the transportation of ore and shipments will soon be commenced to Silver Plume.

The Harris lode, East Argentine district, near Georgetown, which has been operated under lease by W. F. Farragher for the past three years, has been leased to J. Keating. He intends to work in the raise, now up 50 feet, and to continue the tunnel.

The Lombard mine, at Yankee, is being worked continuously with three shifts.

Chaffee County.

Manager Philbrick of the Shawmut Con. Copper Co. has contracted to supply the Canon City smelter with 500 tons of copper ore monthly from the Sedalia mine, near Salida.——It is reported that work is to be resumed at the Jasper mine in the Turret district. The Independence, Vesper, Copper King and Badger are being worked.——J. B. MacDonald is shipping regularly from the Madonna mine, near Monarch.——The Monarch tunnel is in 1450 feet. It is to be driven 6000 feet.

G. H. Van Wagoner of London, O., president and general manager of the Golden Fleece mine, in the Manoa district, 12 miles north of Salida, has started work, after equipping the mine.

Custer County.

In Junkins park, near Silver Cliff, the snow has gone and all parts of the park are accessible to prospecting. Development work is being done.——P. M. F. Finnis has organized the Fountain Park G. M. & M. Co., to work claims in the district. Men are driving a tunnel that will cut the dikes at depth.

Dolores County.

The Western G. M. & M. Co. contemplates putting a small hoist on their mine near Rico.

Eagle County.

Mining at the head of Lake creek, at Silver City, is going on. The claims are all above the timber line. J. E. Miller of Leadville has eighteen claims which he has leased to Eastern people. A tunnel is being driven from the foot of the hill 100 feet and will be driven 1100 feet farther.

El Paso County.

As soon as the ore on hand is treated, the Standard mill at Colorado City will be closed down. The reason given by C. M. MacNeill, vice-president and general manager of the United States Refining & Reduction Co., which owns the property, is shortage of ore receipts. About 200 men will be thrown out of employment when the mill shuts down.

Gilpin County.

Since the new rule went into effect on the Colorado & Southern road concerning shipments of ore and concentrates on the Clear Creek division of the line, wherein the marked capacity of the car governed the freight charge, regardless of how much less the shipment was, efforts have been made to have the road rescind the order, as it worked a hardship on many of the small shippers on the line. The Colorado Mine Operators' Association took the matter up with C. L. Wellington, general traffic manager of the road, with a result as follows: Effective July 5, 1905, the following carload weights on ores and concentrates shipped from points on the Clear

Creek division of the C. & S. railway, will govern: On cars under fourteen tons capacity, twelve tons minimum. On cars over fourteen tons capacity, twelve tons minimum.——Manager Anderson of the Gold Dirt M. Co. in Independent district reports that the new mill in Gambell gulch will be running on ores about August 1st.——Work has been resumed on the Gold Dollar property, owned by Jenkins, Daly & Nelson of Central City. The main shaft on the Happy Hollow, operated by the Inter-State Con. M. Co., near Gambell gulch, is down 50 feet and, as soon as the necessary timbering work can be done, Superintendent Churchill intends to crosscut towards the north.——Superintendent C. H. Karns of the Empress mine, near Lake gulch, reports that they have reached a depth of over 300 feet in their shaft, are making good headway in cleaning out and retimbering the shaft and expect to reach the bottom, a depth of about 400 feet, within two weeks.——Work is being rushed on the new shaft building on the East Notaway mine of the Town Topics M. Co. in Russell district, to replace the large shaft building, which was destroyed by lightning and fire.

The Imperial M. & M. Co. has put in a 7-drill compressor at the Mackey mine in the Pine Creek district.——The Newfoundland G. & S. M. Co. has men at work extending the east 900-foot level as well as stoping in the 800-foot east workings, with four leasers besides the company men. They are shipping smelting, milling and concentrating ores to Black Hawk. G. W. Mabee, Jr., is superintendent.——The Gladstone and Firenzi claims, in Illinois Central district, near Central City, have been under a lease and bond by J. H. Heinz of New Marion, Ind., who has appointed Henry Ehrhardt in charge of the property. On the Gladstone property the main shaft is down 225 feet and as soon as machinery can be put in the lessees intend to clean out the shaft and sink it 100 feet deeper. The new plant will consist of a 25 H. P. hoist and 35 H. P. horizontal boiler.——The Firenzi shaft is down 90 feet and a whim is to be put in.——The work of cleaning out the shaft on the Homestake in Lake and Russell district, near Central City, is under way and as soon as the bottom is reached, a depth of a little over 300 feet, the Homestake Co. intends to commence sinking. B. G. Granville has charge.

Gunnison County.

The Raymond T. & M. Co., operating near Ohio City, have ordered a 100-ton mill as soon as it can be built, based on the plans and specifications being prepared by C. Neicel of Denver. In the course of 2000 feet of the Raymond tunnel a number of fine veins have been cut, some of which have been developed by laterals from the tunnel. To ascertain their value in bulk, Manager E. M. Lamont sent several lots to the Denver Ore Testing & Sampling Co., N. C. Bonnevie manager, and himself watched the entire process of treatment. The results were satisfactory, showing that all of these ores will pay well when properly handled. The value originally was $10.60 gold, 2½ ounces silver, 3.6% lead and 2.8% zinc. It amalgamates $4 per ton gold, the concentrates carrying 3 ounces gold, 14 ounces silver and 20% lead. The zinc product was not saved, being within the penalty limit. Neicel will have charge of the construction and operation of the mill.

The Joplin mine at Spencer is being worked by F. P. Hott.——B. Pomel of Spencer is working the Neglected lode.

The machinery for the aerial tramway for the West Gold Hill M. Co. is being hauled to the property from Pitkin. This tramway when completed will be 2250 feet long without a tower, and will convey ore from the mine to the mill and 65-ton cyanide plant.——Wm. Friend has men working on the Grand Prize, near Pitkin. The shaft is being sunk and is down 70 feet.——The Forest Hill mine and mill are to be started up. The values are mostly in zinc.——The Quartz Creek mill, near Pitkin, is being put in shape by A. B. Clark for treating ore by cyanide.

The old Montezuma mine, between Crested Butte and Aspen, is being examined. —— J. E. Ericson, manager of the Copper Creek M. Co.'s properties near Gothic, has started work.

Hinsdale County.

The Fidelity M., M. & P. Co. has been formed at Lake City by C. J. Fox of Philadelphia, Pa., T. Henneberry of Denver and others to develop the Bull Hill claims and the Alhambra placer in Four-mile park. They intend to build a wire tramway to convey the Bull Hill ore to the Alhambra placer, where the reduction works will be built.

Lake County.

The different properties on Rock hill, Leadville, are producing high-grade lead ore, and the different shafts that are going down are making good headway. The Reindeer is shipping 100 tons daily and development work is being carried ahead in different parts of the mine. The Dome is shipping and developing the ore body to the north, and as work proceeds the ore shoot becomes more defined. The Murphy shaft is down to the necessary depth and drifts are being run under the ore body. A shipment has been made from the Bessie Wilgus and the drift has been run to the south under the ore shoot and upraising started. New machinery is being put in at Buffalo-President, on the Iowa gulch side of the hill, and when completed will be in position to handle the water struck recently in the shaft at a depth of 300 feet. The Nil Desperandum is in ore in both drifts.

Mineral County.

Ore is being taken from the Happy Thought mine at Creede, through the Worcester tunnel, and is being treated in the Humphreys mill. It is reported that the Worcester tunnel, now in over 10,000 feet, is to be continued. A slimes plant is being added to the mill.

Ouray County.

Electric drills are to be put in the Blowout tunnel of the Ouray Con. M. Co., ¾ mile from Ouray. The tunnel is in 475 feet and is to be run 2000 feet farther to cut ledges at a depth of 1600 feet. J. H. Tumbach is manager at Ouray.——The Atlas M. & M. Co.'s tunnel, north of the Revenue mine, is in 600 feet. F. Carroll of Ouray has charge.

In the Genessee tunnel of the Red Mountain R. M. & S. Co. a crosscut from the main tunnel and 2100 feet from the portal has cut a 7-foot body of ore, in depth 700 feet from the surface, where it outcropped.——G. Crawford of Red Mountain expects to unwater the old shafts of the Yankee Girl, but the volume of water is so great that it will of necessity be slow. If the entire amount of water was broken into at once it would flood the tunnel. It is probable that the reservoirs of water will be tapped with diamond drills and drawn off gradually.

Park County.

(Special Correspondence).—Several properties are operating in Buckskin gulch, among them being the Fannie Barret, A. Crown manager. This company is running a tunnel to tap the old stopes on the property which were opened twenty years ago. This tunnel when completed will be 1000 feet in length and will tap the vein 800 feet below the surface. The property is on Loveland hill.——The Red Lion is under lease to S. A. Offerson & Co. and two to three cars per month are being shipped. Near the Red Lion, A. A. Bissell is operating the New York and shipping about ten tons per day.——A. B. Ogden is operating the Sweet Home mine. This property has been idle for many years, but during the early days of the mine considerable ore was shipped to Swansea, Wales. Power drills will be put in, also aerial tramway for handling the output of the mine.——The old Ling mine on North Star mountain is being operated in a small way, but arrangements are being made to put on a larger force by Manager O. Eldredge. The Wheeler mine on the south slope of this same mountain is also under the management of Eldredge and operations will be increased about August 1. Small shipments are being made from both the Ling and Wheeler.——R. A. Morrison of Denver, Colo., president of the Montgomery G. M. & M. Co., is driving a tunnel under North Star mountain to strike the Ling vein and other veins on their own property, which they have opened up on the surface. The tunnel is in 620 feet and about 2 feet per day is being driven by hand work. Work on the tunnel is being done under contract by Blank & Larson.——A. M. Anderson has organized the Pawnee G. M. Co., and is operating the Helen Gould Nos. 1, 2 and 3 and Goldsmith claims. This property is on London mountain. J. M. Kuhn is manager and T. E. Schwarz, consulting engineer.——The Oliver Twist Co., near the London Co., is developing on London ground.——The 10-stamp mill at Montgomery, 6 miles above Alma, on the Platte river, is operating under the management of H. Eddy on ore from one of the mines belonging to the company.——It is understood that J. A. Shinn of Leadville is in Pittsburg, Pa., making arrangements for money to carry through his tunnel scheme to pierce Mosquito range in the Horseshoe district.

Alma, July 20.

(Special Correspondence).—On the Platte river, between Alma and Fairplay, the Snow-Storm Hydraulic Co. is operating its placer ground. During the beginning of the season they sunk sixteen drill holes and eleven shafts to bedrock, a distance of 40 to 60 feet, and tested the ground thoroughly. They have driven a tunnel 600 feet under the hill to connect with a 40-foot shaft. From this shaft and through the tunnel they have built a double flume, which extends from the tunnel entrance. The flumes are each 3 feet wide and 3 feet deep and the first 100 feet is composed of Angle iron riffles. Owing to delay in receiving pipe from the manufacturers, they have been delayed in getting their giants, which will consist of two No. 1 and one No. 5, in operation. The gravel and sand are washed from the pit into the shaft and down through the flume. As work proceeds in the pit, the shaft will be done away with and later on the present pit will be used for a dumping place. The giants will operate under 275-foot head of water taken from Platte river. They are also putting in an electric light plant.

Fairplay, July 24.

Pueblo County.

The two zinc concentrating mills of the United States Zinc Co. at Pueblo are completed and running continuously. One uses the dry crushing and the magnetic separation method, the other the wet process, employing Willfey tables. E. Anderson is agent. The concentrators have a capacity of 100 tons a day. They can smelt 25% to 30% zinc ores carrying clear values in gold, silver and lead, without concentration.

Saguache County.

The Shawmut Gold, Silver, Copper M. & M. Co. has put in a hoist preparatory to sinking in the Bonanza district, 16 miles from Villa Grove. The Bonanza and Morning Star mines are being developed in the same district.

The Shawmut mines in Bonanza district, 12 miles south of Alder, have been sold for $100,000 to W. P. Black, G. C. Moore, E. E. Hume, H. J. Welman, Chas. Eckles, C. Renner and H. A. Bush, of Cambridge Springs and Erie, Pa. W. P. Black has been chosen general manager, and is putting in a 100 H. P. steam hoist.

San Juan County.

The 6000-foot crosscut tunnel of the Stoney Pass M. Co. has been driven over 1300 feet toward a lead-silver vein in Prospect basin. J. W. Dolan of Silverton is superintendent.——Superintendent M. M. Gregg is drifting on the Magnolia vein from the 1200-foot point of the Hurley tunnel, near Gladstone.——It is reported that E. L. Thompson of Silverton, manager Delayed M. & M. Co., intends putting in a compressor and drills at the company's mine near Rockwood.

Malchus Bros. & O'Neil are making preparations for a 75-ton mill, to be put on the Mayflower. The ore, being a copper-gold proposition with small lead-silver values, is satisfactory for concentration.

Kramer Bros. & Carmichael, who recently took a lease on the Silver Ledge mine and mill at Chattanooga, are employing thirty men. The mill is taking sixty tons daily of crude ore from which the concentrators return fifteen tons of lead and eight tons of zinc, after the Blake electric zinc separator has done its work.

The Grand Mogul Co. has under way improvements on its property, near Gladstone. Excavations are being made for a 200-ton mill. The ore is first to be crushed under 1350-pound stamps, after which it is passed over amalgamating plates. It is then further reduced in Boss grinding pans, after which it is carried to the concentrating tables, where the remaining values are saved. The product is then passed through the drying ovens, when it is ready for shipment. The mill will be connected with the mine by an aerial tram, 8500 feet in length.

San Miguel County.

Work has been resumed at the Ophir Con. M. Co.'s mines near Ophir, under the direction of W. B. Ladd, representing Eastern directors. G. E. Driscoll is experimenting with ten stamps of the mill as to the best method of treating the ore.——The upper levels of the Butterfly-Terrible are being worked by leasers, their ore being treated in the company's mill. Manager J. F. Keating of Ophir is continuing the crosscut tunnel.——J. O'Brien of Ophir has charge of the D. Gale M. Co.'s work in Swamp canyon.——Ore from the Montezuma-Cariboo mines is being milled in the Yellow Mountain mill, near Ophir, under the superintendence of O. Ericksen.

Summit County.

(Special Correspondence).—For a number of years Summit county has been noted for its placer mines. At present there is perhaps as much, if not more, lead mining than placer work, especially in the neighborhood of Breckenridge. The American Gold Dredging Co., W. W. Dyar manager, is operating several drills on their property near Swandyke, prospecting with a view of adding several new dredgers to their equipment the coming year.——In French gulch the Lincoln G. M. Co. is operating its placer ground, using hydraulic giants. It has a lease on the water from the Gold Run ditch which belongs to the American Co. It has about 2000 inches of water at present and it is thought that the supply will continue till cold weather sets in, on account of the large volume of snow in the hills. The flume of this company is now about 2000 feet in length. It is preparing to put in a hydraulic elevator for handling the water and gravel from its pit.——The French Creek G. M. Co. is driving a crosscut tunnel in Baldy mountain, to tap some rich veins which are known to exist at the surface. The tunnel is now in 1320 feet. Electric drills are being used in doing the work. The tunnel is 5x7 in the clear. The work is being done at present by E. T. Brooks, under contract from the company. It is understood the company intends to keep driving ahead until it proves whether the ore goes down with depth. Should good paying ground be opened up, it will be the means of starting other enterprises along the same line of work.——In the same gulch nearer Breckenridge, on Mineral Hill, is the old Wellington mine, being operated by the Colorado & Wyoming Dev. Co. The crosscut tunnel, which is 650 feet in length, cuts the "Big" vein which carries zinc and lead. There are 650 feet of drifting on the vein and 400 feet of raises. One shoot in this mine is 14 feet wide and a 24-foot winze is sunk on the shoot. Mostly development work is being done on this property. They are able to ship enough ore from the upper workings to pay for all development work. R. W. Foote is manager and C. F. Aultland superintendent.——B. S. Revett is getting his big dredger under operation in French gulch, and it is expected to increase the output of the placer mines in this section.——The Old Union M. & M. Co. has five claims and millsite on Mineral hill. The company has sunk its shaft to a depth of 450 feet and now driving a crosscut from the gulch side to connect with the shaft, which will require some 1100 or 1200 feet to reach. In driving the tunnel they have met with a few setbacks which have delayed their work materially. The company has recently completed a new mill at the mouth of the tunnel. As soon as the tunnel is completed, the mill will be in shape to receive the ore from the mine. The mill will have a capacity of 100 to 150 tons per day. It consists of crushers, rolls, screens, jigs and tables. A. E. Keables is manager.——The Gold Dust Mines Co., M. W. Hoyle manager, has been working the old Puzzler mine, near Breckenridge, but recently closed down until they can make arrangements to put in a mill. Manager Hoyle is now in the East, endeavoring to raise the necessary capital.——On Mineral hill the Abundance M. & M. Co. is putting in a new hoist preparatory to doing a large amount of development work. The shaft is down 175 feet but will be continued deeper. At the 150-foot level they are crosscutting each way from the shaft to the side lines and have cut veins on each drift, but are making no efforts at present to develop them. John G. Goodier is manager.

Breckenridge, July 24.

(Special Correspondence).—The Masontown M. & M. Co. expect to start operations in the nextmonth on their property at Frisco.

Frisco, July 25.

Teller County.

The Lonaconing property on Beacon hill, Cripple Creek, is looking better than it has for many months. The operators have proved that the ore shoot was not worked out south of the shaft, and the developments show that the shoot took a pitch another way and is now showing mineralized rock.——Machinery is being put in at the Pay Rock, on Rhyolite mountain, Cripple Creek, preparatory to sinking from the 200-foot level.——The machinery has been put in at the Blue Flag mine of the Blue Flag M. & M. Co. by Manager J. F. Erisman.

Marshall Bowers proposes to sink the Pharmacist shaft on Bull hill, Cripple Creek, to a depth of 1000 feet. A 6-drill compressor is to be put in.——A hoist capable of lifting from a depth of 2000 feet is to be put in at the Shurtloff mine of the Findley Con. Co. at Cripple Creek.

IDAHO.

Boise County.

J. K. Woodburn, who purchased the concentrates produced by the War Eagle mill at Grimes Pass, found them to be too low grade to bear the expense of wagon haul to the railroad, freight charges and treatment. Since then he and Eugene Grice have been experimenting to discover an economical and successful method of extracting the values. After several unsuccessful attempts they found that by roasting values were saved by cyaniding. They have shipped an outfit to

Pioneerville and will begin operations at once. The concentrates will average $40 per ton, and it is thought they will be able to save 85% at a cost of $5 per ton. There are about 200 tons at the mill from the Bruiser and Pheasant mines. Should this work prove a success it is probable that these mines will be started up.

The American Exploitation Co. is working the Nellie claims, in the Pearl district, with M. E. Hopkins as manager.

Elmore County.

H. Le Bar, manager of the Mountain View property, near Pine, reports that the 10-stamp mill is almost completed and the electrical plant is on the road. A cyanide plant is to be built.

Idaho County.

H. Thorpe, manager of the Gott M. Co., operating placer properties on Grouse creek, between Resort and Warren, states that the big ditch built by the company, which heads in Secesh creek, is being completed and it is thought water can be turned in by September 1. The ditch will be 4 miles long, 7 feet wide at the top, 4 feet at the bottom and 3 feet deep. There yet remains 500 feet of excavating to be completed, and the work so far has been done, including the clearing of a 20-foot right of way, with thirty-five men since June 1. J. J. Toler has sold his interest in the company.

M. F. Tytler, manager of the Seattle & Idaho M. Co. at Dixie, has resumed work on the Comstock under bond. The company intends to put in a cyanide plant.

Kootenai County.

H. M. Williams, general manager of the Ponderay Smelting Co., owning the new lead smelter, near Sandpoint, says that all the machinery except the electric equipment is on the ground, and the plant should be running in two months. D. T. Parker is superintendent. About 25 men are employed. People interested in the Ponderay Company are developing in the Minerva and the True Blue, nearby, and are also driving on the Venezuela, and have let a contract for continuing the crosscut 300 feet.

Shoshone County.

Good concentrating ore has been struck in the lower workings of the Paragon mine, 4½ miles east of Murray. L. W. Stedman is manager. —— The New Hope M. Co. is developing claims 2 miles from Osburn, on New Hope gulch. On the south vein a tunnel has been run 240 feet. The lower tunnel is a crosscut intended to cut the ledge 300 feet below the workings above and has been run 420 feet.

The old tunnel on the Phœnix mine, near Osburn, has been cleaned out by the German-American M. Co. of Spokane, Wash. A compressor with two drills has been put in and the contract let for 150 feet of tunneling, extending the present tunnel, which is 640 feet. C. E. Mitchell of Spokane, Wash., is interested.

Tooele County.

The Overland property at Sunshine, which was sold to Denman Blanchard of Boston for $37,500, is to be started again. The mill is to be overhauled. M. A. Sheets has been named as superintendent.

MONTANA.

Broadwater County.

The Edward F. Co. is building a stamp mill and putting in cages and cars at its property at Hassell.——The Mason syndicate have started their concentrator at Mason.——The concentrator on the East Pacific at Winston will be started by August 1.

Fergus County.

The Armstrong property, at Kendall, is being developed by J. A. Irwin, of the Spokane Diamond Drill Contracting Co.——W. G. Moore has men at work on the W. G. Norman ground at Kendall.——A. S. Wright has purchased twelve claims adjoining the Kendall, North Moccasin and Barnes-King mines.——E. E. Wright has sold his one-quarter interest in the Boss fraction claim, adjoining the Bullard property, to R. Hamilton, of Kendall, for $1000.

Jefferson County.

General Manager M. L. Hewett of the Cataract C. M. Co. at Basin has increased the force at the Bullion mines. Recently a body of rich ore has been opened up. The concentrator will be completed and ready to operate by September 1.

Lewis and Clarke County.

The Spring Hill, owned by the Pittsburg & Montana Co., 4 miles south of Helena, has commenced shipping to the company smelter at Butte. The mine is working forty men, who have piled a large amount of ore on the dumps, and shipments will be large.——The East Helena smelter is running three stacks, with a capacity of 450 tons of ore per day, and are receiving more ore than they can handle. The ore supply is the largest for years, and indications are that it will increase, making it necessary to blow in another stack.——The Red Bird Co. is crosscutting at the 500-foot level and is sinking another 100 feet on its Copper Hill property at Austin.

Madison County.

The new cyanide plant at Rochester is nearly completed. Five 16-foot and four 26-foot steel tanks, and filterers for the same, are being placed in position, and all that remains to be done before starting the mill is putting in the electric lighting plant. The Watseka mill is claimed to be one of the most economical in the State, everything being done as near as possible with water. The new flume from the McClay - Murray springs is completed; it is 1½ miles long, and supplies more than enough water to operate the plant.

The Garnet Co., near Pony, are undecided whether to put in an electric power plant, a gas producer plant, or to obtain electric power from the Madison Canyon Power Co. A plant capable of furnishing 125 H. P. is required and work must be started before the weather becomes too cold to run water in an open ditch.——Work has been commenced on a 600-foot tunnel to develop the Mountain Cliff vein in Mineral hill, near Pony.

Silver Bow County.

The Supreme Court has reversed the decision of Judge Clancy of Butte in the case of E. Hickey, L. A. Hickey and J. M. Stewart against the Anaconda and Washoe companies, better known as the Nipper case, in which the lower court, after a memorable trial, held that certain veins of the Amalgamated Co.'s Anaconda and Washoe veins found their apex in the portion of the Nipper mine, owned by Heinze. The case is reversed on account of errors, largely attributed to the failure of Judge Clancy to admit certain evidence brought out on cross-examination of Stewart, one of the plaintiffs.

NEVADA.

Lincoln County.

The Searchlight M. & M. Co. have started their new 15 H. P. hoist at the mine at Searchlight. An 800-pound bucket will be used for hoisting the ores. Sinking is to be resumed from the bottom of the 300-foot shaft. A 3-stamp mill is being put in.——The Shoshone claims, 4 miles east of Searchlight, near Summit Springs, and owned by G. B. Smith and E. R. Bowman, has been bonded to O. B. Steen and Geo. Montgomery, who have started work.

Storey County.

When the pumps in the Ward shaft on the Comstock are put in they will have sufficient capacity, with the pumps in the C. & C. shaft, to unwater all the lower levels of the Comstock lode. At present the pumps are lifting 7,250,000 gallons of water a day, but their capacity will be 3,000,000 gallons more daily after the Ward shaft pumps are placed in operation. This will result in extensive workings of the lower levels.

Washoe County.

At Olinghouse, on the No. 2 mine, O. M. Pudor is preparing to sink to the 300-foot level. As yet no mine in the White Horse district has reached this depth, and if the sulphides hold out at that depth the permanency of the camp is assured. Large tunnels have been started in the Oro and in the Pritchett & Dahl group.

OREGON.

Baker County.

Good ore has been opened up in the Minnie McDowell claim, near Cable Cove, by E. Rawson and J. I. Sturgill. The ore is being sorted for shipment to the Sumpter smelter.——The Conner Creek placer mines, near Baker City, have been sold to a California syndicate represented by S. Adams. The property was owned principally by Union Pacific Railroad employes and was sold for $60,000. By the terms of the sale the new company agrees to spend $5000 in improvements this year. The mines will be worked by the cribbing process.——The Buckeye mine is being unwatered and sampled.——In Rye valley, 30 miles southeast of Baker City, the Gold Coin mine is being developed by a company recently organized in Pendleton. Preparations are being made to put in a 40-stamp mill, ten stamps of which it is expected will be dropping by September 1.

It is reported that a good strike has been made in the Morris property, Greenhorn district, owned by the Iowa-Oregon G. M. Co. of Webster City, Iowa.——W. J. J. Smith, one of the partners in ownership of the Salmon group, near Greenhorn, says he will urge putting in a compressor at the property when he returns to the Cincinnati office of the company. The crosscut tunnel is in 900 feet. Drifting is to be carried on with the machine drills, if they are authorized by the principal owners.

L. V. Swiggett, manager of the Golden Chariot group, in the Bear Gulch district, near Sumpter, states that the ledge for which they have been driving the crosscut has been cut.

Douglas County.

The Bohemia correspondent to the Telegram reports that on the Hiawatha claims, on the west slope of Fairview mountain, 450 feet of work has been done, and the management has again commenced operations for the summer. A 5-foot ledge is exposed. The property is owned by the Hiawatha M. Co. David Finn has charge. Much work will be done, and it is the intention of the management to put up a mill.——The Gold Hill & Bohemia M. Co. owns the Wall Street, adjoining the Vesuvius and Music mines. Over 600 feet of work has been done, exposing three veins.——The Judson Rock nine claims, on the western slope of Fairview mountain, are making a good showing as development proceeds. Over 1000 feet of work has been done on this property. ——The Syndicate group, owned by C. E. Lockwood and E. Jenks, adjoins the Noonday and Helena No. 1. There are seven claims in the group, and the development consists of four tunnels, several crosscuts and surface openings.——The Phœnix group of three claims contains a good ledge. E. Jenks is the owner, and the property is on Horse Heaven creek, south of the Riverside group.——J. B. Morgan owns two claims below the Riverside. He has a ledge 12 feet wide.——The Mineral King claims, owned by A. W. Zinicker, on Horse Heaven creek, is below the Riverside.——The Mayflower claims, on Horse Heaven creek, is owned by the Mayflower M. Co., W. P. Ely being the principal stockholder. This property is opened up by tunnels.——J. M. Peterson and J. Klucky, owning the Golden Star group, have over 400 feet of work done.——The Sweepstake eight claims, on the west slope of Fairview mountain, S. J. Brund owner, is opened by a 250-foot crosscut and 200 feet of drifting on the lead.——The Three Monte group, on the slope of Fairview mountain, is the property of A. Churchill, who has 250 feet of work done on the three claims.——The Knott property is developed by a 250-foot shaft.——G. Bohlman of Cottage Grove owns three claims on the west slope of Fairview mountain.——F. Mackentire is developing the Clay property.——J. B. King, on the White Iron and Black Bear claims, is driving a crosscut.——The Pittsburg claims, owned by W. H. Shane and F. Flesher, contains 800 feet of tunnel, the longest tunnel being 200 feet.

Grant County.

Recent work on the Wide Awake four claims, near Alamo, owned by L. Steinmetzer and Wm. Turner, has opened a good vein of free milling ore.

The placer mine on Canyon creek, 2 miles above Canyon City, owned by Dart, Yorgenson & Walker, is closed for the season, the final cleanup having been made.

Jackson County.

At the Oregon Belle mine, in the Forest Creek district, the crusher, stamps and concentrators are in place in the new mill and the plant will be in readiness for operation by Aug. 1.——At the Golden Standard property, near Jacksonville, P. S. Casey has men working. It is likely that a mill will be put in this fall or winter.

Josephine County.

The Grouse Mountain mine, on Mt. Baldy, 2 miles from Grants Pass, has been sold to L. P. Larson and C. Jasper of Spokane, Wash. Development is under the management of A. L. Smith. ——The Horace Greely mine, owned by E. E. Blalock and H. H. Howe of Golden, has been bonded to the Greenback M. & M. Co. for $15,000.

As a result of the returns on ore shipped from its Picket Creek property, the Oregon Timber, Mining & Development Co. has put in a mill and reduction plant near Grants Pass.

SOUTH DAKOTA.

Pennington County.

The machinery for the Montezuma property, at the head of Irish gulch near Rochford, is being hauled to the mine.——J. Hartgering has made the arrangements for work on the Bullion mill near Keystone. The process will be Chilian rollers and amalgamating tables, with Wilfley concentrators, and then cyaniding the concentrates. F. Beedle is in charge of the work.

UTAH.

Juab County

The Tintic King M. Co. has been formed to work the Manhattan and the Revenue lode claims, near Eureka. L. Hopper will have charge of the development. The officers of the company are W. R. Pike of Provo, president; L. Hopper, vice-president, and E. Pike, secretary and treasurer.——A water seam has been cut on the 500-foot level of the Uncle Sam mine, near Eureka, which will supply the mine, which has heretofore drawn on the mill for its supply of water. C. C. Griggs is superintendent.——The ore shipments from Tintic district for the week ending July 21 amounted to ninety-two carloads, and one carload of concentrates from the Uncle Sam mill. The producers were: Gemini, 6; Bullion Beck, 3; Centennial-Eureka, 45; Yankee Cons., 4; May Day, 1; Uncle Sam Cons., 2; Eagle and Blue Bell, 6; Swansea, 6; Eureka Hill (lease), 2; Grand Central, 6; Victoria, 4; Ajax, 5; Carisa, 1; Mammoth, 1.

Park County.

The hoist has been put in at the King Con. mine at Park City and sinking is to be resumed from the 800-foot level.

Salt Lake County.

Sampling has been finished at the Utah copper mine, at Bingham, and the report to the American Securities Co. is being made out. The third east drift is to be connected with the Ohio drift 100 feet below.——The Bingham West Dip Tunnel Co. intends to run a 4-mile tunnel from the Tooele side through the Oquirrh range, and drain the West Mountain district. It expects to develop some mineral on its own ground and also provide water for the irrigation of Tooele lands. Reports submitted at the recent meeting showed that the company was free from debt and work was progressing on the tunnel. The following officers were elected: F. M. Lyman, president; F. M. Lyman, Jr., vice-president; M. Pratt, treasurer and manager; F. M. Bishop, secretary.——The Copper Center tunnel of the Boston Con., at Bingham, has been cleaned out and work resumed driving it ahead.——The American S. & R. Co.'s new 3000-ton copper smelter, which will be built 10 miles north from the mouth of Bingham canyon, will be ready for operation next spring, according to Daniel Guggenheim, chairman of the executive committee of the smelting company. The smelter was made necessary by the increasing output of the Bingham mines. The Utah Copper and Boston Con. alone will furnish 1000 tons of ores and concentrates to the new plant. The contracts on the Cactus and other properties and the increasing tonnage from this camp will justify the smelter management in fixing the capacity of the new plant at 3000 tons daily. Six full sections of land, 6400 acres, have been acquired by the smelting company, near the springs north of Bingham, as a site for the new plant and there will be no farmers to raise complaints of damage from smoke.

Sevier County.

B. T. Ashby has made arrangements to work the Congress claims on Gold mountain, near Richfield.

Utah County.

T. E. Steele and R. R. Steele, who own the Steele property, will start work in American Fork canyon August 1. —— The new flume now under construction at the Wyoming mine is 480 feet long. This will give the mine two flumes through which to convey their sacked ore from the mine to the teamsters' station. —— Work is continuing on the Silver Glance, near the Steele group, under a lease held by J. H. Wooton.

WASHINGTON.

Ferry County.

Alex. Sharp, manager of the First Thought and Napoleon mines, near Orient, reports that the First Thought is shipping a carload of ore a day to the smelter, while the Napoleon is shipping eight carloads a week. These mines are owned by P. Burns.

Skamania County.

The McCoy Creek Mines Co. has been formed, with principal place of business at Chehalis, by L. J. Sticklin, G. E. Nolan, H. B. and B. J. Blankenship, A. Edlund and K. Anderson. The new district is near the northern boundary of Skamania county, on McCoy creek, a tributary of the Cispus, which in turn flows into the Cowlitz. The mines are reached by way of Chehalis. The company intends to put in a mill and begin active mining.

WYOMING.

Carbon County.

(Special Correspondence). — The mill at the Penn-Wyoming Copper Co., of Encampment, is handling all the tonnage the tramway can supply. The Hancock jig is a successful feature of the mill. The large

furnace is to be blown in soon. The Doane-Rambler Co. is about to build a concentrator. The camp has a healthy appearance and all available teams are hauling copper to Walcott.

Encampment, July 20.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District

The newly appointed officers of the Dominion Copper Co., which has taken over the holdings of the Montreal & Boston Co., have arrived at Phœnix and are making arrangements to resume work. These include M. M. Johnson, chief consulting engineer, T. W. Drummond, the local superintendent, and W. C. Thomas, the smelter superintendent. They intend to reopen the mines at once, also starting the company's 2-furnace smelter at Boundary Falls.——The shaft on the Prince Henry is down 65 feet.——The diamond drill which has been working with satisfactory results on the Wolford group in Wellington camp is being removed to the Jewel property in the Similkameen.

Nelson District.

The May Day and Pink Diamond claims, near Ymir, owned by J. F. Harbottle and others, have been bonded to John Boultbee of Rossland at $15,000.——Near Salmo, strikes have been made near the Queen and Kootenay Belle mines. Billings & Schwinkie made the first discovery, and J. G. Devlin of Nelson has located rich ground.——The Kootenay Belle mine, on which Patrick Clark recently relinquished his bond, has reverted to the former lessees, Bell Bros. of Salmo.——The 10-stamp mill at the Porto Rico mine, near Ymir, has been started by G. W. Barnhardt, the lessee. A large quantity of high grade ore has been broken down for milling. The mine is also being opened up on a deeper level.

Rossland District

The tonnage of ore shipped from and crushed at the Rossland mines for the week ending July 22 and for the year to date was as follows:

Mine	Week.	Year.
Le Roi	1,850	70,131
Le Roi (milled)	210	510
Center Star	2,250	53 880
War Eagle	1,230	36,870
Le Roi Two	60	4,402
Le Roi Two (milled)	....	4,830
White Bear	....	1,100
White Bear (milled)	....	3,920
Jumbo	300	5,529
Spitzee	60	4,479
Velvet-Portland	....	1,977
Gopher	....	60
Homestake	....	30
Lily May	30	60
Totals	5,990	187,778

On the ninth level of the Center Star a station has been cut and a hoisting engine put in to deepen the shaft for 200 feet below that level. The purpose is to develop another shoot which has been opened by a winze extending down from the ninth level for 190 feet. —— The Jumbo is being developed on the No. 1 and the intermediate levels.——The following are the shipments for the week ended July 15: Le Roi, 1950 tons; Le Roi (milled), 150 tons; Center Star, 2430 tons; War Eagle, 1350 tons; Le Roi No. 2, 60 tons; Jumbo, 200 tons; Spitzee, 120 tons. Total, 6260 tons, and for the year to date, 181,788 tons.

The Le Roi Co. shipped from the mine to Northport during June 8738 tons of ore, containing 3430 ounces of gold, 3200 ounces of silver and 163,600 pounds of copper. Estimated profit on this ore, after deducting cost of mining, smelting, realization and depreciation, $13,600. Expenditure on development work during the month, $10,000. Experimental concentration mill commenced running July 1.

CENTRAL AMERICA.

Panama.

According to a decree passed by the cabinet council of the Republic of Panama, on May 15, 1905, the Republic of Panama retains the right to all mines, of any kind whatsoever, within its limits, even should the vein or drift, etc., lie below the surface of private property. The owner of such property has the right only to the surface, and the subsoil belongs to the nation. However, the owners of land overlying mines which are ceded or leased by the Government have a right to remuneration for the use of the surface of their land by the concessionaire or prospector, as provided by law.

MEXICO.

Cedros Island.

The Esperanza M. Co. of Cedros Island expects to blow in the new smelter as soon as G. Brown, the manager of the company, arrives at the mines. This is the Morgan smelter, which was set up at San Diego two years ago, but never used. It was afterward bought by Mr. Brown and taken to Cedros Island, but has been but recently set up. The Esperanza Co. has been shipping copper ore to San Diego, where it has been reshipped to the smelter at Tacoma.

Guanajuato.

F. G. Corning, president of the Guanajuato Con. M. & M. Co. at Guanajuato, reports that the new cyanide plant is running successfully on a crude ore production ranging from 130 to 150 tons daily. This output it is expected to gradually increase to the full capacity of the plant, which is estimated at from 180 to 200 tons daily. The waste tailings from the process show from 50 cents to $1, United States currency, per ton The estimated differences, based on the assays of the mill headings and tailings, indicate a saving by the process as now in operation, with combined mechanical concentration and cyanidation, of 90% of the gold and silver values. This is an improvement, without increased cost, over the old milling process heretofore in use. The company's Sirena mine has many years of ore in sight. On the fifth level below the main tunnel, at a depth of 1200 feet from the surface outcrop of the vein, the ore bodies have developed widths of from 20 to 100 feet. The mine and mill are operated by electricity furnished by the Guanajuato Power & Electric Co.

Chihuahua.

R. B. Hutchinson, general manager of the Concheno mine, near Ocampo, states that his company has decided to increase the capacity of the present 60-ton cyanide plant at the mines to 100 tons daily. An electric power plant is also planned.

Jalisco.

The Mexican-Union M. Co., operating in the Ayutla district, is enlarging the 35-ton reduction plant at the Soquite Prieto mine to take care of increased production. This capacity will be doubled. W. H. Lees is manager.

Sonora.

A 10-stamp mill and cyanide plant is to be put up at the Anita mine of the Magdalena M. & M. Co. at Llano. ——The Yerkes G. M. Co. at Cajon de Amarillas, in the Altar district, is putting in an air compressor and machine drills.——A. H. Moore is developing a gold property, 20 miles southwest of Llano.——At Toledo the Yaqui River S. & R. Co. are putting in a new reverberatory furnace which will have a daily capacity of 100 tons of calcined ore or sixty tons of raw.——V. S. Oliver, manager of the Tucabe mine, in the Magdalena district, beyond the Santo Domingo river, has resumed operations. The 110-foot shaft will be sunk an additional 100 feet and 400 feet away a 3-compartment vertical shaft will be sunk.——J. R. Magruder has let a contract for sinking a new shaft upon the Yeso mine, near Las Cruces, and a new mill has been ordered for the property. It will have a daily capacity of thirty tons of ore and will be a dry crusher and chlorination process.

NORWAY.

The British consul reports regarding the Sulitjelma copper mines that 1400 men were employed and 80,000 tons of ore were produced in 1904. Of this amount about 64,000 tons of copper pyrites, containing 45% sulphur and 3⅜% to 4½% copper, were exported, and also 15,000 tons of ore for smelting. A wire rope tramway 4 miles long was built to the Jakobsbakken mine. Various other improvements have been effected, including a smelting house in which a new process is to be used. This process effects a saving in coke, and may be described as a direct application of the Bessemer process to the ore. ——The Alten Copper Works in Finmarken and the Krængenan mine have employed 360 men. Copper ore has been produced containing 390 tons of copper.——The Bossmo pyrites mine in Moi Ranen produced 26,100 tons of pyrites containing 49.5% or 50% sulphur, and employed 240 men.——The Roros Copper Works produced 18,000 tons smelting ore and 11,000 tons pyrites; 733 tons of copper were sold during the year; 600 men are employed. For 1905 a production of 800 tons of copper and 13,112 tons of export pyrites is planned.——The Killingdal mine, north of Roros, produced 14,000 tons pyrites and employed 100 men.——The Kjoli mine, near Roros, has built an aerial tramway 10 miles long.——The mining of iron pyrites, principally for export, has increased from 105,000 tons in 1900 to about 120,000 tons in 1904. Italian sulphur, which has hitherto been used in the Norwegian sulphite-cellulose factories, is now being replaced by Norwegian pyrites. Twelve or thirteen thousand tons of sulphur were formerly imported, but the factories now build roasting ovens for Norwegian fine pyrites, thereby saving about 5 kroners per ton of cellulose. When all the factories have carried out this plan the home consumption of pyrites is estimated to rise to 30,000 tons per year, as compared with 15,000 tons in 1904. The production of pyrites in 1905 is expected to rise to about 160,000 tons on account of the workings at Sulitjelma and Kjoli. Between 3000 and 3100 men were employed in 1904 in the Norwegian copper ore mines, and the gross value of the products, delivered at a Norwegian port, amounted to £264,000.

Commercial Paragraphs.

THE new plant of the Vulcan Iron Works, Toledo, Ohio, will cost $250,000.

WM. STEPHENS is erecting a 100-stamp mill for the Joshua Hendy Machine Works, of San Francisco, Cal., on the Alaska Perseverance mine, 4 miles from Redding, Cal.

ROY D. HUNTER, formerly manager of the Denver branch of the Sullivan Machinery Co., has been made general sales manager, with headquarters at the home office, Railway Exchange building, Chicago. W. P. J. Dinsmore succeeds Mr. Hunter as manager of the Denver office.

THE S. H. Supply Co., Denver, Colo., are furnishing two complete air compressing plants to Clear Creek, Colo., and Arizona. This company also reports sales of the Wild mill, which they are manufacturing, as follows: Two No. 2 mills to Idaho and No. 2 and No. 3 mills to Mexico.

AT the Lewis & Clark Exposition at Portland, Or., the Byron Jackson Machine Works, 411 Market St., San Francisco, Cal., has a working model of what is stated to be the largest high-head series centrifugal pump in the world, now in operation at Grants Pass, Or. The pump has a capacity of 10,000 gallons per minute, is designed for 500-foot lift and tested to a working pressure of 250 pounds. The model illustrates the method of creating artificial pressure at the nozzle, discharging through a giant against the bank of a miniature placer mine.

THE new Ingersoll-Rand Co., which was recently incorporated for $10,000,000, will open offices on the fourteenth floor of the Bowling Green Building, 11 Broadway, New York City, early in August. The main offices of the Ingersoll-Sergeant Co., for years in the Havemeyer Building at 26 Cortlandt Street, New York City, and the offices of the Rand Drill Co., at 128 Broadway, will be moved to the new location. By reason of the consolidation of these two important enterprises the Ingersoll-Rand Co. will start with a larger and more widely distributed patronage, and a greater manufacturing capacity in the combined plants, in the rock drill and air compressor business.

THE Pelton Water Wheel Co. of San Francisco and New York has a contract for a water wheel installation for D. J. Aguirre & Co. of Tepic, Mexico. The head available is 175 feet, the plant consists of two Pelton wheel units of 700 H. P. capacity each, direct connected to 300 revolutions per minute General Electric generators, also two Pelton wheel units for driving exciters. Sturgess oil type governors will be used. Pelton wheels are universally employed at the sugar plantation of Aguirre & Co., there being six wheels at present employed for driving heavy sugar rolls by means of direct connection, machine shops, electric lighting plant, etc. The company reports that their export trade has increased in the past year, and that they have made large shipments to Central and South America, Japan and the Straits Settlements.

Personal.

A. CROWN is manager Fannie Barret mine, near Alma, Colo.

R. C. GEMMEL has returned to Salt Lake City, Utah, from Mexico.

W. E. THORNE is manager Snowstorm Hydraulic Co., near Fairplay, Colo.

E. K. AUSTIN is general manager Yellow Mountain M. Co., near Ophir, Colo.

JAMES REAL is superintendent Suffolk M. Co.'s mine and mill at Ophir, Colo.

S. L. ROPES has been made superintendent Bald Butte mine, near Helena, Mont.

A. M. FRIEND of Marshalltown, Iowa, is in Colorado inspecting his mining properties.

F. M. PERKINS has taken the management Beztan mines, Huetama, Michoacan, Mexico.

J. WHITE has been appointed superintendent Ferris-Haggarty mine at Encampment, Wyo.

JAMES CUSICK of Lead, S. D., has been made superintendent Ethel mine, near Rochford, S. D.

G. A. TREADWELL of New York City has been inspecting mines in Yavapai county, Ariz.

CHAS. DOBLER takes charge as superintendent Fairview mine, Pappoose, Trinity county, Cal.

OLIVER ELDREDGE of Alma, Colo., is manager Ling and Wheeler mines near Montgomery, Colo.

W. E. CONNELLY has resigned as superintendent Ferris-Haggarty mine at Encampment, Wyo.

RICHARD LLOYD has been examining mines in the San Francisco mining district, Mohave county, Ariz.

T. E. SCHWARZ of Denver, Colo., has returned there from a trip to the London mine in Park county, Colo.

J. M. PHILIPS, superintendent Rincon mine, near Martinez, Ariz., has returned from a visit to Lodi, Cal.

FRANK CARNAHAN has been made manager Cia Metallurgica Mexicana at Sierra Mojado, Coahuila, Mexico.

J. A. KIRBY of Salt Lake City, Utah, has been chosen superintendent Montana-Tonopah mine at Tonopah, Nev.

MONT TONG has been appointed general manager St. Paul M. Co. in Green Lake mountain, near Georgetown, Colo.

NATHAN GREGG, SR., has returned to Denver, Colo., from an inspection of mining properties in Park county, Colo.

O. TROJENOWSKY of Wallace, Idaho, has charge of building a mill at Tin City, Cape Prince of Wales, Alaska.

H. E. LEES is superintendent Creede United M. Co.'s mines at Creede, Colo. L. H. Norton is mill superintendent.

J. C. GEORGE of Milwaukee, Wis., interested in the Snowstorm Hydraulic Co. at Fairplay, Colo., is at the property.

W. J. SHARWOOD of Berkeley, Cal., has gone to the cyanide department of the Homestake mine at Lead City, S. D.

C. A. BOHN has been appointed manager Santa Rosalia smelter of the Encinillas M. Co. at Santa Rosalia, Chihuahua, Mexico.

H. C. ARCHER has resigned as superintendent Rising Star mine of the Bully Hill M. & S. Co. at De Lamar, Shasta county, Cal.

W. C. OFF AND DR. S. B. PREVOST of Kansas City, Mo., are looking after mining interests in Summit county, Colo.

P. S. CAULDREY has been made manager Le Roi Two mine at Rossland, B. C., succeeding Ernest Levy, who has returned to London.

JOHN TREWEEKE has been appointed general superintendent Belle of Thunder Mountain and Sunnyside mines at Roosevelt, Idaho.

W. K. JEWETT of Colorado Springs, Colo., and R. M. Gummere of South Bethlehem, Pa., have been in Alma, Colo., looking after mining interests.

W. A. PRICHARD, late West Australian partner of Messrs. Bewick, Moreing & Co., has opened offices at 681-682 Salisbury House, London Wall, E. C., for practice as consulting mining engineer and metallurgist.

Books Received.

The practicing analyst will find a useful working manual in "Western Mill and Smelter Methods of Analysis," by P. H. Argall. It has been written as a laboratory handbook for the assayer and chemist and describes the methods of analysis in every day use in mills, smelters and cyanide plants. The contents include chapters on standard solutions, slag analysis, ores, coal and coke and daily work in the cyanide process, together with valuable hints on refinery and laboratory methods. The author has selected the methods in general use, those that have been standardized, as it were, by the titration of experience. His language is concise and to the point, facilitating rapid and accurate determination. The synopsis of cyanide methods is complete and practical. The book is not an indiscriminate collection of untried methods. It is less complete than the ordinary manual which usually presents many alternative methods. But the processes given have been refined by the tests of experience and will help the busy assayer. It is published by the Industrial Printing & Publishing Co. of Denver, Colo., and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price, $1.50.

The fourth bi-monthly bulletin of the American Institute of Mining Engineers contains a number of interesting papers on the manufacture of iron, including supplementary data by James Gayley on "The Application of the Dry-Air Blast to the Manufacture of Iron," discussions on the same paper by J. W. Richards and T. W. Robinson and a paper by J. P. Roe on "The Manufacture and Characteristics of Wrought Iron." A. H. Brooks writes on "The Outlook for Coal Mining in Alaska," giving a summary of investigated and reported occurrences. Geology is represented by W. P. Blake's paper on "Origin of Orbicular and Concretionary Structure" and Ed. Halse's paper on "The Occurrence of Pebbles, Concretions and Conglomerate in Metalliferous Veins." The former paper is based on the study of a white volcanic tufa from Tucson, Ariz; the latter is a description of the occurrence of a water-worn conglomerate in a gold-bearing vein in the Remedios district, Antioquia, Colombia, South America, which, the author argues, was formed in situ by the flow of water in the vein itself. J. F. Kemp describes "The Copper Deposits at San Jose, Tamaulipas, Mexico," a study of the contact effect of a diorite-porphyry-laccolith intrusive in a fine-grained, bluish limestone. T. H. Oxnam contributes a detailed statement of conditions, methods and costs in "Cyaniding Silver-Gold Ores of the Palmarejo Mine, Chihuahua, Mexico." The system of wet crushing, concentration and cyanidation has successfully replaced dry crushing, roasting and pan amalgamation. A. H. Bromley writes of "Tin Mining and Smelting at Santa Barbara, Mexico," and G. T. Wickes on "A Machine for Drawing Coke From Bee-Hive Ovens."

The working geologist's library receives a valuable addition in Arthur Lake's "Geology of Western Ore Deposits." The author introduces his subject by an exposition of general features of mining geology. This is logically presented and clear cut in statement, although at times more detail would give a better comprehension of conditions. Positive statements are frequent, which are valuable to the student if they are not subject to successful contradiction. He gives a practical account of the historical geology of the Rocky mountains that is intelligible to one ignorant of the fine points of paleontology. Igneous rocks are described briefly, the manner of vein formation is described in accordance with generally accepted standards, and includes a description of the principal ores of the useful metals. Little new material is introduced, but the author gives an intelligent resume of the results of geological mining research of the past decade. The results of his own painstaking work are more fully exemplified in accounts of the important mining districts of Colorado, as illustrating the principles outlined in the preceding chapters. This section is probably the most valuable in the book, for from it one gains in condensed form an understanding of Colorado's mineral occurrences. The author is undoubtedly well acquainted with this subject, somewhat of a contrast, it must be confessed, with regard to his statements concerning other examples of Western ore deposits. The Homestake mine of South Dakota is dismissed with twelve words in this section. The State of Arizona receives two pages of text. This may be excusable on account of lack of space, but not so the statement that "the Mother Lode extends from Mount Ophir, in Mariposa county, to Mokelumne Hill, in Calaveras county, or over 70 miles," utterly ignoring the fact of its occurrence in Amador county, which at present contains its largest producers. The occurrence of sandstone and serpentine with the cinnabar deposits of the Coast range is not specially mentioned, although many accessories are named. These misstatements were found only after a searching examination and may be regarded as a few flaws in what is, in the aggregate, a good specimen, well worth the careful attention of the mining man. It might better have been called "The Geology of Colorado Ore Deposits." A good feature of the book is the ample illustration from the author's pencil which accentuates the important geological principles. It is published by Kendrick Book & Stationery Co., Denver, Colo., and will be sent postpaid by the MINING AND SCIENTIFIC PRESS on receipt of $2.50.

Obituary.

EDWARD W. NASH, president of the American Smelting & Refining Co., died in Omaha, Neb., July 22, from the effects of a stroke of paralysis sustained May 22.

Trade Treatises.

Bulletin No. 55, of the Crocker-Wheeler Co. of Ampere, N. J., illustrates and describes small generators arranged for direct connection.

Haeseler "Axial Valve" hammers are depicted in construction and in use in Form 6 of the Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York City.

Aerial tramways are attractively pictured and detailed in a neat brochure from the Vulcan Iron Works of San Francisco, Cal. Both double and single-rope tramways are illustrated.

"Progressive West" is the title of a new magazine devoted to the development of the material resources of the western country. It is edited by Mrs. M. Garwood and is published at Reno, Nevada.

Latest Market Reports.

SAN FRANCISCO, July 28, 1905.

METALS.

SILVER. — Per oz., Troy: London, 27 3/16d (standard ounce, 925 fine); New York, bar silver, 58⅝c, refined (1000 fine); San Francisco, 58⅜c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, $15.12½; Lake, 1 to 3 casks, $15.12½@15.25; Electrolytic, 1 to 3 casks, $15.25; Casting, 1 to 3 casks, $14.50@14.75. San Francisco: $16.00. Mill copper plates, $17.00; bars, 18@24c. London: £67 15s spot per ton.

LEAD.—New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.42½; San Francisco, $3.70, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £14 ℔ long ton.

SPELTER.—New York, $5.50; St. Louis, $5.18; London, £23 15s ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $32.95@33.15; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, ℔ lb., 35@37½c. London, £150 15s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $41.00@$41.50, large lots; London, £7 7s 6d; San Francisco, local, $38.50@39.00 ℔ flask of 75 lbs.; Denver, $42.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 18.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.60; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3¼c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@$23.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ¼c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 12c; Hallett's, 13c; San Francisco, 1000-lb. lots, 11c; 300@500-lbs. 12c; 100-lb. lots, 13c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ℔ set; 14 oz., 40s., 9¾c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¾c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2¼@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 64c; cs., 69c; raw, bbl., 62c; cs., 67c; Lucol oil, boiled, bbl., 56c; cs., 61c; raw-bbl., 54c; cs., 59c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

BORAX.—Concentrated, 6@7c ℔ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ℔ lb.

MOLYBDENUM.—Best, $2.75 ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

URANIUM.—Oxide, ℔ lb., $3.50.

MERCURY.—Bichloride, ℔ lb., 77c.

TUNGSTEN.—Best, ℔ lb., $1.25.

PHOSPHORUS.—American, ℔ lb., 70c.

SODIUM.—Metal, ℔ lb., 50c.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¾c; less than 500 lbs., 8c.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MAGNESIUM.—Pure, N. Y., $1.60.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JULY 14, 1905.

794,834.—PUMP PISTON—R. Addison, Pomona, Cal.
794,837.—ROASTING FURNACE—Anker, Watson & Evans, Los Angeles, Cal.
795,017.—STEAM MOTOR—F. S. Barkelew, Los Angeles, Cal.
794,918.—CHART CABINET—L. O. Bisang, S. F.
794,925.—GARMENT HOLDER—J. W. Cairns, San Mateo, Cal.
795,105.—FURNACE FEEDER—W. H. Curtis, Portland, Or.
794,928.—CONCENTRATOR—W. G. Dodd, S. F.
794,931.—WATER HEATER—M. Flatland, S. F.
795,112.—SAFETY ELEVATOR—R. H. Gaylord, Pasadena, Cal.
795,034.—DRUM—G. Harris, S. F.
794,797.—TOOL HOLDER—P. Hawkinson, Astoria, Or.
794,801.—HARVESTER—B. Holt, Stockton, Cal.
794,714.—ORE GRINDER—F. J. Hoyt, Redlands, Cal.
794,865.—SPIRIT LEVEL—P. Kaufmann, Portland, Or.
795,137.—SIGNAL SYSTEM—F. V. King, Winslow, Ariz.
794,871.—WHEEL ADHESION—R. Lowry, Seattle, Wash.
795,018.—BOOK HOLDER—W. Maguire, Bisbee, Ariz.
794,875.—SEWING MACHINE—R. H. Moore, S. F.
794,733.—RETAINING RING—M. C. Neuner, Los Angeles, Cal.
795,161.—GAS GENERATOR—J. J. Nix, Los Angeles, Cal.
795,162.—GATE—A. Noe, Tacoma, Wash.
795,231.—CAR COUPLING—F. H. Norwood, Pasadena, Cal.
794,883.—BASKET—M. L. Porter, Redding, Cal.
794,884.—FRUIT GATHERER—M. L. Porter, Redding, Cal.
794,948.—LUGGAGE CARRIER—J. J. Richard, Pasadena, Cal.
795 176.—FIRE APPARATUS—S. A. A. Stenberg, S. F.
794,958.—DREDGER BOX—C. M. Symonds, S. F.
794,950.—INDICATOR—C. H. Townsend, Berkeley, Cal.
794,963.—KNITTING MACHINE—G. D. Whitcomb, Glendora, Cal.
795,084.—DENTURE—L. L. White, Portland, Or.
794,706.—ENGINE BOILERS—T. M. Wilkins, Seattle, Wash.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

PNEUMATIC OPHTHALMIC-CHART CABINET.—No. 794,918. July 18, 1905. Louis O. Bisang, San Francisco, Cal. This invention relates to an apparatus especially designed for use in connection with optical practitioners. It consists of a polygonal drum turnable upon a shaft upon which it is carried and a pneumatically actuated device by which the drum may be advanced to expose its sides successively, said sides having characters marked thereon which are designed to test the condition of a patient's eye.

INDICATOR AND ADVERTISER.—No. 794,950. July 18, 1905 Chas. H. Townsend, Berkeley, Cal. This invention relates to a device comprising endless movable belts and a mechanism by which said belts are driven at different rates of speed. It is designed to provide a movable indicator with figures or characters which are successively presented for inspection, and in conjunction therewith a second movable belt adapted to carry advertising or other matter and which is moved in unison with the indicating belt. In conjunction with this is an alarm whenever the indicator is moved to call attention thereto. The device is especially useful in barbers' shops or other places where a line of customers may be waiting to indicate the next in turn. It consists of a plurality of belts, independent drums around which said belts pass, mechanism by which the belts are advanced and a front through which the characters of each are exposed; means for removing belts and drums, said means comprising slotted bearings in which the shafts of the drums are turnable, and elastic sections in the belts whereby said belts may be extended to allow the drum shafts to be lifted from their bearings.

GARMENT HOLDER.—No 794,925. July, 18, 1905. John W. Cairns, San Mateo, Cal. This invention relates to a holder, and especially to a device for holding cuffs, collars and other light articles of apparel and which also comprises a receptacle for collar buttons, studs and other things. Its object is to provide a simple, attractive, inexpensive and practical device of this character. The device comprises a tubular holder having means at one end for attachment to a support, said holder having one end partially closed whereby the interior of the holder is normally accessible and serves as a receptacle for collar buttons and the like, said holder having garment-supporting means on its periphery.

MINING AND SCIENTIFIC PRESS.

Whole No. 2350.—VOLUME XCI. Number 6. SAN FRANCISCO, CAL., SATURDAY, AUGUST 5, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Development of a Prospect.

The past two years has seen greater activity on the deserts of southern Nevada than before in many years. The rich strikes at Tonopah, Goldfield, Bullfrog and in other districts have attracted men of every nationality and every condition in life to the wastes of rocks and sand in that desert region. Many of these had little knowledge of mining, or none at all, when they first reached the region of the mines, but they went into the hills like their more experienced companions, and, trusting to luck, as the greater number of them did, located any reef of rocks which seemed more prominent than those of the immediate vicinity, or which showed the stain of iron oxides or copper carbonate.

The outcome of those chance locations resulted sometimes in discoveries of mineral wealth where more experienced miners would scarcely have looked, simply because the conditions were somewhat different from the ordinary.

In many instances these gold and silver-bearing veins are unlike those in other regions, being found almost wholly in volcanic rocks, such as rhyolite and andesitic rocks of various kinds. Mineral deposits found in these formations are wholly different in appearance from those occurring in slates and schists or other sedimentary rocks or in granite or greenstone. In these latter instances the distinguishing features of the outcrop are usually a defined vein of white or mineral-stained massive or ribbon-like quartz. In the volcanic rocks there are also defined veins, but usually the outcrop is on a zone of fracture, shearing and mineralization which gradually passes over to the normal country rock. There are many of these zones of fracture and mineralization in the desert region, but not all of them are valuable for their precious metal contents. Some contain only iron oxides, with little or no silver or gold. These worthless "blowouts," as they are sometimes called, look much the same as the most valuable of the mines discovered under similar conditions. It is merely a question of values, and these cannot always be determined without assay, as was the case at Tonopah.

When a find of one of these reefs is made by the prospector his first move is to pile up a heap of rocks which he dignifies by the term monument. In this he places a folded location notice, claiming all the law permits, and often more. The next step is usually the location of adjoining land, to take in the extensions of the original location.

He next proceeds to locate additional claims on all sides for "protection" against possible legal troubles later on, and to make sure that nothing is overlooked. Following these precautionary measures work is commenced at the most favorable spot on the group of claims, and strangely subsequent development usually justifies the initial judgment of the prospector—and this applies to experienced, as well as inexperienced men. It is rarely that there are more than two or three, or at most half a dozen, very valuable pay shoots in one small district, and some of the greatest mines of the Southwest are practically alone, isolated from all other mineral districts and locally limited in extent.

Almost universally the first machine placed on a mine is a windlass. Some of the greatest mines of the world in their prospective stage have been so equipped. In fact, where a shaft is required it is the only rational device for hoisting inexpensively from moderate depth. The simple windlass is often followed by a whim, in which horse power is usually employed. Shafts are not infrequently sunk 200 feet or more with a device of this kind, though where the mine promptly proves up well under development, a steam, electric or gas engine hoist is installed. It is not uncommon to see a modern hoisting plant going in on a mine not over 40 feet deep. The limitation is a depth of shaft which will be sufficient to afford reasonable security from the flying rocks when blasting. Occasionally such energy is shown in equipment that the hoist is in place and the headframe built and under roof when it is still necessary to cover the collar of the shaft with a bulkhead of timbers to keep the flying rocks from tearing holes through the roof of the shaft house.

The devices employed by miners in reducing the amount and cost of manual labor about a new mine are ingenious and interesting, and some of these have been previously illustrated. The engraving on page 90 is representative of the first stage in the development of a claim near Goldfield, Nev., which may in time become a noted mine. The greatness of a mine cannot always be predicted from the surface outcrop. Mines, generally speaking, are made, not found. It not infrequently requires years of active and expensive developments and metallurgical experiment before a mine can be considered great from a financial as well as a mechanical point of view.

The Champion-Providence Mine, Near Nevada City, Cal.

A Noted California Mine.

Mining, which for more than fifty years has been vigorously prosecuted in the region adjacent to Grass Valley and Nevada City, Nevada county, California, had done much for the industry in an educational way, as well as producing many millions of dollars in gold from the mines. Many of the mines of these districts have become noted through long years of continued prosperity. For years the Idaho mine at Grass Valley was a famous producer. It was eventually closed down, but it has recently been reopened, and there is promise that it will again become a producer. The history of the Idaho is practically that of a great many other mines of the district. Some of the most important properties have had many "ups and downs." A season of prosperity has at times been followed by one of adversity, but in most instances a mine which has at one time been a profitable producer has again become so when vigorously worked under competent management.

The Champion consolidation is one of the noted groups of mines near Nevada City. It comprises the Champion, Merrifield, Wyoming, Providence and Nevada City mines, besides a number of others. At present a portion of the property is tied up by litigation with the Home Co., the dispute involving some interesting points in the law of apex and extra-lateral rights. Although a considerable area of valuable ground is idle through this suit, the property is being vigorously worked in other portions of it. A long drift has been run from the Champion into the Nevada City, and a good vein of mill rock opened up, and in other places good ore is being mined. On the surface some tributers are mining the outcrop and gathering the float rock, hauling it to mill, and are said to be doing very well by the venture. The accompanying engraving illustrates the surface improvements. At the extreme right is the hoist building over the Merrifield shaft, which is down 1600 feet on the incline. The building adjoining it on the left is the chlorination works, not at present in operation. The next building is the shaft house of the Champion mine. This shaft, also an incline, is down 2400 feet. Near this hoist is the old mill of thirty stamps. Between these buildings is seen the pipe line, which crosses the creek on a bridge. At the farther end of the bridge is the hoist of the Providence mine, not shown in the engraving. The large building on the left of the picture is the new 40-stamp mill, and just above it, a little to the left, is the original Wyoming shaft. To the right of the mill is seen the mouth of the drain tunnel, which is in nearly 5000 feet, draining the Nevada City to a depth of several hundred feet. The present workings of the Nevada City are far below this level.

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THE recent placing of a 20% ad valorem duty on zinc imported into this country is giving substantial aid to zinc producers of the United States, the price of zinc ores having gone up materially since the ruling of Secretary Shaw went into effect.

THE publication of cost sheets of mining and metallurgical operations have a beneficial effect on those engaged in these industries, as they have a tendency to stimulate a friendly rivalry, to bring down the costs and to lessen extravagance in all departments. The segregation of accounts also affords an opportunity to locate excessive costs in the department where they occur should such exist.

THE Argentine Republic of South America, concerning which numerous inquiries have been made of late, is at present an agricultural and pastoral country, but it is said to possess great possibilities in mining in the Andes, which lie along its western border. As yet these mines are developed only to a small extent, but, with the rapid settlement of the country and the influx of American and European peoples, material progress in Argentina's mineral development may be expected.

THE strong tone of the base metal market speaks well for the mining industry in America generally. Copper, lead and spelter are each showing an upward tendency, and this in the face of increased production. The great industrial activity in this country and abroad absorbs the metal output as fast as it reaches the markets, and prices are not only maintained, but advance under the stimulus of strong demand. Tin has not been as high as at present in many years, but up to the present time the tin mines of the United States have not yet reached a point where they can take advantage of this condition.

Graft in Mine Equipment.

Mines are frequently equipped with expensive hoisting and metallurgical plants which are either wholly out of proportion with the available resources of the mine, or entirely unsuited to the treatment of the ore. Not uncommonly the owners and directors of mines and mining companies have little or no knowledge of the business of practical mining, and still less of metallurgical plants and their operation. Such men are likely to build a smelter on a dry ore mine, or put in a gold mill to treat lead carbonate ores because they carry gold. From necessity, where the directorate of a mining company realizes its lack of technical knowledge, they naturally turn to the consulting mining engineer for advice and assistance in preparing proper plans and specifications for a suitable mining and reduction plant. In this engineer they must have implicit confidence, or his services would not be sought, but unfortunately the history of some mining concerns proves that occasionally this confidence is misplaced, and that the "consulting engineer" employed is either grossly incompetent and inexperienced, or that he is a "grafter," and sometimes both. On the other hand, the engineer may be competent, but easily influenced, and, desirous of securing a retainer, lends himself to the plans of another, and recommends what he knows to be unsuited to the requirements of the case, or, at least, that which he is not sure will be entirely satisfactory, trusting to some future turn of fortune's wheel for an opportunity to set himself right—in other words, he embraces an opportunity to experiment at the expense of his client.

In the manufacture and installation of mining equipment there is often large profit, particularly where the plant is extensive and the competition is not too keen, and substantial proofs of the friendship existing between the manufacturer fortunate enough to secure a good fat contract and the engineer who advises the purchase may sometimes pass. This practice, not at all uncommon in other industrial lines, has resulted in its abuse by some.

Take as an instance a mining company owning a valuable property, the ore of which is not free milling, but which really requires considerable chemical and metallurgical knowledge on the part of the consulting engineer, who is called in in an advisory capacity, to determine just what sort of plant would be best suited to the reduction of this ore, assuming the ore to be a sulphide, with several bases, but carrying also good values in gold and silver. The engineer advises a stamp mill and an elaborate lixiviation plant. The specifications are elaborate, and set forth in detail each part of the machinery and specify certain makes of mechanical devices which may run up the cost unnecessarily. The investment required in this plant would be large, but the possible commissions coming to the engineer would help to sooth his conscience, even though the entire plant must later on be changed and remodeled at great expense to suit it to the treatment of the ore.

Such grafting cannot but prove injurious to legitimate mining. To avoid such results, the investors should know that their engineer is competent to advise them properly, for in all probability there would be just as much advantage to the engineer in advising a proper plant in the first place as in that which ultimately proves to be useless for the purpose for which it was intended. Many large plants, it would seem, are ordered on insufficient investigation as to their adaptability to the ore to be treated and to surrounding conditions.

In one instance, the purchasing agent of an Eastern corporation owning mines in the West made a request for bids on a plant of certain description. The engineer for the house assured the would-be purchaser that the plant proposed was not at all suited to the ore, but was told bluntly that it need not concern him in the least; that the company had decided to build a plant of that description, and if this house did not care to furnish it they would go to those less particular. As the machinery people were out for business, they took the contract and built the plant, but as had been said, it was not adapted to the ore and it stands idle to-day.

A CORONER'S JURY in Shasta county, Cal., found that a miner who was killed in the shaft of a mine came to his death through the carelessness and incompetency of the hoisting engineer, who was immediately discharged. It seems unfortunate that a human life should be sacrificed to make it apparent that the hoisting engineer was incompetent. It is certainly a part of the duty of the management of a mine to know that a man appointed to so important and responsible a position as that of hoisting engineer, particularly when he must handle men, is competent and experienced as an engineer of this class, and also reliable as a man. The temperament and disposition of a hoisting engineer is almost as important as his ability as engineer.

Rock Nomenclature.

The widely divergent opinions of those high in authority in geological science, and its several branches, often render a clear understanding of what is meant most difficult, if not impossible, to nontechnical readers, if not to the "Doctors" themselves. This is notably the case in rock nomenclature. It is well known that rocks of certain groups pass by gradual transition from one type to another, the addition or absence of certain minerals, conventionally determined as essential, making an important difference in the name. It is not infrequently possible to obtain from a single rock magma half a dozen or more distinct classes of rock, and yet, in the face of this knowledge, the confusion, already more than sufficient, is being increased by further hair-splitting determinations until rock nomenclature is becoming so thoroughly involved that it begins to look as though it would require the labors of an international congress of geologists and petrographical specialists to bring a semblance of order out of the existing chaotic condition. More than twelve years ago the late Dr. F. M. Endlich, a noted mineralogist and geologist, said that in a few years the microscope would cease to be employed as a means of rock determination, as by its use confusion became more confused, and that the transitions of rocks from one type to another, with which all students of microscopic petrography are familiar, would eventually result in rock classification falling back upon chemical analysis as a means of identification. It is scarcely probable that the prophesy of this eminent scientist will be realized, if for no other reason than the advantage the microscope affords in the study of rock structure. It is well known that certain rocks of nearly the same chemical composition present a very different physical appearance, and under the microscope this difference is accentuated in even a greater degree.

If rock classification and nomenclature could be simplified, instead of rendered more difficult, by the creation of new and previously unheard of varieties among rocks already commonly known by names sufficiently definite and comprehensive, it would be greatly appreciated by all concerned.

ENGINEERS are not infrequently called upon to undertake the designing and building of structures which call for innovations. When unusual constructive features are introduced in these structures there is always the feeling that possibly the novel construction is not all that the engineer believes it to be—and a test is demanded, to prove the correctness of the engineer's theory and to demonstrate that the structure is safe. Without doubt the testing of new structures, whether built on new lines or after ideas long in use, is necessary but, in numerous instances, these structures are tested to their destruction, being required to sustain loads or undergo strains which never are equaled or approximated in working practice. When dams, arches, or other structures are built, it is well to test them to a reasonable extent, but not infrequently these tests are carried far beyond the limit of safety, and usually these structures, built on proper lines, are sufficiently strong and would meet every requirement. Recently, a reinforced concrete structure, which was not designed nor required to carry any weight, was loaded with sand for the purpose of test and the entire structure collapsed. In Mexico a concrete viaduct, built in a series of arches, was likewise tested to its destruction. It would seem that tests to determine the real capacity of an edifice or structure, or even so simple a thing as a rope, a timber, or steel beam, might be applied without going beyond the limits of rational demands for security.

CONCENTRATES.

THE micas of commerce are muscovite and phlogophite, the former being of more common occurrence.

NICKEL AND COBALT usually occur together, and where one is found at least a trace of the other is almost sure to be found also.

THE only mineral mined for commercial purposes which contains titanium is rutile. Its principal use is in the manufacture of titanium oxide for coloring porcelain.

THE presence of metallic lead and alloys of lead, zinc, etc., in amalgam, will lead to the belief before retorting that the gold contents of the squeezed amalgam is much greater than it really is.

DANAITE is a cobalt-bearing mispickel. When exposed to natural oxidizing influences it usually becomes coated with a pink efflorescence of erythrite or "cobalt bloom," a hydrous cobalt arsenate.

RUNNING ropes may be guided around curves by placing alternately horizontal and vertical rollers, the latter being slightly tapered, the greatest diameter being at the top, to prevent the rope working upward.

LARGE rock breakers should be able to break rock from a maximum size to a stated smaller size with less expense than in a smaller machine of the same type. This is a principle which is applicable to nearly every class of ore reduction.

THE metals mostly used in steel hardening are chromium, molybdenum, nickel, titanium, tungsten, uranium and vanadium. Titanium is used only to a very limited extent, other metals having been found to give more satisfactory results.

MONAZITE is an anhydrous phosphate of the rare earth metals—cerium, lanthanum and didymium. It is mined chiefly for its thoria contents, being obtained from placers, both modern and ancient. It is obtained in the same manner as gold, by sluicing.

METALLIC gold, when in very fine grains, or thin sheets like gold leaf, is slightly soluble in a dilute solution of hyposulphite of soda. Metallic lead is not affected. A moderately warm solution of sodium hyposulphite is more active on most minerals than a boiling hot solution. Silver sulphide is not soluble in the hypo solution.

IT is impossible to estimate the value of an undeveloped mine by surveying the surface, though great mines usually carry certain distinctive features which characterize strong ore deposits everywhere. There are important exceptions, however, and valuable mines occasionally underlie a surface that conveys little idea of the value beneath.

GARNET is a name employed to denote a group of minerals which are closely related in both physical and chemical properties. They are rather complex in composition, being silicates of alumina, with varying amounts of lime, magnesia, iron, manganese, and other metallic oxides, to which are due the various colors. All garnets crystallize in the isometric system.

AN authority has placed the relative cost of the excavation by hand of the various materials as follows: Hard rock, 1.2 to 1.5; medium hard rock, 0.75 to 0.100; soft rock, 0.35 to 0.50; friable soils, 0.20 to 0.25; loose soils, 0.13 to 0.18. These figures may be referred to the cost of excavating any particular kind of ground, for the purpose of comparison, when any one is known.

FULLER'S EARTH resembles clay, but unlike most clays does not become plastic upon being moistened. It is used in fulling wool and in clarifying and deodorizing oils, etc. It may be considered as a clay containing just enough fine silica to destroy its plasticity, so that it crumbles to fine powder when mixed with water. Some siliceous rocks upon decomposition are converted to Fuller's earth.

THE sources of tungsten are the minerals scheelite, wolframite and hubnerite. Scheelite is the most readily reduced of these to metal or to an alloy with iron. This mineral is a tungstate of calcium. It is usually white or cream colored and noticeably heavy. The most abundant of the tungsten ores is wolframite, the tungstate of iron and manganese. Hubnerite is similar to wolframite, but contains more manganese.

THERE is a structural difference between slate and schist, though the chemical composition of these two varieties of rock may be similar. Slate breaks with a smooth cleavage, which may be due to either sedimentation or to pressure, or both. Schist does not split as readily nor as smoothly as slate, having a more wavy appearance. Slates are uniformly fine grained, and schists may be either fine or coarse in texture. Many confuse these terms. The same confusion exists between slate and shale. The structure of shale is due entirely to sedimentation, and not to pressure. Shale is not as firm as slate, easily disintegrating. It is found more abundantly in the later rocks. Shales have a laminated appearance, due to bedding, and on exposure usually break in small fragments. Shale is simply a consolidated fine clay or mud—it may graduate into slate. When the grains become coarser the rock graduates into sandstone, and when very coarse is called grit.

DIAMONDS have been found in a number of localities in the United States, viz., in Alabama, in Shelby county; in California, in Amador, El Dorado, Butte, Nevada, Trinity and Del Norte counties, and one diamond is reported from Tulare county; Indiana, in Brown and Morgan counties; Kentucky, Russell county; Michigan, Cass county, a diamond of 10⅞ carats; Ohio, Clermont county; Tennessee, Monroe, Roane, Lutterell and Union counties; Wisconsin, Pierce, Dane, Washington, Ozaukee, Waukesha (15⅛⅝ carats) and Racine counties.

A "KEEVE" is a circular tank or pan in which a separation of mineral is effected by the agitation of the pulp by rotating paddles or stirrers, which are actuated by a vertical shaft revolving in the pan, and by hammers or other devices automatically striking the side of the tub to produce a slight shock. Hammers are sometimes similarly employed to strike a box containing sulphurets shoveled from the concentrator box, the object being to cause the sulphurets to settle more solidly and the water rising to the surface of the box and flowing away, thus reducing the moisture.

ASSAY SLAGS are always brittle, and some are harder and more dense than others, but the object should always be to make a perfectly fluid slag which will permit the lead particles, reduced from the litharge to take up the particles of precious metals, and to accumulate in a button at the bottom of the crucible. The earthy and other impurities are driven into the slag. If the slag is not sufficiently fluid, this result cannot be accomplished. The proper amounts and kinds of fluxes must depend on the character or composition of the ore. Copper makes the lead button hard, and antimony, arsenic, tellurium, etc., make it brittle. The cause of lead adhering to the slag is that improper fluxes have been used or that the heat has been too low to properly fuse the charge.

WHERE the mortar or the anvil block on a concrete foundation cuts unevenly into the concrete, it has been found by experiment that if a plate of steel (boiler plate) be placed between the anvil block and the concrete, the plate extending 2 inches or more beyond the edge of the casting, this tendency to uneven wear is obviated to a great extent. Concrete mortar blocks and heavy anvil blocks between mortar bottoms and concrete have a tendency to increase the crushing capacity of the battery, but it also hastens the crystallization of the stamp stems, with consequent increased breakage. Instances are reported where this increased breakage was noticed as 3 to 1 against mortars resting on wooden blocks. This being the case, it is merely a question as to which is the more economical—increased crushing capacity or lessened expense for repairing the broken stems. This each mill man must figure out for himself under the conditions existing at his mill.

A PROPER smelting mixture would require a careful analysis of available fluxes, where the basis of the charge is as follows: Cu, 4.35%; SiO_2, 52%; CaO, 9.3%; MgO, 0.3%; S, 3.5%; Fe, 12.1%; Al_2O_3, 4.55%; Ag, 3.82 oz.; Au, .06 oz.; to smelt in a 36-inch round furnace. Should figure on a 35% silica slag for this work, and a copper bullion product. The furnace should put through about thirty tons in twenty-four hours of ore and fluxes; fuel consumption about 13% of charge with good coke. An ore such as described is not self-fluxing and would require the addition of lime and iron flux, the amounts depending upon analysis of these fluxes. In general this ore would require a charge approximating: 22% good iron oxide flux; 35% good lime flux; 43% ore as submitted. Such an ore would not pay to smelt in a 36-inch furnace, and making bullion product, but if sulphides could be obtained in the vicinity, that would stand a small working expense; it would be possible to make it pay on a 100-ton basis, provided fuel is not too expensive. In the case of a sulphide ore with fuel not over $15 per ton, the same furnace should smelt fifty tons of ore in twenty-four hours on a fuel consumption of 6% or 7% coke. For method of charge, figuring and general data, see "Modern Copper Smelting," by Peters, in chapter devoted to "The Chemistry of the Blast Furnace."

THERE are several of the so-called penetration devices for determining the quality of asphaltic cement or pavement, the most noted being Bowen's and Dow's. Bowen's apparatus consists of a needle of stated size and weight, the vertical movement of which is indicated on a dial, by a pointer. The needle is secured to a lever which is balanced by a counter-weight. The needle is lowered to the point of contact with the asphaltum when a clamp is released and the needle penetrates the asphalt for the period ore of second, and the amount of penetration is registered on the dial. The asphalt must have been kept at a temperature of 77° F. for half an hour before the test is applied. The Dow machine consists of a No. 2. sewing needle secured to the end of a brass rod, which is connected with a metal tube 0.4 inch diameter and 1.6 inch long. Mercury is poured into the open end of the tube in any desired amount from 30 to 300 grains. The rod, tube and needle are free to slide vertically in a frame and can be secured in any position by a clamp. This vertical movement of the instrument is registered by a pointer on a graduated dial. The material to be tested must be at the standard temperature—77° F. (25°C.)——and the unit of measurement is the distance, in hundredths of a centimeter, that the No. 2 needle will sink into the asphaltum pavement in five seconds, when weighted with 100 grains of mercury. This latter instrument is the standard of measurement employed by the Government since Jan. 1, 1899.

WHEN a large excess of lime is added to cyanide solutions it results in the formation of Ca (CN_2). Only sufficient lime should be employed to neutralize the acidity of the ore. If the use of lime does not produce the desired result, it would, perhaps, be better to treat the ore with fresh water to wash out a portion of the soluble sulphates, and then a smaller quantity of lime should suffice. Very few cyanide operators use caustic lime. It is the almost invariable practice to use slacked lime. It is a very difficult matter to determine the amount of calcium cyanide present in a solution. The amount of cyanogen present can be determined and also the amount of calcium present. The operator must then judge for himself the amount of calcium cyanide in the solution. It is impossible to have calcium carbonate present in an alkaline solution in appreciable amount for the reason that it is an insoluble salt. W. H. Virgoe says, in the Journal of the Chemical, Metallurgical and Mining Society of South Africa, that if the alkali be lime, one molecule of the zinc salt requires the presence of two molecules of lime, and the equations are probably therefore as follows: $1 = 2(Zn\ Cy_2\ 2KCy) + 4Ca(OH)_2 + 2Ag\ NO_3 = 2Zn\ Ca\ O_2 + 2Ag\ KCy_2 + 2KNO_3 + 2Ca\ Cy_2 + 4H_2O$. $2 = 2Ag\ NO_3 = 2Ca\ Cy_2 = Ag_2\ Ca\ Cy_4 + Ca(NO_3)_2$. This paper was published in full in the MINING AND SCIENTIFIC PRESS, Oct. 31 to Nov. 21, 1903, inclusive.

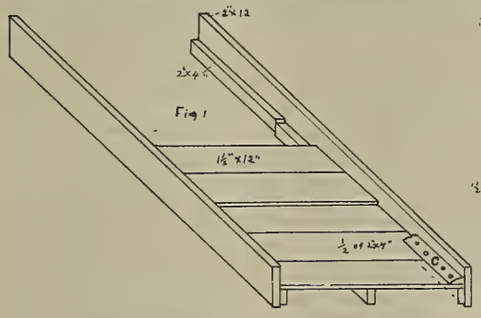
THE Homestake mine at Lead, South Dakota, occurs in pre-Cambrian rocks, of presumably Algonkian age. These rocks consist of a series of metamorphic sedimentaries—quartzite, mica schist, quartz schist, graphitic, garnetiferous and chloritic schists, phyllites, slates, etc., intruded by ancient basic dikes, now altered, for most part, to amphibolite schist, but which were evidently originally a type of rock similar to diabase, as the hornblende has been found, by study of microscopic slides, to be uralitic—that is, altered from augite, and not original hornblende. In these greenstone schists are found a variety of minerals, mostly of secondary origin. They include, according to J. D. Irving and S. F. Emmons, actinolite, plagioclase, secondary quartz, and orthoclase in subordinate amount, with zoisite, titanite, leucoxene, and calcite. More recent intrusions of acid rocks have taken place. These rocks are of two kinds, rhyolite and what is described as a trachytoid phonolite. These latter dikes and masses are closely associated with the ore bodies of the Homestake mine, and are thought by some to have resulted in enriching the ore deposits. It is known, however, that the schists were gold-bearing prior to the intrusion of these dikes, as not only large masses of the older rocks are gold-bearing where there is no porphyry, as in the De Smet mine, but the overlying conglomerate at the base of the Cambrian is gold-bearing, while it is known that the intruded acid dikes are not older than cretaceous.

THE most important rock-forming mineral is quartz. It occurs in many forms and under many guises, and its presence is not always readily detected, being sometimes found in microscopic grains. The next most important rock-forming mineral is feldspar, of which there are several varieties. Feldspar is particularly prevalent in eruptive rocks, in some kinds forming a very large percentage of the entire mass. The most important characteristics which distinguish feldspars are the presence or absence of potassium, soda and lime. Orthoclase feldspar is the characteristic feldspar of granite (potash feldspar) and is colorless, greenish white to pink. Sanidine is the distinguishing feldspar of trachyte and rocks of that class. It is similar to orthoclase, containing potash, but also some soda. It is usually glassy and transparent. In color it is grayish or yellowish. A third variety of potash feldspar is microcline, which occurs in irregular grains rather than in distinct crystals. There are two other varieties of feldspar, intermediate between the alkali orthoclase feldspars and the basic lime-soda feldspars. These are cryptoperthite (a soda-potash variety) and anorthoclase (a potash-soda variety). They are found mostly in basic rocks. The plagioclases are the several varieties of feldspar which range between the soda feldspar (albite) on one hand and anorthite (the lime feldspar) on the other. Oligoclase is next to albite, containing relatively much soda and a little lime. It weathers readily to kaolin and white mica. Andesite is a soda-lime feldspar, in which there is a relative increase of lime over that in oligoclase. It is the characteristic feldspar of the andesites and kindred rocks. Labradorite is a lime-soda feldspar and is found only in dark colored basic rocks, such as dolerite and norite. Anorthite is lime feldspar, and is the ultra basic feldspathic constituent of volcanic rocks. It is common in the lava of modern volcanoes.

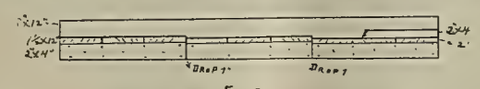
Amalgamating Tables.

Written for the MINING AND SCIENTIFIC PRESS by ALGERNON DEL MAR.

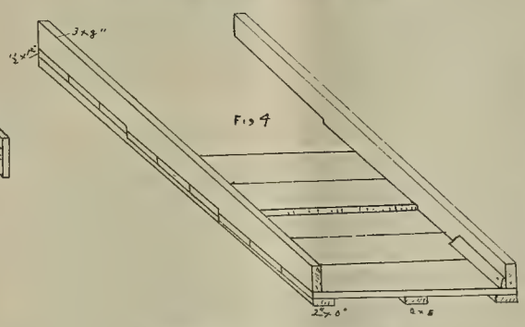
The accompanying sketches represent three styles of amalgamating tables shown without the copper plates and without supports. Each copper is presumed to be 4 feet in length (although, for convenience in drawing, they are represented as 3 feet) and 4 feet 6 inches respectively in width, with a drop of an inch after each plate. A higher drop between the plates would have a scouring effect, while half an inch is often sufficient to secure the desired result—that of turning the pulp over so that any floating particles of gold or "quick" may be brought into contact with the amalgamated surface of the plate. Should the copper plates be 4 feet wide, as is often the case, the side strips C (Fig. 1) may be made 4 inches wide, instead of 1 inch, or an offset may be made at the top of the table to fit around the lip of the mortar. The



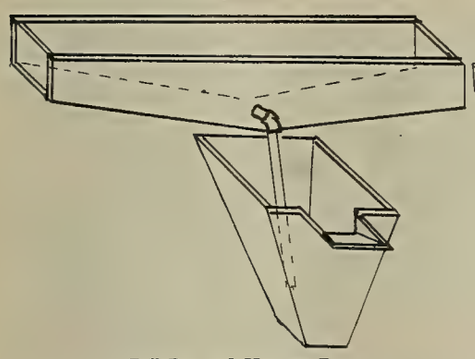
Section Showing Parts of Plates in Place.



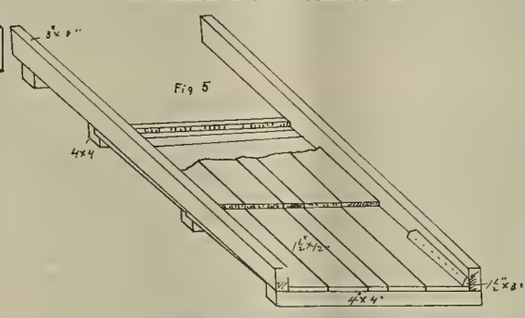
Side View, Showing Drops in Plate.



A Variation in Table Construction.



Tail Box and Mercury Trap.



Method of Constructing Table.

objection to the 4-inch strip is that it takes off 6 inches of space between two tables, which in mills where the battery posts are narrow would inconvenience working between the plates.

Should it be deemed advisable to have the upper 4 feet of plate detachable, this can be easily arranged in each case; but, unless special care be taken to make a good joint and a sufficient overlap, the table will be very leaky.

There are three important essentials in an amalgamating table, leaving out of question the grade or angle of inclination: First, it must be strong and rigid, to bear heavy weights and strains; second, it must be water tight, to prevent loss of gold by leakages, and to prevent loss of temper on the part of the millman, who neither desires to see gold lost nor to wade about in rubbers; and, third, it must be level on a line normal to the pitch of the plate, or the pulp will go to one side. The center might even be a shade lower than the sides, for the tendency is always for the pulp to go to the sides.

Another important consideration, that has not so much to do with the construction of the table as of the mill, is that the floor on which the table rests, or, at least, on which the supports of the table rests, should be totally detached from the battery itself, for the vibration caused by the falling stamps, if communicated to the table, will cause amalgam and "quick" to gradually work down the plates, and it is most unpleasant for the millman who has to stand and work about on that same floor for twelve hours at a stretch. With the old light stamps the vibration was not an important consideration, but with stamps weighing from 1000 to 1300 pounds, dropping over 100 times a minute, it is an important matter and must be reckoned with as a primary factor in mill construction.

The table illustrated in Fig. 1 requires little skill to construct, and the amount of lumber required in each case being equal, it is, perhaps, to be preferred. There are many other types of table, but Figs. 1, 4 and 5 are representative and may serve those who are not altogether familiar with the subject in making a choice. Some prefer one piece of copper 12 feet long; therefore no transverse joints or steps are necessary; but strength and insurance from leakages are still the prime considerations.

The side strip, to be sure of a water-tight joint, may be bolted down with ¼-inch bolts or securely nailed or screwed, as is more often the case. The plates should be underlaid with blanketing or canvas, the latter preferred.

It is often a matter of discussion whether the top of the table should be made with tight-fitting boards or open spaces left between them. The writer is of the opinion that it makes little difference, if the side strips and all other joints are absolutely water tight. But can one be sure before actually turning on water? If there are leakages and the boards are planed to fit tight, any moisture getting under the plates will tend to warp the table and so buckle the plate. It is obvious, therefore, that leakages must not be allowed. A good plan is to plane the boards and leave about ⅛ inch space, between which fill with some material that will expand before the wood, such as oakum. Any liquid getting under the plates will then cause a water-tight joint without warping the boards.

At the end of the plates it is best to have a tail box (Fig. 3), the length of which equals the width of the table, and about 8 inches wide.

All the pulp from the table falls into the tail box, which is fitted with a discharge hole at or near the bottom, through which the pulp passes to the mercury trap (shown in Fig. 3) through a connecting pipe.

The exit of the pipe or pipes from the tail box into the trap should be about 2 inches above the bottom of the tail box, and the pipe should dip into and near the bottom of the trap and not discharge on the surface, for in this case the whole object of a trap is negatived; the essential feature of a trap is to create a zone of comparative quiet, where the heavy amalgam and "quick" may have a chance to separate from the lighter sand and sulphurets. An ordinary truncated pyramidal trap is shown, but there are many other patterns equally as good, some with baffle boards and some with floats.

The Bingham Mining District, Utah.

A work of practical as well as scientific interest is a professional paper entitled "Economic Geology of the Bingham Mining District, Utah," by J. M. Boutwell of the United States Geological Survey. An introductory chapter on the general geology of the region about the Oquirrh range, by S. F. Emmons, adds much to the value of the paper, and a section on the areal geology of the Bingham district, by A. Keith, contributes greatly to its interest.

The field work, of which this report represents the final results, was first undertaken in the summer of 1900. Owing to the fact that the geological structure of this district proved to be unexpectedly intricate, the work of investigation has been more prolonged than was at first expected. While the delay is cause for regret, this regret is much tempered by the consideration that, had the report been published earlier, many important facts brought to light during the vigorous development of the region in late years would not have been available.

In his introductory chapter, Mr. Emmons describes the general geological features of the Oquirrh range. The geography, topography and areal geology of the Bingham district are described by Mr. Keith. In the economic portion of the report, which forms the main body of the paper, Mr. Boutwell gives a history of the Bingham mining district, discusses the character, occurrence and genesis of its ores, and describes in detail the ore deposits in all the accessible workings of every property in the district. A chapter is devoted especially to the placer mines of the district. From all these detailed scientific and economic studies Mr. Boutwell deduces a valuable array of commercial applications, which will make interesting reading for the miner. The final chapter on recent developments brings the investigation down to date. The volume is amply and appropriately illustrated, with forty-nine photographic plates and ten miscellaneous maps, sketches and figures.

Bingham is the oldest and largest copper-producing camp in Utah. It is situated in the Oquirrh mountains, 20 miles southwest of Salt Lake City. The main slopes of the Oquirrhs, which rise steeply from elevations of 5000 feet on the surrounding deserts to elevations of 10,000 feet on the main divide, are deeply dissected by many narrow, steep-walled canyons. Toward the northern end of the range is a prominent canyon which follows a crescentic course northeastward across its eastern slope and receives several tributary canyons from the west. This is Bingham canyon, which has given its name to the mining district. Its drainage basin embraces the principal mining localities which constitute the Bingham district, an oblong area of about 24 square miles.

This region has been the center of a complex succession of geological activities, which have resulted in the deposition of valuable ore bodies. The sedimentary country rock has suffered extensive intrusion, intense fissuring and partial burial beneath a latite flow. The ore bodies are centered in the localities which have undergone the most intense intrusion and fissuring. Outside the limits of the comparatively small area that is characterized by the combined effects of these several activities, ore deposits have not been found.

The present output consists almost entirely of low-grade pyritous copper ore with comparatively small amounts of enriched high-grade black copper sulphide ore and of rich argentiferous lead ore. The immense bodies of copper ore occur as lenticular beds in metamorphosed limestone adjacent to intrusives and fissures. The rich argentiferous lead ores occur in strong northeast fissures.

The daily output of the camp is about 2000 tons, which is produced almost entirely by five great consolidated properties located upon a belt of metamorphosed limestone. In 1900 the district produced only a little over 100,000 tons of ore; in 1904 it is reported to have had an output of nearly 1,000,000 tons of copper ore alone. Its total output from 1874 to 1904 is valued at about $40,000,000.

The two points in Mr. Boutwell's paper which will be of most interest to the geologist and the miner respectively are his conclusions regarding the genesis of the ore deposits and the probable future of the district.

Mr. Boutwell holds, briefly, that between Carboniferous and late Tertiary time monzonitic intrusives invaded sediments in the Bingham area, metamorphosed them and introduced metallic elements which replaced marbleized limestone with pyritous copper sulphide. Later, heated aqueous solutions introduced additional metallic elements, such as copper, gold and sulphur. Silver-lead ore was deposited in the northeast-southwest fissures, mainly by filling, partly by replacement. Since this second period of mineralization, these original ores have been altered in their upper portions, by surface waters, to carbonates and dioxides, and relatively enriched in their underlying portions through replacement by black copper sulphide with additional gold and silver, probably as telluride.

Mr. Boutwell believes that geological indications and recent developments are favorable to the future of the mining industry in the district. They show it is reasonable to expect that new shoots of valuable copper-sulphide ore will be found in the great limestones in central localities, and that new lodes of rich argentiferous lead ore will be discovered in the composite country rock about the head of Bingham canyon, and in or adjacent to the calcareous-carbonaceous shale northwest of Bingham canyon and Carr Fork. Furthermore, recent mining developments have increased the known resources of two types of copper deposits, first by indicating that the values in the great copper shoots descend in depth, second by proving that the disseminated low-grade auriferous copper ores in the monzonite can be milled at a profit. These facts indicate a probable regular increase in the output in the immediate future and imply the continued prosperity of the mining industry of Bingham.

This valuable work will soon be ready for general distribution. It is listed as Professional Paper No. 38, and may be obtained, free of charge, on application to the director of the Geological Survey, Washington, D. C.

Vertical Shaft Sinking on the Witwatersrand, South Africa.

In discussing the paper of H. F. Roche in the Journal of Chemical, Metallurgical and Mining Society of South Africa on "Vertical Shaft Sinking on the Witwatersrand," J. Pedrini said:

Mr. Roche depicted an ideal method and gear for sinking vertical shafts in future. I agree with him that the steel headgear and the permanent hoisting engine should be erected, if possible, at once, time permitting.

The author recommends the tamping in of 20 or 30 feet of clay directly above the first set of bearers. That might answer where the shaft is in country rock from the surface, but I contend that the tamping in of clay behind the timber cannot be relied on, nor is it advisable where there is water and heavy pressure behind the timber. A good plan and method, in my opinion, for sinking through surface soil sand or heavy ground, is to sink the shaft 2 feet larger than the size required and timber temporarily, say 6x6 inches (ground permitting), until the solid formation is properly entered, and the first set of bearers set in position in deeply seated hitches in the bottom, the ground leveled all around, and the first set of the permanent timber resting on the bearers set in position and closely lagged, when the bottom set of the temporary timber could be removed if practicable, and the space behind the timber filled with 2 feet of concrete; the operation repeated to the surface. Should there be any water a drain pipe is put in through the concrete at the bottom and run into a tank fixed for the purpose, and thence baled or pumped to the surface. A concrete mixer should be erected near the collar of the shaft and a chute connected to send the concrete down the shaft, thus saving unnecessary handling. This plan, in my opinion, will keep all surface water entering the shaft and will provide a solid foundation for the collar set. The most important point is that it practically relieves all pressure behind the timber. It has also proved a success in other mining fields where running sand and water were encountered.

I cannot endorse Mr. Roche's opinion in carrying down a Cornish pump in conjunction with a sinking pump where sinking operations are in progress for many reasons. The size of the pump might prove too small or too large for the water encountered, hence the unnecessary cost involved. He says that the size of the pump would depend on the quantity of water and the surrounding conditions and data from the outcrop mines. I am of the opinion that might prove very misleading, and many instances could be quoted where deep level mines have a great deal more water to contend with the outcrops; in other cases the reverse.

When we consider the great depth of future shafts, the marvellous progress of electricity as a motive power in other branches of engineering, and the introduction of electrically driven high lift pumps working at a pressure from 600 to 700 pounds per square inch, corresponding to a vertical height of 1500 feet, a Cornish pumping plant beyond a depth of, say 500 feet, in my opinion, has passed the stage of practical economy.

As an illustration, suppose a shaft, say 3000 feet in depth, to be equipped with a 10-inch Cornish pumping plant. Before the water is delivered at the surface it requires to be lifted by stages ten times, requiring ten complete sets of pumping parts, five sets of balance bobs, and five stations cut for same; ten cisterns will also require to be cut, 10 inch delivery pipes, about 3000 feet of 10 to 12-inch pitch pine rods, plunger poles, etc., and other moving parts, making a total weight of, approximately, over 150 tons of reciprocating details, requiring same to be started and stopped, say five or six times a minute—the maximum speed that this class of pump could be driven with safety, on account of the great weight in motion limiting it, and stresses are soon overreached, causing breakdowns. Now in an up-to-date high lift pumping plant there are light weights, smaller parts, continuous motion, requiring a smaller delivery pipe, delivering the water to the surface in two stages instead of ten, giving at once the most flexible system, accommodating to any size instalment, no moving parts in or near the shaft, with less supervision and practically very little wear and tear. These modern pumping plants will prove themselves far more economical in working than a Cornish plant. I also recommend a compressor air-driven plant with reheater should be put down as a stand-by in case of a breakdown.

Shaft sinking and mining on these fields are the simplest in the world, and the same is true as regards ventilation. It is only a matter of equipment and other detail for the mines to be worked at the lowest cost possible. We have no heavy water to contend with except in a few isolated cases, no excessive hardness of rock and everything favorable for record shaft sinkings being made. In a comparatively dry shaft I prefer hand labor over machines, being 20% to 30% cheaper, but when water has to be considered, machines have the advantage over hand labor, and I prefer the larger size, viz., 3⅛ inches diameter, instead of the small size, 2½ inches, and the greater number you can put down the shaft, the quicker the ground drilled, consequently a better footage record at the end of the month.

I can endorse Mr. Carter's remarks in regard to efficiency and good workmanship in regard to shaft sinking. It is better to sacrifice a little speed and make sure that the work is done in a substantial manner to last the life of the mine with a minimum cost of repair. Proper bearers should be put in at about 80 feet interval and only the best of timber put in the shaft.

Continuing the discussion, L. Simson said: I judge that Mr. Roche has been somewhat misinformed in regard to the sinking of the Catlin or East shaft of the Jupiter Gold Mining Co., Ltd. The average monthly sinking in this shaft for twelve months from Feb. 1, 1898, the time when active sinking commenced, after dewatering in January, was 146.6 feet, and the greatest amount for any one month was 186 feet. Similar figures for the Howard or West shaft of the Simmer & Jack West, Ltd., from March 1, 1898, give an average of 145 feet, with 203 feet for the month of July as a maximum. From these figures it will be seen that 211 feet per month were never made.

The natives working during this period were not all "O.R C. Basutos," but a mixed lot, and not more than half were "excellent," while fully one-third were very poor. No contractors were ever employed, and changes of employes were frequently made. The rate of pay for miners and timbermen was £1 for an eight-hour shift, and a bonus for footages over 100 feet was distributed to all those who were deserving and directly connected with furthering the shaft sinking, a part being often given to employes who pushed along on breakdowns, repairs, etc. It is interesting to note here that as late as 1895 similar bonuses were given for hand-sinking footages over 40 feet, and this limit has been gradually raised.

Where the ground permitted, shaft timbers were not kept within 30 feet, but generally 60 feet or over from the bottom. The conditions under which the sinking was accomplished were not "perfect," and, with the exception of the fact that there was little trouble from water, the equipment did not approach the ideal laid down by Mr. Roche.

In regard to buckets versus skips, it is probable that skips have given greater safety in the past, but with our present experience there should be no danger from the use of buckets down to 3000 feet. When three buckets are used on one double-drum hoist, one beign in process of filling continuously in that spot in the shaft where the least shoveling is needed, quicker cleanups and less shoveling will be done in a large shaft than with skips. If the nature of the ground will permit the timbers being kept, say 60 feet or over from the blasting, more presentable shaft timbers will result than is the case with some shafts on these and other fields, where the use of skips has necessitated the timbers being kept close down and the bottom set cleated.

Mr. Bradford has drawn attention to the most excellent incline sinking done under Mr. Britten's management of the Wolhuter during 1902. Since that time at the New Kleinfontein east incline shaft, under Mr. Way's management, an average of 171.6 feet per month has, I understand, been made over a period of five months, with a maximum of 213½ feet for one month. But even this is eclipsed by the work done in July, 1898, under E. H. Garthwaite's management at the Nigel Deep, where a 14 by 17-foot incline shaft was sunk at the rate of 260 feet in a month, two Ingersoll-Sergeant 3½-inch drills being used. Besides the rock from the bottom, rock from the development of six drives and several winzes and raises were hoisted through the shaft during the month, and all this with a 7 by 12-foot double drum hoist, situated underground at the top of the incline.

PERFECTLY transparent quartz, colorless and without flaw, is valuable if occurring in good sized crystals or masses. A ball 5½ inches diameter, cut from a crystal discovered at the Green Mountain mine, Chili gulch, Calaveras county, Cal., is valued at $3000. Several crystals from the same deposit cut 7 inch spheres, but they were not without slight flaws. A 7-inch ball without imperfection would have a value about $30,000.

The Ore Deposits of Mount Lyell.*

NUMBER IV.—CONCLUDED.

Written by J. W. GREGORY.

The two main ore masses of the Mount Lyell field both occur where masses of the schists have been nipped in the re entering angles between great, hard blocks of conglomerate. The Mount Lyell mine has been developed in schist, which is bounded on the east by the Great Lyell Fault; to the south by the cross fault, which has thrown the Great Lyell Fault to the west; and it is bounded below by a thrust plane, which probably shifted the downward continuation of

Development of a New Strike on the Desert. (See Front Page.)

the Mount Lyell ore mass to the west, and left it isolated as the buried pyritic mass of the South Lyell mine.

If this explanation be correct there must be two parallel faults below the Mount Lyell ore body—one at a depth of 100 feet below the No. 8 level, which has brought the conglomerates against the schist; and another about 50 feet below the same level, which cut off the original continuation of the ore body, and threw it to the west. It is possible, however, that there is only one thrust plane, which was formed before the date of the deposition of the Mount Lyell ore mass. In that case the ascending solutions which deposited the ores rose through the schists opposite the Great Lyell Fault, in the South Lyell Co.'s lease; on reaching the level of the thrust plane the solutions were diverted eastward over the platform formed by the thrust plane, so that they kept along the band of crushed and shattered rocks in close proximity to the Great Fault.

The intense heat generated by the formation of the Great Lyell Fault caused any waters that came from below along it to rise as hot solutions, and like most plutonic or deep-seated waters they were probably alkaline in character. They no doubt carried in solution sulphates of iron and copper and some silver and gold. These solutions, nearing the surface, had their temperatures lowered, and were subject to lighter pressures; they therefore naturally precipitated their contents along their channels. Where the solutions rose along the simple fault lines in the schists, they produced the widespread fahlbands of mineralized schist. In other places, owing to the intersection of cross faults with the Great Lyell Fault, the rocks were completely shattered and fault fissures ran in all directions through blocks of rock; in these cases mineralizing solutions would permeate the rock, removing the original constituents, molecule by molecule, and, replacing them by pyrites, formed the great ore masses. Hence the chief pyritic masses occur in every case where the schists have been completely crushed and shattered by intercrossing faults; and it is only in such positions that we can anticipate the discovery of similar ore masses. It is to be regretted that the money spent in the thousands of feet of experimental drives at the Lyell field were not devoted to prospecting the places where the chief cross faults cross the Great Lyell Fault, and in tracing the course of this fault farther north and south from the Lyell field.

The contact theory of the Lyell ores cannot be dismissed without considering the relations between them and the great series of igneous rocks which lie to the west of them, both north and south of Queenstown. These igneous rocks are probably a pre-Silurian series. They cannot have been connected with the formation of the Mount Lyell ore, which must be regarded as due to tectonic and not to igneous action.

The possibility of the ores having been introduced in the form of vapors, instead of in solution, must also be considered. The metals were probably carried into the rocks in hot alkaline solutions, for the primary ores are sulphides. The gangue materials are quartz and barite, the latter of which may have been introduced as a soluble barium sulphydrite subse quently oxidized to barium sulphate, and thus precipitated. The materials must in any case have arisen as solutions, for there is a striking absence throughout the field of volatile materials that could have ascended in vapors. There is, for example, very little arsenic. The ordinary analyses of the ores show none of it. It occurs in very small quantities in the form of enargite in some of the fahlore enrichments of the Mount Lyell mine. I saw no arsenical pyrites in the ores, but Mr. Batchelor tells me there was some at the northwestern end of level No. 4 in the Mount Lyell mine. Arsenic is practically absent from the great ore masses, and is only present in the small secondary enrichments. Antimony is, of course, contained in the fahlore, and thus is present in the fahlore enrichments of the Mount Lyell mine. It also occurs in small amount in some of the fahlband ores. It is somewhat more widely distributed through the field than arsenic, but it is confined to the minerals that were last deposited. The presence of antimony is less evidence of the action of vapors than is that of arsenic. The microscope shows that the fahlore occurs as strings in cracks through the pyrites or in thin skins around pyrites. The fahlore may have been due to vapor, but this is not probable, as it was introduced almost simultaneously with the quartz, which is generally deposited from solution.

Of other volatile metals, there is neither bismuth nor mercury, and there are none of the minerals of the tourmaline or topaz group, which are produced by the action of boron vapors on various feldspars. The amount of zinc sulphide is much less than of galena.

There is, moreover, no evidence that the ore masses were deposited in cavities or fissures which contained free air or were reached by superficial waters. Had meteoric waters taken part in the formation of the ores we should expect the occurrence of chlorides and carbonates, which are absent except from the gossans. If the ores had been deposited in cavities we should expect the deposits would have been in layers, or, to use Posepny's term, they would be crustified. This "crustified" structure is well developed in the pyritic ores of Roros, in Sweden; but there is nothing of the sort shown at Mount Lyell. The lamination of the pyrites at one place on Bench No. 3 is a pseudomorphic relic of the beds replaced by pyrites, and not due to the deposition of the material, layer on layer, in a fissure. Some of the quartz of the gangue shows an irregular comb structure, but this quartz occurs in cracks in the pyrites.

Another argument against the deposition of the pyrites in a free space, or in contact with surface waters, is the absence of sulphates (except of barium), of carbonates and metallic oxides, except where the pyrites has been secondarily altered.

These features in the great pyritic masses of Mount Lyell and the remarkable scarcity of gangue, and the general uniformity of the ore, with the concentration of the precious metals on the foot wall side of the ore body, all support the view that the ores were formed by the replacement, molecule by molecule, of the pre-existing rocks. The pyrites was introduced in solutions, which permeated the country in places that had been cracked in all directions by complex earth movements.

The enrichment of the gold on the foot wall side of the deposit is an ordinary case of secondary concentration. It is due to the action of descending waters, which removed the valuable metals from the higher part of the pyritic mass as it was destroyed by denudation, and then re-deposited the metals, when the soluble salts were reduced, at a greater depth.

Sodium Cyanide in Practice.

Written for the MINING AND SCIENTIFIC PRESS.

For several years the material sold as potassium cyanide, and commonly supposed to contain 96% to 98% of that salt, has been known to be largely made up of sodium cyanide. In a large number of consignments examined at the port of New York, Dr. Russell found from 10% to 55% of sodium cyanide—and only two brands out of eighteen were free from sodium.

More recently sodium cyanide has been sold as such and rated at its equivalent in potassium cyanide. Thus a fairly pure article, on account of the lower atomic weight of sodium, would test "125% potassium cyanide" and was sold at a proportionately higher price than the 98%, as it was supposed to be correspondingly efficient. At this rate a saving of about one-fifth of the freight would be made by mining companies adopting the new cyanide. Tests made in London were said to show an even better extraction of gold by sodium cyanide than by its equivalent of potassium cyanide, to the extent of several per cent, so that 100 pounds of the 125% would extract as much gold as 132 to 135 pounds of the usual 98% double salt, and it was further alleged to be more free from sulphides.

Doubt has since been thrown on some of these conclusions by the experience of several plants in Nevada, which commenced to use sodium cyanide but after a short trial have abandoned it in favor of the mixed 98% salt, regardless of the higher freight on the latter.

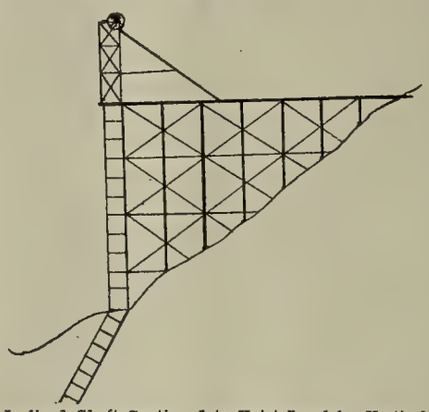
On the other hand, the sodium salt has been found the most advantageous at the Palmarejo mine, Chihuahua, Mexico. Incidentally it may be added that the consumption of cyanide at the mine mentioned is unusually high—averaging from 3 to 4 pounds of the 125% salt per ton of ore, the values being principally in silver. In a paper recently read before the American Institute of Mining Engineers, the manager, T. H. Oxnam, says:

"For over a year past we have been employing sodium cyanide exclusively. Titration with silver nitrate shows that the sodium cyanide being used is, on an average, equivalent to about 125% of potassium cyanide. Our experience at this place with sodium cyanide leads us to believe that it is fully as efficient as potassium cyanide for the dissolution of the values contained in the ore. It also appears that, since commencing the exclusive use of sodium cyanide, our solutions become rather less fouled than was previously the case. Freighting expenses are always a considerable item with us and by the adoption of sodium cyanide, equivalent, as above stated, to 125% of potassium cyanide, a saving of 20% of the freighting expenses on this article has been effected. Granted, as our experience seems to confirm, that sodium cyanide is equally as efficient as potassium cyanide, it would seem probable that it will gradually displace the latter, which, until recently, has been almost universally employed. Besides the direct saving in transportation expenses, the sodium cyanide appears to possess other advantages. From a metallurgical standpoint, other things being equal, it would seem preferable to use a salt as nearly pure as is to be obtained. Absolutely pure sodium cyanide being equivalent to about 132% of potassium cyanide, a product testing from 125% to 130% of potassium cyanide is manifestly nearly pure. It by no means follows, however, that the ordinary commercial cyanide, rated as 98% to 99% pure, and which by the usual silver nitrate titration will stand up to this strength, contains but 1% to 2% of impurities. That this commercial cyanide frequently carries a varying percentage of sodium cyanide is a well-known fact, and it of course naturally follows, on account of the relatively greater proportion of the CN radical contained in this salt as compared to potassium cyanide, that the greater this percentage of sodium cyanide contained in the ordinary 98% to 99% of potassium cyanide, the greater will be the percentage of impurities."

In view of these conflicting results, it is to be hoped that the managers of other plants, where sodium cyanide has been tried on a large scale, will follow Mr. Oxnam's example and publish the details of their experiences. From a chemical standpoint there seems to be no reason why a molecule of NaCN in dilute solution should act differently to a molecule of KCN, nor why the gold double cyanide of the one should be more or less stable than that of the other. Possibly the alkaline carbonate, present as an impurity in varying percentages, may have had some influence in the case of certain ores. Fuller information on the subject is certainly desirable.

Location of a Hoisting Plant.

Where the only suitable site for a hoisting plant is on the footwall side of a vein and on the hillside above the vein outcrop, which is near the bottom of the canyon, there is no mechanical objection to continuing the line of track upward on the surface to a proper landing, particularly if there be no material change in the angle of inclination. Inclined shafts not infrequently change their dip underground, and, if this be necessary, it may also be done on the surface, and would be an advantage over building a vertical line of timbers from the collar of the shaft to the desired height, as was done in the instance illustrated in the accompanying sketch. Here the out-



Inclined Shaft Continued to Hoist Level by Vertical Timbering.

Inclined Shaft Continued to Hoist on the Surface.

crop is near the bottom of a deep canyon and the only available site for the hoist was about 75 feet higher than the vein outcrop. The shaft was sunk at an angle of about 60°, and from the collar the shaft was carried upward vertically to a level with the hoisting engine by a frame work of timbers, as shown. By grading back of the hoist and at a somewhat higher level, the shaft could have been carried up on

the surface, somewhat after the style of that in the accompanying engraving, which is at the Adams iron mine in the Mesabi iron range of Minnesota. There are many places where surface inclines connect directly with shafts, and operations under such conditions are in no way unsatisfactory nor more expensive than where the entire shaft is underground.

Cyaniding Silver-Gold Ores of the Palmarejo Mine, Chihuahua, Mexico.*

NUMBER II.

Written by T. H. Oxnam.

Experiments With Wet Crushing, Concentration and Raw Pan Amalgamation.—Shortly after my return to this property in March, 1901, at which time I assumed the management, a series of experiments was commenced to determine, if possible, a better method of ore reduction which would promise that future operations could be conducted on a financially successful basis—a condition which up to that time had not been attained.

In order to effect such a change, it did not necessarily follow that a higher percentage of extraction need be obtained. The difficulty might be solved by the adoption of a treatment whereby the quantity of ore treated would be substantially increased, while effecting at the same time a material reduction in the operating costs per ton, although the percentage of values recovered be no more, or might be even less, than that obtained under the old system.

With this object in view, two series of experiments were conducted; one, on the treatment of the different grades of ore by wet crushing and concentration, followed by raw pan amalgamation and subsequent reconcentration of the pan tailings; the other, on the treatment of the ore by wet crushing and concentration, followed by cyanide leaching of the resultant sands. Several very careful tests on a practical scale were made along the lines of the first set of experiments and, although the results indicated that, under such a system, operations could be conducted at a certain profit, they were by no means satisfactory and were not as promising as those obtained by the cyanide experiments.

A brief summary of some of the tests made are here given, and in them 1 ounce of silver is valued at $1.20 (Mex.) and $1 gold at $2 (Mex.).

Test No. 1.—Eighteen tons of ore, of as nearly an average composition as could be obtained of the ore being regularly treated in the mill, were crushed wet through a 30-mesh screen in a specially prepared battery. The pulp was passed over a Wilfley concentrating table, which removed 1 ton of concentrates; the tailings from the table were elevated by means of a belt and bucket elevator to a series of 3 connected settling tanks, having a combined capacity of approximately 50 tons. The overflow from the third tank was run to waste. After settling, the ore was transferred to the amalgamating pans in charges of 1.5 tons and the pans were run for from 6 to 8 hours at a speed of 68 revolutions per minute, the temperature of the charge being maintained at about 105° F. During the amalgamation, 200 pounds of quicksilver, 15 pounds of salt and 7 pounds of bluestone were added. The pans were discharged into settlers, from which the material was fed over a second Wilfley concentrating table, the tailings from which were run to waste.

The ore assayed 29.6 ounces of silver and $4.16 of gold per ton.

18 tons @ 29.6 oz. of silver = 532.80 oz. of silver = $639 36 (Mex.)
18 tons @ $4.16 of gold = $74.88 of gold = 149.76 (Mex.)

Total value of 18 tons of ore = $789.12 (Mex.)

First Concentration.—By first concentration 1 ton of concentrates was recovered assaying 126.93 ounces of silver and $17.40 of gold.

1 ton @ 126.93 oz. of silver = 126.93 oz. of silver = $152.31 (Mex.)
1 ton @ $17.40 of gold = $17.40 of gold = 34.80 (Mex.)

Total value of concentrates = $187.11 (Mex.)

The percentage of total values saved by first concentration was 23.70%.

Pan Amalgamation.—15.7 tons of material were worked in the pans, yielding 96 ounces of silver and no gold.

96 oz. of silver = $115.20 (Mex.)

The percentage of total values saved by pan amalgamation was 14.59%.

Second Concentration.—100 pounds of concentrates were saved by the second concentration assaying 117.15 ounces of silver and $19.24 of gold per ton.

1/20 ton @ 117.15 oz. of silver = 58.58 oz. of silver = $7.03 (Mex.)
1/20 ton @ $19.24 of gold = $0.96 of gold = 1.92 (Mex.)

Total value of concentrates = $8.95 (Mex.)

The percentage of total values saved by second concentration was 1.13%.

In this test there was a loss of 1.3 ton of slimes, equal to 7.22% of the total weight of ore taken. These slimes, which escaped in the overflow from the third settling tank, assayed 34.4 ounces of silver and $4.16 of gold per ton. The larger portion of these slimes could, however, have been caught in settling tanks of large capacity and treated, but the gain which would result from this source was considered as offsetting the losses that would occur in treating the concentrates.

The results of Test No. 1 were:

	Per Cent.
First concentration, total values saved	23.70
Raw pan amalgamation, total values saved	14 59
Second concentration, total values saved	1.13
Total, total values saved	39.42

Test No. 2.—A second test on 12 tons of this same ore, conducted along the same lines as Test No. 1, with but slight variations, gave the following results:

	Per Cent.
First concentration, total values saved	20.40
Raw pan amalgamation, total values saved	18.25
Second concentration, total values saved	2.72
Total, total values saved	41.37

Test No. 3.—The ore for Test No. 3 was taken from a large dump containing about 40,000 tons of material, which was of so low a grade that it was entirely worthless for treatment by the process used in the mill. Could a process be devised by which this material could be treated at a profit, either by itself or by mixing it with the regular mine ore, the dump would at once become a valuable asset, as there would be no mining costs to charge against it and it could be delivered at the mill bins for $1 per ton; 15.5 tons of this ore assaying 17.15 ounces of silver and $3 of gold per ton were taken and crushed wet through a 30-mesh screen. The crushed material was treated practically the same as in Tests No. 1 and No. 2, with the following results:

	Per Cent.
First concentration, total values saved	23.76
Raw pan amalgamation, total values saved	19.43
Second concentration, total values saved	1.63
Total, total values saved	44.82

The results of these tests could not be considered satisfactory, although a careful calculation of the working costs under this system showed that both the mine and the dump ore could be treated at a small profit.

Experiments With Cyaniding Mine and Dump Ores.—While the above mentioned experiments were in progress, extended tests were started on cyaniding mine and dump ores. The results did not indicate that a higher percentage of the silver content could be obtained than by the old process on the mine ore, yet they showed that the treatment of both mine and dump ores by wet crushing and concentration, followed by cyanidation of the resultant sands, should prove a commercial success. As a consequence of these experiments, I made a report in June, 1901, on the various tests which had been conducted, strongly recommending that the mill be converted into a wet crushing, concentrating and cyaniding plant. The report being favorably received, the old process was discontinued in October, 1901, and the conversion of the plant begun. The necessary changes in the mill to permit of wet crushing were effected, the cyanide plant was installed, and in February, 1902, operations under the changed conditions were commenced.

On account of the lack of sufficient fall between the batteries and the available location for the cyanide leaching vats, it was necessary that the material leaving the mill be elevated for a height of from 5 to 6 feet, and for this purpose a wooden elevator wheel built on the premises was installed.

The original idea was to subject the entire mill product to a proper classification by means of a series of steel hydraulic classifying cones, but owing to the lack of ample fall this idea was abandoned.

The experiments indicated that a thorough oxygenation of the sands during leaching was essential and the advisability of putting in a double treatment plant, in which half of the vats would be directly superimposed over the other half, was fully considered, but put aside, largely on account of the lack of proper fall, as well as on account of the greater initial cost of installation. This lack of fall between the mill and the cyanide plant rendered it necessary in several ways to construct the plant along rather different lines than would otherwise have been adopted.

Experiments on the ores crushed through 20, 30 and 40-mesh screens and leaching, after concentration, for varying periods of time, with cyanide solutions containing from 0.25 to 2% of KCN, resulted in the decision to commence operations, crushing through 20-mesh screens and subjecting the resulting sands to a ten-days' treatment with two strengths of cyanide solution, the weak solution to be approximately 0.5% of KCN and the strong solution to be approximately 1.5% of KCN; the ten-days' treatment to include filling and discharging and being equivalent to a nine days' leaching. It was the intention to send the mine and the dump ores to the mill in such proportions that the battery heads would average about 22 ounces of silver per ton.

Certain modifications of the method and alterations of the plant suggested themselves during the subsequent operations. The working strengths of both the weak and the strong solutions have been gradually reduced; and the transferral of as many charges as possible from one vat to another at some time during the treatment has been adopted. About two years ago the original leaching plant was increased by the addition of two leaching vats and, at the present time, two more leaching vats are in course of construction. The solution sump capacity has been increased and several other minor changes effected. Otherwise the leaching plant and the method of treatment have been altered but slightly since the commencement of operations under this system. Owing to ill health, I was obliged during May, 1902, to resign the management of this property, remaining, however, in the service of the company as their consulting engineer until May 1, 1903, and during this period making a visit to the property. On the latter date I again assumed the management. The present plant and practice is as follows:

Present System of Milling.—The ore averaging 6% of moisture is brought to the mill in trains of from 9 to 14 cars, each car holding 4.5 tons, and is dumped directly into the main upper storage bin, which has a capacity of approximately 1100 tons. From this bin the ore is drawn out over 3 5x10 feet iron grizzlies having 1.5 inch openings to the 7x10-inch Blake rock crushers. These crushers run at a speed of 250 revolutions per minute and the jaws are usually kept set sufficiently close to deliver a product which will pass through a 2-inch ring.

We have made extended tests on the using of iron crusher jaws cast in our own foundry compared with manganese steel castings, and have found the latter to cost slightly less per ton crushed and to give better satisfaction in every way. For some time past we have been employing the manganese steel castings exclusively.

The percentage of material falling through the grizzlies varies considerably according to the percentage of mine and dump ore being treated. Of the dump ore, which is very coarse and extremely hard, approximately 90% goes to the crushers; of the mine ore, which is much finer and of a softer nature, approximately 50% goes to the crushers, the other 10% and 50% respectively falling through the grizzlies. A secondary storage bin of approximately 1100 tons' capacity receives the ore from both grizzlies and crushers. The ore is then trammed to three small intermediate bins, each of about 50 tons' capacity. From here it is conveyed by means of half-ton cars to the hoppers of the Challenge ore feeders. This double handling of the ore is inconvenient, but is rendered necessary because of the construction of the mill which, as has been stated, was originally erected to conform to different requirements.

The stamps when equipped with new shoes weigh 850 pounds, distributed as follows: Stem, 350; tappet, 130; boss head, 215; shoe; 155; total, 850 pounds.

The stamps drop a distance of from 6 to 7 inches 100 times per minute, the order of drop being, 1, 3, 5, 2, 4; 20-mesh brass wire screens, No. 26 wire, are used and the height of discharge is kept as nearly as possible at 2 inches. The stamp duty is from 2.75 to 3.25 tons per 24 hours. The average stamp duty would doubtless be somewhat increased by the installation of narrow mortars of the Homestake pattern. The same wide, double discharge mortars used in dry crushing are still in service. The back discharge of these mortars has been closed by a blind screen, and cast iron liners have been introduced into the ends and backs of the mortars, thus reducing their inside measurements; liners for this purpose are cast here. For some time past forged steel shoes have been used in preference to the cast iron shoes of our own make. The steel shoes cost approximately 15 cents per ton of ore crushed as compared with approximately 18 cents for the cast iron shoes. We, however, cast all our own dies, for which purpose the worn out shoes and otherwise useless iron and steel scrap are employed. The average life of the forged steel shoes is about 95 days, while that of the cast iron dies is approximately 33 days. All of the cams are equipped with Blanton fasteners, which give good satisfaction. The camshafts are 4⅝ inches in diameter and weigh about 425 pounds. Heavier camshafts would be more preferable, but it would prove a difficult matter to bring in a camshaft of more than the present weight.

From the batteries, the pulp passes directly over ten Wilfley concentrators, running with a ⅞-inch stroke at a speed of 215 strokes per minute. During the year ending July 1, 1904, the concentrators removed 0.76% by weight of the ore forming concentrates, which contained 18.28% of the gold and 17.98% of the silver values of the ore crushed during this period.

A large wooden launder conveys the pulp from the tables to the tailings elevator wheel. The latter is 14 feet in diameter and is of the outside bucket type, having 22 steel buckets, each 18 inches long, 8.5 inches wide and 8.5 inches deep, with a total capacity of about 1025 cubic inches. The wheel is driven by a ⅝-inch plow steel wire cable, at a speed of 18 revolutions per minute. The discharge efficiency, as in all wheels of this type, is not high, the discharged tailings leaving the wheel in a launder 5.5 feet above the level of the mill launder supplying the pulp.

A large masonry sand retaining tank divided into four compartments, each compartment measuring 25x80x4 feet in depth, receives the product from the wheel. Distribution is effected by means of a central launder in each compartment, provided with a number of 4-inch side discharge pipes. Each compartment is provided with a removable end discharge gate, 4 feet wide, composed of pieces of 2-inch plank, planed smooth on the edges and sliding in guides secured to the side posts. As the compartment fills up with

*Trans. Amer. Inst. Min. Engrs.

sands the discharge of these gates is raised. The discharge overflow empties into the main slime launder. Each compartment also communicates with its immediate neighbors by means of small, side discharge doors. The purpose of this arrangement is that the mill product may be emptying into one compartment, from which a portion of the finer material escapes through one of the side gates to an adjoining compartment, while the finest material is passing off in the discharge over the lowered end gate of this second compartment.

It is found, however, that a considerable quantity of the finest material will always tend to collect at the lower end of the first compartment, receiving the discharge of the elevator wheel, to lessen which an overflow from the end gate of the compartment is also necessary. In every case, however, the first 5 or 6 tons of material removed from the compartments are always extremely slimy and are trammed a short distance to an open drying patio, where they are spread out, sun dried and broken up, after which they are mixed in with the coarser sands and treated in the leaching vats. A third compartment of the sands retaining tank is kept full of sands, which are being allowed to drain, while the dry sands are being trammed from the fourth compartment. Each of these compartments holds the sands of from 48 to 60 hours' crushing in the mill when operating under normal conditions. The retained sands are usually subjected to about 2 days' draining before commencing to charge them into the leaching vats. The very fine material escaping in the overflow from the masonry retaining tank is carried by means of a wooden launder to three, so-called, slime pits having an aggregate capacity of approximately 15,000 tons. Every precaution is exercised that no slimes escape at the overflow gates of these pits, but, as is to be expected, at no time is such overflow perfectly clear and free from suspended matter.

During the 18 months ending December 31, 1904, of the total net tonnage crushed in the mill, 19.16% went to the slime pits. Various sizing tests, using the ordinary brass wire assayer screens, have shown that on an average about 6% of this material is retained on 100-mesh, while approximately 85% passes a 200-mesh screen.

Although this material as a whole is chiefly slimes, which on long drying crack up into layers almost absolutely impervious to leaching, it is found that considerable quantities of extremely fine, but leachable, sands are deposited at the heads of the slime pits in the vicinity of the discharges from the slime launder. About two months after ceasing to discharge into any one slime pit, this very fine sandy material at the heads of the pits will have dried sufficiently during ordinarily dry weather to permit of being walked on, and it is then conveyed by contract labor to the open drying floor or patio, together with a certain percentage of more slimy material which unavoidably becomes mixed with it. Here the material is spread out, sun dried and thoroughly broken up, after which it is mixed in with the ordinary sands and treated by leaching.

During the past year 2400 tons of very fine material from the slime pits have been treated in this manner. By far the greater portion of the material collected in the slime pits, however, is so extremely fine and of such a clayey nature that, as above stated, it is almost absolutely impervious to leaching.

(TO BE CONTINUED.)

THE PROSPECTOR.

It is not always possible to tell from the hand sample the correct name of a decomposed rock. It is often necessary to study the occurrence in the field to get a knowledge of its structural relations. For instance, a mud shale may be transformed into a hard, dense, flinty jasper. Fine grained limestone may be silicified to a dense jaspery rock, and rhyolite or felsite, as well as other rocks, may be altered by silicification to dense jaspery rock. Each of these siliceous rocks bear a resemblance to the others, and if the occurrence can not be observed in place, the only thing possible toward identification is to simply call such rocks jasper, chert, flint or hornstone, etc. Rocks are often much decomposed from atmospheric or chemical agencies, due to more or less crushing and the infiltration of waters which oxidize and decompose certain mineral constituents, often removing some minerals and substituting others, as in the case of the silicification above referred to. Feldspars are altered to kaolin or clay-like minerals, calcium carbonate is found segregated, and the bisilicates—hornblende, augite, etc.—are altered beyond recognition to other minerals. So while it may be possible for this department to describe the rock sample as it now appears, it may be impossible to determine accurately, or perhaps at all, what the rock was originally The rock samples from Goldfield, Nev., are of this kind, and the following determinations are made as nearly as the small size of the specimens and their condition will admit. No. 1 is a silicified rock. It is marked "dike," but there is no evidence in the sample to indicate whether it is a dike or a portion of a larger formation that has been silicified along a certain zone. No. 2 is much changed, the feldspars being altered to clay. A rock so thoroughly decomposed as this which does not effervesce with acids suggests that the rock did not originally contain lime-soda, or soda-lime feldspars, and that the feldspar was largely orthoclase. The occurrence of blebs of quartz in the rock further suggests either rhyolite or quartz porphyry. The slickensides and tendency of the rock to cleave into flat sheets indicates that it has been subjected to pressure and movement, and the occurrence of pyrite indicates proximity to a vein or ore body. No. 3 has also been subjected to pressure and movement, and is apparently an altered rhyolite. No. 4 also looks like an altered rhyolite. It contains considerable iron oxide, and may be from the outcrop of an ore body, but whether low grade or not is for the owner to determine. No. 5 is similar to No. 1, though containing more iron oxide. A few small feldspars are seen, and also small plates of muscovite mica. No. 6 is a cavernous fine grained feldspathic rock, not greatly unlike Nos. 1 and 5. The color is due to iron oxide. It may also have been rhyolite. No. 7 is so thoroughly decomposed as to render identification impossible. It resembles No. 2 somewhat, but contains no pyrite. The feldspars have been wholly altered to clay. The rock is less siliceous than those previously described. No. 8 is basalt. It contains no olivine that can be seen without a microscope, and it is vesicular.

The samples from Denio, Or., have been identified as follows: No. 1, pitchstone, a variety of volcanic glass occurring in dikes, boses and beds, sometimes of great thickness. No. 2 is quartz, carrying a large percentage of micaceous iron (hematite); the yellowish mineral is epidote, and quartz, stained with dust-like inclusions of epidote. No. 3 is diabase, a basic intrusive rock. No. 4 is rhyolite, in which there is a large development of sanidine. No. 5 is a basic eruptive—olivine diabase. No. 6 is a fine granular quartz rock in which there is some disseminated pyrite. The yellow spots are iron oxide, due to the decomposition of some iron-bearing mineral, the nature of which is unknown. No. 7 is quartz in which the green material is chlorite intermingled with the quartz, and the greenish-yellow mineral is epidote, derived from decomposition of the chlorite. No. 8 is similar to No. 7, except for the absence of the chlorite and the presence of a large amount of epidote. There are no sedimentary rocks in the samples sent.

The specimens from Homestead, Or., are: No. 1, granular quartz with finely disseminated sulphide of iron (pyrite). No. 2 is baryta (barium sulphate), also called heavy spar. The green mineral is copper ore. The rock also contains a crystal of copper-iron sulphide altering to bornite. No. 3 is an altered igneous rock, diorite or granite, in which there are veinlets of quartz. The entire rock is siliceous and may be gold-bearing. The greenish color is due to chlorite altered from hornblende. No. 4 is greenstone, probably diabase. No. 5 is an altered rock (probably igneous), but is now mostly fine granular quartz and iron sulphide.

The three samples from Confidence, Cal., are: No. 1 a cherty quartz, containing a large amount of iron oxide (hematite) and probably some gold also. No. 2 is quartz, with scales of molybdenite (sulphide of molybdenum). This mineral when cleanly concentrated is worth about $200 per ton. No. 3 is decayed hornblende schist, probably altered from granodiorite. It is stained slightly with green copper carbonate (malachite) on one side. The brown mineral is iron oxide.

The rock specimens from Columbia mountain, Nevada, are found on examination to be much altered. The dark colored ore is almost wholly brown and red (hematite) iron ore. The bright, transparent and white crystals are calcium carbonate. The black portion is not manganese, but iron, and gives a red streak. This character of ore is sometimes called by miners "liver-colored" rock. The small, solid brown piece is similar to the other dark ore, but is more siliceous. There is no tungsten present in any of the samples. Gold and silver probably occur. The white, fine-grained piece is a much altered rhyolite. The darker, bluish colored piece is also a much altered eruptive, too much changed to make identification positive. It looks like a fragmental andesite—tuff. The gray rock that gives a red streak on striking with a pick is also tuff. The red streak is due to the presence of innumerable grains of red iron ore, which, on being scratched, shows the characteristic color of hematite. The alkaline taste of the samples is due to mineral salts present, owing to decomposition of the rock.

The mineral specimens from Landore, Idaho, are: No. 1, quartz, with needles of tremolite (a variety of hornblende). The dark color is due to a mat of fine hornblende crystals. No. 2 is a granular quartz rock, seemingly altered from a dike. It contains considerable iron sulphide (pyrite). No. 3 is a much altered feldspathic rock, the feldspar having been almost wholly altered to kaolin. It contains a small amount of iron sulphide. No. 4 is a fine-grained dike rock containing disseminated iron and arsenical sulphide. No. 2 and No. 4 may contain gold and silver, and possibly No. 3 also.

The red rock sample from Canyon City, Colo., is principally iron oxide. It resembles some scoriaceous lavas.

The Amended Location Notice.

Recently several readers have requested information on the amendment of mining locations. The frequent necessity for the amendment of mining locations has been anticipated by several of the mining States and legislation passed directing how it shall be done. The States which have made provision for changes of boundaries of mining claims are: Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, South Dakota, Washington and Wyoming. In all of the States, excepting Arizona, the laws are similar to those of Colorado, which are as follows: "If at any time the locator of any mining claim heretofore or hereafter located, or his assigns, shall apprehend that his original certificate (of location) was erroneous, defective, or that the requirements of the law had not been complied with, before filing, or shall be desirous of changing his surface boundaries, or taking in any part of an overlapping claim which has been abandoned, or in case the original certificate was made prior to the passage of this law, and he shall be desirous of securing the benefits of this act, such locator, or his assigns, may file an additional certificate, subject to the provisions of this act; provided, that such location does not interfere with existing rights of others at the time of such relocation, and no such relocation, or other record thereof, shall preclude the claimant, or claimants, from proving any such title, or titles, as he, or they, may have held under previous location."

The law in Arizona differs somewhat from that of the other States and reads as follows:

"Location notices may be amended at any time and the monuments changed to correspond with the amended location; provided, that no change shall be made that will interfere with the rights of others."

Concerning the amended location the Supreme Court of Colorado has said: "The evident intent of the statute is that the additional certificate shall operate to cure defects in the original, and thereby put the locator, where no other rights have intervened, in the same position that he would have occupied if no such defect had occurred. Such intent is in accord with the principle of all curative provisions of law."

Another court decision says: "Every one who is at all familiar with mining locations knows that in practice the first record must usually, if not always, be imperfect. Recognizing these difficulties, it has never been the policy of the law to void a location for defects in the record, but rather to give the locator an opportunity to correct his record, whenever defects may be found in it. * * * This is the function and proper office of amendments: To put the original in as perfect condition as if it had been complete in the first instance."

In making an amended location the following form may be used:

KNOW ALL MEN BY THESE PRESENTS: That I, ..., the undersigned, being a citizen of the United States, claim by right of amendment and relocation ..... feet linear and horizontal measurement on the ..... (naming it) lode, along the vein thereof, with all its dips, variations and angles, together with ..... feet in width on each side of the middle of said vein at the surface, and all veins, lodes, ledges and surface ground within the lines of this amended and relocated claim; ..... feet on said lode running in a ..... direction from the center of the discovery shaft of the claim originally located as the ..... (naming it) claim, and ..... feet running in a ..... direction from said center of discovery shaft. This amended additional and relocated lode mining claim is bounded and described as follows, to wit: Beginning at corner No. 1 (described by metes and bounds), being situate in the ..... mining district, county of ....., State of .....

That this is intended as an amendment and relocation of the ..... (naming it) claim, of which I am the owner, the location certificate of which is filed in Book ....., page ....., in the office of the recorder of ..... county. This amended and additional location is made for the purpose of changing the surface boundaries of said ..... (naming it) claim, so as to include within it the ground heretofore covered by the ..... (naming it) claim, also owned by me, the location certificate of which is filed in Book ....., page ....., in the office of the recorder of ..... county, and to secure all abandoned overlapping claims.

That this amended and additional location as above described embraces the original discovery, as well as all development work, which I or my predecessors in interest have performed upon or for the benefit of said original ..... (naming it) mining claim, and I therefore claim that this amended certificate of location relates back to the date of the original location of said ..... (naming it) claim, and that it is entitled to the benefit of the original discovery, as well as of all work done or improvements made by me or by my predecessors in interest within the limits of this amended and additional location.

This amended and additional certificate is filed without waiver of any previous rights. Date of original location of ..... (naming it) mining claim ..... Date of amendment and relocation .....

Signed ....

Dated ..... 1905.

Notes on Hydraulic Mining.*

Written by R. L. Grider.

The methods of working gravel deposits by hydraulic processes vary with the character and elevation of the material. If the deposits are heavy the giants must be placed behind the materials to be moved, in order to attain a direct drive and to utilize as much of the power as possible. However, if the materials are light the draw method may be adopted. In a placer mine on the Klamath river, California, in which the bedrock is flat and the channel wide, two giants are necessary to drive the gravel across the channel to the sluices. Here one giant drives the gravel from 100 feet to 150 feet and the second giant drives it from 100 feet to 150 feet farther on to the sluices. This method is an economical one, since flume construction is reduced to a minimum.

High banks are worked off in benches of from 50 feet to 60 feet in height. If the gravel deposits are light, it is well to remove the top dirt first and the gravel last, since the gold is more easily saved by this method. If the gravel is heavy, however, work the top and bottom together, since the top dirt aids in moving the heavy materials.

In a hydraulic mine the first work for the engineer is to determine the value of the deposits, and from the topography of the surrounding country and from the character of the deposits determine the best method and the pressure necessary to work them. After this information has been obtained, run a preliminary ditch survey, giving the required head, from the mine to the source of the water supply, examine the topography of the country and the character of the formations through which the ditch must be constructed. Then, from experience, the engineer can decide from the topography the least expensive and best place to construct the ditch, and from the geology of the formations the proper grades to be established. Plans can now be made, cost of plant calculated, expense of working the whole estimated, and the least possible margin of profit appraised.

Ditch.—Put in waste gates every ¼ to ½ mile. As a protection against floods, flume all water in gulches over the ditch, unless a flume is to be built across the gulch, in which case put a turn-out gate in the flume. Gates often save much expense when the ditch breaks. In crossing large canyons, the inverted siphon may be cheaper than either ditch or flume. When lumber is cheap and the life of the mine is not more than ten years, and a ditch could not be utilized for irrigation or power purposes after the mine is exhausted, build a flume. The first cost of a flume, in most instances, is less than that of a ditch and the repair is very much less. A flume is also more efficient, not only in the amount of water conveyed by it, but in the time saved in repairs when the weather is bad and water plentiful.

Pressure Box.—The penstock, or, more properly speaking, the pressure box, should be spacious and the water should stand not less than 4 feet deep over the entrance of the pipe to prevent the admission of air. Some miners put a partition in the pressure box to prevent sand, gravel, etc., from entering the pipe. A better method is to increase the depth of the ditch 18 to 20 inches below grade from the pressure box for 100 feet up the ditch and put in a waste gate deep enough to drain the excavation, so that the sediments can be caught in the excavation and sluiced out at the gate. Provision must be made in the flume leading to the pressure box to prevent trash from entering the pipe, by means of a rack, and for the overflow when the gates in the pipe line have been closed. In order to facilitate the removal of the trash accumulated on the rack, design the supply flume so that the overflow shall pass back through the rack. Use 2-inch heart lumber in the construction of the pressure box and make it portable.

Pipe Line.—The design and lay of the pipe requires engineering skill and experience. Many obstacles often lie in the course of the pipe line. A 24-inch pipe, owned by the Railroad & Mining Co. of Denver, Colo., crosses the Klamath river on a suspension bridge. The span is about 380 feet and the two cables are each 2 inches in diameter.

To reduce friction, as well as expense, use the shortest pipe line practicable with a minimum number of elbows and depressions. As a material of pipe construction, iron is better than steel in some districts, since steel oxidizes readily. I know of a pipe line constructed of steel that lasted only two years, and on the same mine they are using sheet iron pipe of the same gauge that has been in service about twenty years. The pipe in the mains should be properly covered with a mixture of coal tar and asphalt, which makes a permanent protection. Always test the tar before using it. Fig. 1 illustrates a good method of pipe construction, since pipe manufactured in this manner can be easily made water tight or repaired quickly. Much of the hydraulic pipe is put together at the mine, and practically all of it is repaired at the mine. The pipe ordinarily used is 7, 9, 13, 15, 16, 20, 22, 30, 36 and 40 inches in diameter and formed of Nos. 8, 10, 12, 14, 16 and 18 Birmingham gauge sheet steel or iron. The lengths of the sections are usually 12 and 17 feet, but may vary from 8 to 20 feet, depending somewhat upon the diameter of the pipe and the character of the country.

The sections should be put together stovepipe fashion, i. e., one end is simply inserted into the end of the next piece 3 or 4 inches. If the joint is not tight and the pipe telescopes too much, use tarred cloth strips. Never use wood wedges; they injure the pipe. To prevent flattening of the pipe, the supports under the pipe should be placed back of the joint and directly under the first joint of the section; thus at A and B. (See Fig. 2.) Anchoring the pipe

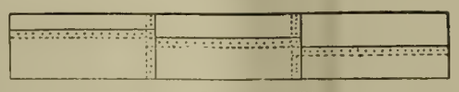


Fig. 1.—Riveting in Pipe.

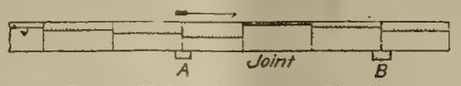


Fig. 2.—Method of Supporting Pipe Line.

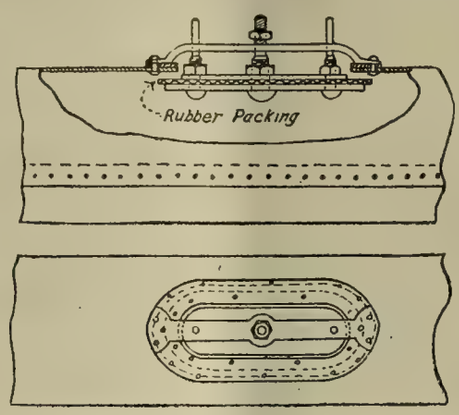


Fig. 3.—Air Valve.

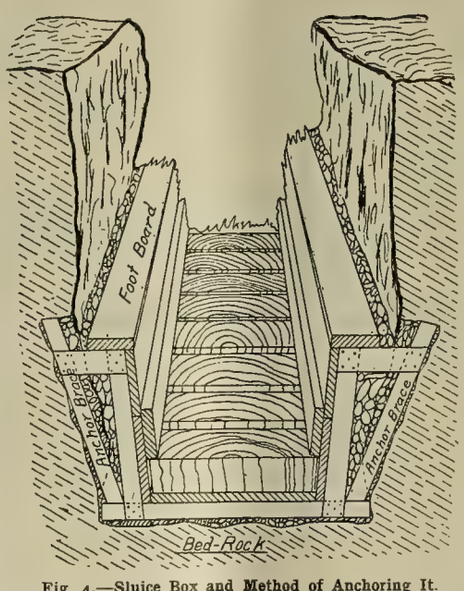


Fig. 4.—Sluice Box and Method of Anchoring It.

line is necessary only where elbows, tapers, Y's or gates occur, unless the slope is considerable. Put in air valves at all points where vacuums are likely to occur. An excellent air valve which any blacksmith can make is shown in Fig. 3. In general, the expansion in hydraulic pipe lines is neglected and is reduced to a minimum by keeping water in the pipes by means of the gates. Gates, also, reduce leakage to a minimum. Sawdust, dirt and fine leaves are used to stop leakage. The diameter of the pipe at the head should be large and decrease as the head increases according to the laws of hydraulics. The effective pressure should be made as great as possible with reasonable outlay. Many miners err here, not knowing how to make the proper calculations. For economy, the gauge of the pipe material should decrease directly as the pressure.

The introduction and filling of the pipe line with water must be undertaken with great care. The inflow must be gradual to prevent the admission of air. If this precaution is not taken, serious accidents may occur, especially with high heads. The gate at the pressure box, therefore, must be gradually opened. Rapid opening of gates at any point on the main or distributing lines should not be tolerated, since shocking, bursting, bucking or collapsing may occur.

Giants.—The two types of giants in general use are the single and double jointed. The double-jointed giant is more efficient, as far as the efficiency of the stream is concerned, but the single-jointed machine is more efficient in manipulation, since it can be lubricated without turning the water out of the machine, which is necessary with the other style. The double-jointed machine is safer under high heads (200 feet or more).

The double-jointed giant is manufactured with or without king bolt. The latter type has a clear water way; hence is more efficient, but is objectionable since it is ball bearing. The balls often crush, get lost or work hard because of the dirt and sand entering into the grooved ring. The king bolt type is simpler in construction and is a good machine for all practical conditions. There are eight sizes of giants which use nozzles from 1½ inch to 10 inches in diameter, and which weigh from 390 pounds to 2300 pounds. The deflector is an indispensable attachment for giants of all sizes, except the No. 1. From 20% to 80% more material can be piped by its application. If it is not adjusted properly and handled with care, it transposes the giant into a demon of destruction. Many a poor pipeman has been killed by one through carelessness. Before deflectors were invented three men were required to move a large giant under a high head, but now, by use of the deflector, a child can direct it at will with one hand. The higher the pressure, the easier it works. The giant is bolted to an 8x8-inch to 12x12-inch timber, 6 or 7 feet long, called the bed piece or brace block. In setting the giant, stake against this bed piece and brace against the stakes. Catalogues and books on the setting of the giant recommend driving bars of iron or steel through holes, bored for the purpose, through the ends of the bed piece into the ground to secure the giant firmly. This is not practical where there is bed rock. Stakes staked against the bed piece are far better where anything can be driven, and they hold more than iron bars and can be more easily removed. All the moving parts of a giant should be kept well lubricated, since dry surfaces cause serious accidents (breaking king bolts, etc.). A mixture of one part tallow, one part lard, and one part soft, fresh pitch makes an excellent lubricant which is practically water proof.

It is important that the giant is set securely, otherwise accidents may not only be serious to the pipeman and expensive to the operator, but the location for the machine may be damaged to such an extent that resetting is made difficult. Selecting the location for the giant requires much skill and experience, especially when the bank is high. The inexperienced operator would be wise to let his pipeman select the location, provided, of course, the pipeman is experienced. No miner can afford to have any but the best pipeman, since the success of the mine depends largely upon him.

The Bedrock Sluices.—Since the mission of the bedrock sluice is to catch the gold and convey the materials to the dump, it is the most important apparatus of a hydraulic mine. Great care must be exercised in its design, location and construction. The water supply, the character of the ground to be mined, and the topography of the outlying country determine the grade. Sands require heavy grades and shallow sluices. The usual grade is 6 inches per box of 12 feet, but may vary between 1 inch and 12 inches per box. Give the head boxes a little less grade and increase slightly toward the dump. The tail sluices are generally in poorer condition and therefore require more grade.

Wide, shallow sluices are used in mines where the deposits are light, grades scant, and dumps of little depth. If the gravel is heavy (many large boulders) and the dump is poor, use deep, narrow sluices. The depth of the water in the sluices, in this case, should be equal to the width of the flume. Their width and depth, therefore, depend upon the character of the material, as well as the water supply.

Sluices should be set as straight as possible, but if curves are necessary, raise the outside bend according to the degree of curvature and construct the curve of half boxes (i. e., 6-foot lengths).

If the rim of the channel is high and wide or the channel itself is very wide, the sluices are set in tunnels arranged so that they will remain in the bedrock at the lowest point of the channel, and should be run as near to the center of the deposit as practicable before connecting with the surface workings. This last point gives the maximum amount of mining ground per tunnel. Open bedrock cuts are preferred where practicable, and are cheaply excavated by loosening the bedrock in the proposed line of the flume with powder and piping out the material with the giant. Tons of material can be moved quickly and cheaply by the application of this method. After the cut is finished to grade and the flume set therein, anchor the flume in the cut (a method of anchoring is shown in Fig. 4), put in the riffles or blocks, put an obstruction in the flume, and run the sluices full of gravel to prevent them from floating. Next, bury the sluices with gravel. All the spaces around the flume will thus be filled and the grade and form of the flume preserved. Lastly, remove the obstruction placed in the sluices and run the materials through; the flume is now ready for use.

Sluices should not be less than 240 feet in length for economical mining, since fine gold and mercury may pass through. This is true, especially if there

*Abstract of Colorado School of Mines Bulletin.

is much sand or clay in the deposits. Much of the gold in all gravel deposits is fine and some of it is rusty. Undercurrents or grizzlies are used to catch these products which would otherwise be lost.

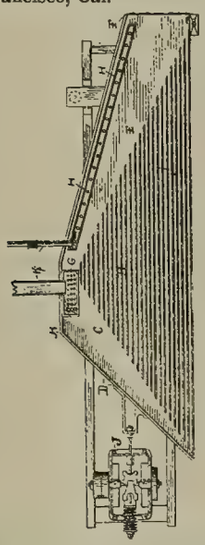
(TO BE CONTINUED.)

Mining and Metallurgical Patents.

PATENTS ISSUED JULY 25, 1905.

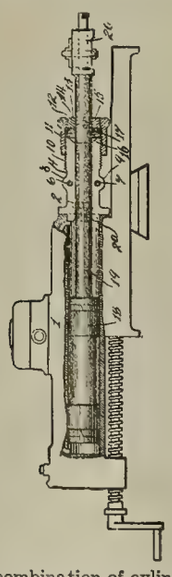
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE CONCENTRATING TABLE.—No. 794,928; W. G. Dodd, San Francisco, Cal.



Transversely inclined ore concentrating table provided on its working face with series of longitudinally extending collecting riffles, which riffles gradually increase in length from uppermost riffle to lowermost one of series, receiving and terminal ends of each riffle extending beyond ends of preceding riffle, there being unriffled or plain surface to table intermediate terminals of riffles and its head and tail respectively, and feeding means so arranged at upper edge of table as to cause portion of pulp delivered onto table to overlap uppermost riffle toward head, so as to feed directly to projecting ends of part of subsequent riffles.

ROCK DRILL.—No. 795,169; G. S. Power, Passaic, N. J.

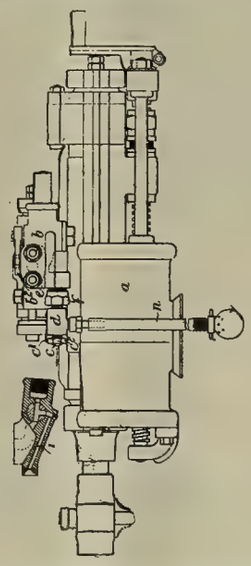


In rock drill, combination of cylinder, piston having piston rod integral therewith, neck or front head composed of halves detachably secured together, separably connected to cylinder and adapted for working fit with piston rod, threaded portion upon neck or head, adjustable gland adapted to work upon threaded portion, tapered opening in gland, and tapered split bushing adapted to fit within opening and to surround piston rod and pack same when gland is adjusted.

PROCESS OF PRODUCING TUNGSTEN STEELS.—No. 795,517; E. D. Kendall, Brooklyn, N. Y.

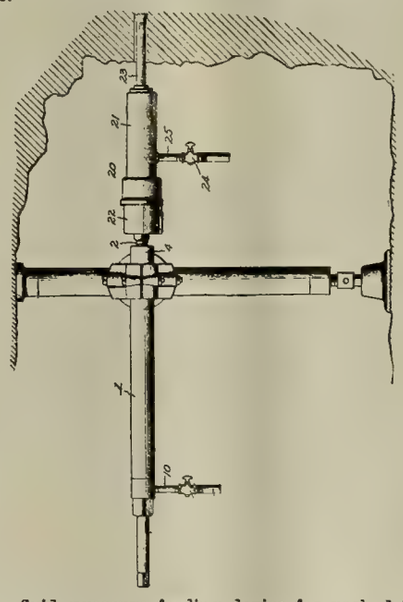
Process of producing alloy or alloys containing tungsten and iron by preparing mixture of tungsten ore, metallic zinc and iron and subjecting mixture to thermal action of electric current, in electric furnace.

APPARATUS FOR ALLAYING DUST IN CONNECTION WITH ROCK DRILLING MACHINERY.—No. 794,752; W. C. Stephens, Camborne, England.



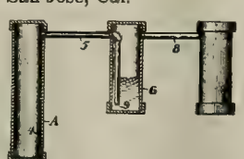
In device of class described, combination with air supply tap of rock drill, of spraying device provided with adjustable nozzle adapted to be rotated to regulate quantity of spray, blade spring secured to spraying device and constructed to bear upon face of nozzle to prevent same from turning, spraying device being directly connected by ball-and-socket joint to tap whereby direction of spray may be varied, tap being provided with admission port for compressed air and independent passages to rock drill and spraying device and plug in tap constructed to admit supply of compressed air to either or both of passages whereby rock drill and spraying device may be operated separately or together.

FLUID PRESSURE FEEDING DEVICE FOR ROCK DRILLING ENGINES.—No. 795,735; C. H. Shaw, Denver, Colo.



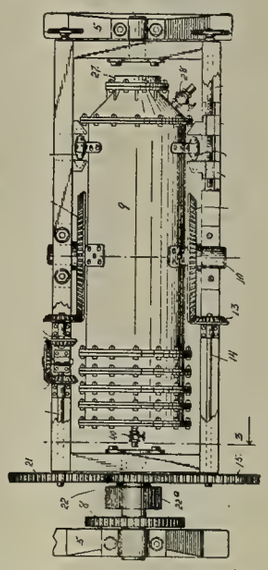
In fluid pressure feeding device for rock drilling engines, combination with pneumatic hammer drill of fluid pressure feed cylinder and piston, comprising cylinder, piston reciprocally mounted at one end in cylinder and secured at opposite end to pneumatic hammer, and plug shaped cylinder head threaded to rear end, motive fluid inlet passage extending through plug cylinder head into cylinder at rear end of piston rod and provided with threaded hole in end, and brace bar comprising bar loosely threaded to end of cylinder head at one end and provided with wrench receiving surface at opposite end.

ORE REDUCING APPARATUS.—No. 795,471; W. T. Armstrong, San Jose, Cal.



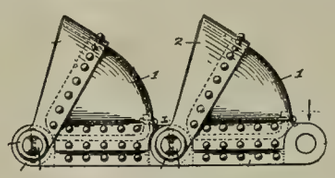
In portable apparatus of character described, tube of uniform diameter threaded at ends, removable closures for ends and rendering tube air tight, tube having inner lining capable of being reduced to carbonaceous form by heat, condenser, and pipe leading from tube to condenser tube adapted to contain body of carbon-forming material mixed with ore, and pipe having end within condenser provided with check valve to prevent backflow into tube.

ORE TREATING AND FILTERING APPARATUS.—No. 795,774; T. D. Jones, Denver, Colo.



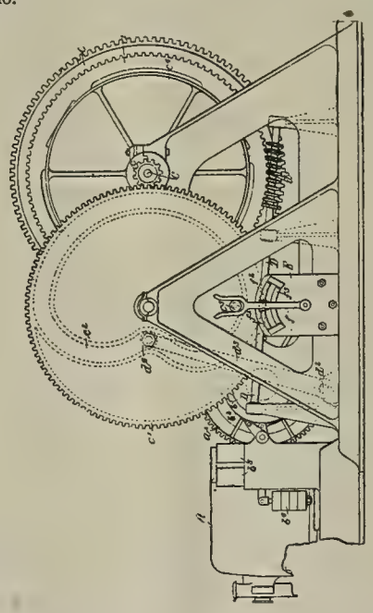
In combined ore treating and filtering apparatus, combination of frame trunnioned at extremities to rotate, barrel mounted in frame to rotate therewith on longitudinal axis and trunnioned in frame to rotate independently of latter on axis extending at right angles to longitudinal axis.

EXCAVATING BUCKET.—No. 795,417; H. H. Postlethwaite, San Francisco, Cal.



Excavating bucket, same comprising body portion, cutting lip secured to upper edge thereof, ends of lip terminating in bearings which project below bottom edge of bucket, bottom plate and link section, link section being united to lower edge of bucket's body, link section being provided with forwardly projecting and rearwardly projecting bearing ears.

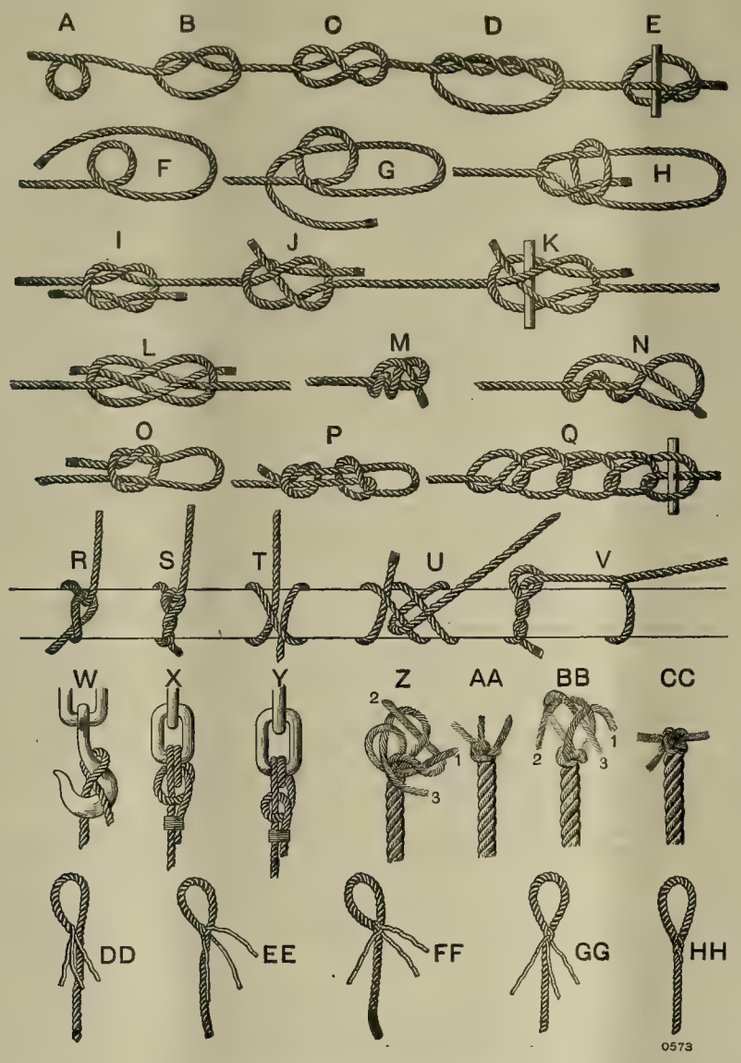
SPEED CONTROLLING DEVICE FOR HOISTING MACHINERY.—No. 795,641; J. McGeorge, Cleveland, Ohio.



Combination of continuously operating motor, structure driven thereby, switch, electrically actuated clutch in circuit with switch and connecting motor with driven structure, brake, and automatic means operated from driven structure constructed to mechanically actuate switch to effect action of clutch and of brake.

Knots, Hitches and Bends.

Miners are daily required to make use of ropes in various ways, both on the surface and underground, and it is very desirable that the miner know how to quickly make a safe knot, hitch or bend in a rope. It is not only the necessity of making a secure knot, but forming one which may readily be untied. For instance, all miners are or should be thoroughly familiar with the combination known as the "timber and half hitch." This is illustrated in the accompanying sketches at V. Its utility is well known and the sketch is both familiar and well made. As this well-known form of hitch appeals to those who frequently are required to make use of it, so each of the other knots, hitches and bends have their particular usefulness, and should be carefully studied and practiced, until each of them can be readily made. The accompanying cuts and descriptive matter are from the handsome pamphlet, "Manila Rope," issued by the C. W. Hunt Co., of 45 Broadway, New York, on transmission and hoisting rope:



Useful Knots and How to Tie Them.

KNOTS, HITCHES, BENDS.—The principle of a knot is that no two parts which would move in the same direction, if the rope were to slip, should lie alongside of and touching each other.

A great number of knots have been devised, of which a few of the most useful are illustrated. In the engravings they are shown open, or before being drawn taut, in order to show the position of the parts. The names usually given to them are:

A—Bight of rope.
B—Simple or overhand knot.
C—Figure 8 knot.
D—Double knot.
E—Boat knot.
F—Bowline, first step.
G—Bowline, second step.
H—Bowline, completed.
I—Square or reef knot.
J—Sheet bend or weaver's knot.
K—Sheet bend with a toggle.
L—Carrick bend.
M—"Stevedore" knot completed.
N—"Stevedore" knot commenced.
O—Slip knot.
P—Flemish loop.
Q—Chain knot with toggle.
R—Half hitch.
S—Timber hitch.
T—Clove hitch.
U—Rolling hitch.
V—Timber hitch and half hitch.
W—Blackwall hitch.
X—Fisherman's bend.
Y—Round turn and half hitch.
Z—Wall knot commenced.
AA—Wall knot completed.
BB—Wall knot crown commenced.
CC—Wall knot crown completed.

The figures DD to HH represent the eye splice commenced and completed.

The bowline G is one of the most useful knots; it will not slip, and, after being strained, is easily untied. It should be tied with facility by every one who handles rope. Commence by making a bight in the rope, then put the end through the bight and under the standing part as shown in the engraving, then pass the end again through the bight, and haul tight.

The square or reef knot I must not be mistaken for the "granny" knot that slips under a strain. Knots H, K and M are easily untied after being under strain. The knot M is useful when the rope passes through an eye and is held by the knot, as it will not slip, and is easily untied after being strained.

The timber hitch, S, looks as though it would give way, but it will not; the greater the strain the tighter it will hold.

The wall knot looks complicated, but is easily made by proceeding as follows: Form a bight with strand 1 and pass the strand 2 around the end of it, and the strand 3 around the end of 2, and then through the bight of 1, as shown in the engraving Z. Haul the ends taught, when the appearance is as shown in the engraving AA. The end of the strand 1 is now laid over the center of the knot, strand 2 laid over 1, and 3 over 2, when the end of 3 is passed through the bight of 1, as shown in the engraving BB. Haul all the strands taut, as shown in the engraving CC.

The "Stevedore" knot M, N is used to hold the end of a rope from passing through a hole. When the rope is strained the knot draws up tight, but it can be easily untied when the strain is removed.

KNOTS ARE WEAK.—If a knot or hitch of any kind is tied in a rope its failure under stress is sure to occur at that place. Each fibre in the straight part of the rope takes proper share of the load, but in all knots the rope is cramped or has a short bend, which throws an overload on those fibers that are on the outside of the bend and one fiber after another breaks until the rope is torn apart. The shorter the bend in the standing rope the weaker is the knot. (See the experiments of Prof. Edward F. Miller, Massachusetts Institute of Technology, in "Machinery," page 198, March, 1900.) The results given in the following table are approximate, but are sufficient to cause engineers to be cautious in all rope fastenings employed in important work.

Table of the approximate strength of knots compared with the full strength of the rope based on Prof. Miller's experiments:

APPROXIMATE EFFICIENCY OF KNOTS IN A PERCENTAGE OF THE FULL STRENGTH OF THE ROPE.

	The Efficiency of the Knot.
Rope dry—average of four tests from the same coil as the knots	100
Eyesplice over an iron thimble	90
Short splice in the rope	80
Timber hitch, round turn, and half hitch	65
Bowline slip knot, clove hitch	60
Square knot, weavers' knot, sheet bend	50
Flemish loop, overhand knot	45

Personal.

R. B. STANFORD of Columbia, Cal., has returned from New York.

R. S. LIGHT is manager Mollie S. M. Co., operating near Creede, Colo.

ED. LYNCH has resigned as superintendent Keystone mine at Amador City, Cal.

C. R. DOWNS has been made superintendent Keystone mine at Amador City, Cal.

S. DAVIS of Butte, Mont., has taken charge Cork mine at Kaslo, Slocan district, B. C.

M. A. SHEETS has been appointed superintendent Overland mine and mill at Sunshine, Utah.

S. H. BASHOR, manager Copper Blush mine at Jamestown, Colo., is making a short Eastern trip.

E. D. TRENAM, manager Deer Lodge mine, Deer Lodge, Nev., is directing work at the mine.

J. L. PARKER is mine superintendent Brown Alaska Co. at Hadley, Prince of Wales island, Alaska.

W. H. ALDRIDGE, manager Trail smelter at Trail, B. C., is on a trip to Montreal and New York City.

E. P. MITCHEL of Santa Barbara, Cal., president Goldstake M. & M. Co., has been in Deadwood, S. D.

J. C. BRENNON, superintendent La Mina Santo Tomas at Torres, Sonora, Mexico, has been at Houghton, Mich.

J. PARKE CHANNING has completed an examination of the mines of the Nevada Copper M. Co. at Ely, Nev.

R. K. HUMPHREY has resigned as manager Montana Zinc Co., Walkerville, Mont., to engage in general engineering work.

H. J. RYAN of Cornell University has taken up his duties as professor of electrical engineering at Stanford University, Cal.

FREEMAN ROWE has been appointed foreman Hecla mine at Wallace, Idaho. A. M. Perkins and Geo. Wall have been made shift bosses.

A. W. JENKS has returned to Salt Lake City, Utah, after four months spent in the examination of mining properties in Nevada and Utah.

D. T. PARKER, formerly superintendent Ohio & Colorado S. & R. Co. at Salida, Colo., is superintendent Ponderay Smelting Co., Sand Point, Idaho.

JOS. PORTER, recent superintendent Fairview mine, Papoose, Cal., has taken the management of the Bonanza King mine, Trinity Center, Trinity county, Cal.

J. W. GATES, for several years in the Denver office of the Mine & Smelter Supply Co., has been appointed local manager of their Salt Lake City, Utah, branch.

LOUIS B. CARR, formerly of Pueblo, Colo., has formed a partnership with Geo. H. Sauer and opened a custom assay and ore shippers' office at 1711 California street, Denver, Colo.

MATTHEW BRODIE, formerly of the Pittsburg office, has been appointed local manager of the Salt Lake City branch of the Sullivan Machinery Co. of Chicago, with offices at No. 128 Keith building.

THEO. F. VAN WAGENEN, who recently returned from South Africa, now makes his headquarters in the City of Mexico. For the next ninety days he will be traveling through Yucatan and the southern States of the Mexican republic.

J. R. HENDRA, superintendent Santa Fe Copper & Gold Mining Co., with mines in Alamos, Sonora, and also in Sinaloa, Mexico, has also taken the superintendency of the San Bernardo Mining Co.'s mines in Aduana, Alamos, Sonora, Mexico.

Obituary.

WM. COLLEY, a well-known zinc and lead miner, died in Leadville, Colo., July 23, of pneumonia, aged 52.

HENRY RAMDOUR, superintendent Globe mine at Trinity City, Cal., died recently at Winnemucca, Nev.

WILLIAM JESSOP died on July 4 at Thornsett Lodge, Bradfield, England, after a long illness. Mr. Jessop was born October, 1856, was educated at Repton, Germany, and at Cambridge. At the time of his death and since 1887 he was chairman of William Jessop & Sons, Ltd., steel manufacturers of Sheffield, England, and was the head of the fourth generation of the Jessop family in control of the firm—the business having been established in 1774. He was also president of Jessop Steel Co. of Washington, Pa., president of the Jessop hospital for women, an institution founded by his father, the late Thomas Jessop, to which he contributed over $200,000, and which was zealously and liberally supported by his son. He was noted for his kindness and generosity and was greatly esteemed by all. He visited Australia, Japan and America in 1903.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ARIZONA.

Gila County.

The old shaft at the Old Dominion plant at Globe has been abandoned for all hoisting purposes and power applied to the new shaft. The gallows frame has been taken from the old shaft and the steam plant is to be removed. The new concentrator will be operated on August 1. The fourth furnace will be put in at once and serve as a relief for the three now in commission. They can be repaired alternately without lessening the output.

Mohave County.

The Santa Inez M. Co. is working the Mohave mine, near Boundary Cone, in the Vivian district.——Superintendent Malone is putting in a hoist at the Fay mine, south of Kingman.——The German-American mill has been closed down owing to the failure of the water supply. Men have been put to work on the Pioneer shaft and it will be driven down into the water stratum. If sufficient water is developed the mill will be started up again.——At the Pinkham mine men are taking out water and getting ready to sample the property.——A hoist will be put in at the Midnight mine and the property unwatered. E. C. Eckis is superintending work on both mines.——Work on the Minnesota-Connor mine at Chloride is under the management of F. H. Griffith. A large compressor is being put in and machine drills will be put in at once.

Pinal County.

(Special Correspondence).—The Arizona-Pacific Copper Co., whose property is near Florence, has put in a complete shaft equipment, including a 35 H. P. hoist, air compressor, machine drills, electric light plant, pumps and other equipment. The company is engaged in sinking a shaft to a depth of 1000 feet. It is down to a depth of 350 feet, where a station has been cut and a crosscut made to the vein. The main office is 702 Stevenson Building, Indianapolis, Ind. F. P. Jeffries is president, J. W. Sharpe vice-president and general manager and E. R. Stafford superintendent. The property is said to show several smaller veins, assaying 3% to 20% copper and $5 to $20 gold per ton. A quartz porphyry dyke, 1200 feet long and of variable width, has been shattered and cemented by veins carrying cuprite, melaconite and chalcocite giving 3% copper.

Florence, July 31.

(Special Correspondence).—The Big Lead M. Co. has purchased copper claims adjoining the Ray mines, 5 miles from Kelvin. A double-compartment shaft has been sunk to a depth of 100 feet, and the copper ore body has been crosscut at the bottom of the shaft to a width of 100 feet. A successful concentration test of the ore is said to have been made at the old Bob Tail mine. A site is being graded on which to build a concentrating and leaching plant with a capacity of 100 tons daily.

Kelvin, August 1.

Yavapai County.

Yavapai county has agreed to accept the road leading from Poland past the Buffalo-Arizona camp to the Michigan-Arizona mines. The opening of the road makes an improvement in the vicinity, furnishing access to the mines from Poland. Previously it has been necessary for the companies operating south of the Buffalo-Arizona to have the freight and mail sent to Prescott, 15 miles away.——On the Gold-Copper Co.'s ground, south of the Senator mine, near Prescott, the company is completing a camp that will accommodate fifteen men until reduction begins. Thos. Marmont is superintendent.

T. J. Rigby, president and general manager of the Rigby M. & R. Co., is establishing the Pohle-Croasdale metal volatilization process at Mayer. All the buildings, ore bins, etc., are completed, the machinery has been made, much of it is on the ground and the rest in transit. The works will be ready to start up by October, beginning with four furnaces capable of handling 125 tons per day. The superintendent and construction engineer is H. A. Clarke. The operation is first one of crushing the ore; second, its subjection to a desulphurizing roast to expel the sulphur; third, volatilizing the metals and, fourth, condensing them in chambers provided for the purpose, where 95% to 98% of the values are said to be recovered. It is automatic.

CALIFORNIA.

Amador County.

At the Volcano quartz mine on the Mokelumne river, near West Point, a 10-stamp mill is being put up.——F. Jackson and J. Podesta are working their quartz mine on the Spagnoli land, near Clinton.——It is reported that the Zeila mine is changing from the old to the new hoist. The hoist has been all ready, but the work of changing has been delayed on account of the flow of water. The mill will be shut down for two weeks while the change is being made.

Butte County.

The main tunnel of the Gold Bank quartz mine, at Forbestown, has been cleaned through its length of 2200 feet.

The Veigne ranch, 5 miles east of Honcut, consisting of 1430 acres, has been bonded by W. E. Crook for mining purposes.

Del Norte County.

(Special Correspondence).—It is reported that a 500-ton concentrating plant is to be put in at the Monumental mine at Monumental by T. W. M. Draper. The ore is soft and it is planned to concentrate twenty-five tons to one.

Monumental, Aug. 1.

Contra Costa County.

(Special Correspondence).—The new smelting and refining plant of the Mountain Copper Co., near Martinez, is about one-half finished. The lead tanks of the sulphuric acid plant have been put in and the building partly built. Most of the buildings have been completed and the furnaces and boilers are being put in.

Martinez, Aug. 3.

Los Angeles County.

A low-grade gold property in Millard canyon on Mount Lowe is being developed by a Milwaukee company represented by H. J. Pullen.

Inyo County.

The Great Western Ore Purchasing & Reduction Co. is running ten stamps at Keeler and five at Swansea. Slag from Cerro Gordo and the Swansea furnaces is being worked, and Darwin's furnace sites will also be worked.

Merced County.

L. K. Vaughan of Oroville is prospecting the bed of the Merced river, near Snelling, with a drill. The ground will be worked with a dredge, if prospects warrant.

Nevada County.

Superintendent F. L. Whipple has temporarily suspended operations on the Federal Loan mine, near Nevada City, while the surface improvements are being made, during which time only the pumps will be kept going and a small crew employed. The mine is down to the 1000-foot level and all ready for drifting and stoping. Since the present company took hold they have sunk 200 feet. —— H. German and Weinman Bros. of North San Juan, who are driving ahead the long tunnel at the Orient gravel mine, near Nigger Tent, found gravel while making an upraise. They connected with the shaft and have fine air for working in the main tunnel. The gravel is 60 feet above the tunnel, pitching at a steep angle into the ridge. To reach the bottom of the channel will require 300 feet of tunnel.

Superintendent W. H. Dunlap is putting in a 10-drill compressor at the Lecompton mine at Nevada City.—— The debris commission have granted permission to the Omega Co. to build another restraining barrier in the canyon below their gravel mine at Omega, near Washington. Superintendent W. M. Wilson expects to commence work as soon as the preliminary arrangements can be completed, as it is desired to have the barrier finished by next fall.——R. I. Thomas and associates have an option on the Hustler holdings, near Cherokee, on the Bloomfield channel.

Placer County.

The Hidden Treasure mine is working 140 men and making good progress on the air shaft near Forks House.——The Baltimore mine at Forest Hill is running with thirty men and putting in a 50 H. P. engine.—— At the Mayflower mine, near Forest Hill, they have struck the Orino channel.——At the Tadpole mine, at Secret House, four men are driving the main tunnel.—— The Jarvis mine, at Red Point, is being worked with twenty-five men.——About fifteen men are employed at the Red Point mine.——The Alameda mine machinery at Black Canyon is being put in order, electricity replacing steam, and forty men will be employed.——The Paragon mine, at Bath, is working twenty-five men on good pay dirt, two shifts a day.——James & Smiley have four men at work at the Prairie Flower mine, at Canada Hill, developing.——The Salvation mine, at Canada Hill, has closed down for a short time.——Drifting is to be started at the Santa Fe mine, at Canada Hill.——In the Golden West mine, at Canada Hill, the pay channel is said to have been reached.

The Acacia, or James mine, near Damascus, has been sold to a San Francisco company by G. and H. W. McAulay.

San Bernardino County.

W. V. Holley and J. Meyer of Los Angeles have bought from J. Nelson and A. E. Moore their claims, near Keswick Springs, on the desert, for $40,000. The ore showed high values on the surface, and at a depth of 150 feet increased in value. Machinery will be put in.

San Diego County.

Near Julian, the Julian Con. M. Co. is putting up a 50-ton roasting plant and also a 20-stamp mill and cyanide plant between the Helvetia and High Peak mines. New shafts are being sunk on both mines and the old ones are being retimbered, to be used for ventilation and escape. The Julian Con. M. Co. also owns the Warlock mine, between Julian and Banner, on which they are running a crosscut to tap the vein. This crosscut is 800 feet long. W. J. Proud is in charge of the High Peak mine, D. F. Lane of the Helvetia, D. S. McPherson of the Warlock and D. G. Juewitt is in charge of the milling and cyanide plant. W. W. Boswell is the general superintendent.

Shasta County.

D. McCarthy proposes to open up the Dry Slide mine above Keswick.

Sierra County.

(Special Correspondence).—The Forest City M. Co. have started men to work and this coming week will have eight men working. New cars have been taken to the mine and work will be crowded as much as possible, and as soon as there is enough money will put on six more men, and it will take but a short time to develop the channel.

Forest City, Aug. 1.

At Forest City work has been started on the Mabel Mertz mine, extending the West tunnel to tap the gravel channel, which was struck some time ago.—— Superintendent E. Kuhfield has been driving the tunnel at the South Fork mine, near Forest, and it is now believed to be under the gravel channel.

At the Mountain mine the tramway which was destroyed by fire last December is being repaired. It is in operation by means of a temporary chute from the level of No. 3 tunnel to the lower bin of the upper terminal. This arrangement is temporary, but will enable the mill to be started and supplied with ore until complete repairs are made. A gyratory crusher is to be put in at the mine. The rock crusher will be driven by a 50 H. P. electric motor, which will receive its current from a 75 K.W. generator at the mill. This plant will also furnish lights for both mine and mill, and later will be used to drive air compressors at the mine. L. H. Carver is superintendent.

Siskiyou County.

The Williams Point gravel mine, 10 miles above Happy Camp, has been sold by T. J. Nolton to Seattle, Wash., and Denver, Colo., parties, who propose to put in a power plant and pump water from the Klamath river for mining by hydraulic means. The experiment is said to have been tried successfully in Colorado, and it will be watched with interest, as there are many mines that could be worked but cannot be provided with ditches.

Stanislaus County.

T. Donohue, superintendent of the La Grange Ditch & Hydraulic M. Co., is building 8390 feet of flume, 5x7 feet. Work was stopped July 1 until this can be finished.

Yuba County.

It is reported that dredge mining is to be started, 4 miles east of Wheatland, by an English syndicate.—— Jas. O'Brien has bonded from T. Mahoney land in Linda township, 4 miles east of Marysville, for dredge mining purposes and also from John Raynolds.

COLORADO.

(Special Correspondence).—The "good roads' movement" which has occupied the attention of Denver the past week will undoubtedly bring forth good results. The question of good roads in this State is not one of comfort and convenience, but one of necessity. In the mountains, especially, the question needs agitation. The county, State and Government should work in harmony along this line and endeavor to make better roads. In many isolated districts and in places where the travel is heavy the roads are almost impassable, even during the summer months. It is to be hoped that the recent convention held in this city will do all and more than it has promised.——The Short Line Railroad, which was built by the mine owners and operators of Colorado Springs and Cripple Creek district, and which is reported as having been sold to the Colorado & Southern Railway, is to have an airing in the courts. James F. Burns, a heavy stockholder in the Short Line, has filed suit against the directors and charges secret manipulation in the sale of the stock. Burns has been refused, according to his complaint, the books and is bringing suit to compel them to allow him to examine the books. ——Activity is shown in several districts where the ores contain considerable zinc. On account of the high price for zinc, a large number of old abandoned mines and dumps are now working at a profit and many more are being started. In upper Clear Creek county this is proving true, as some of the old dumps are being worked at a profit, others are preparing to open up the old stopes as well as treat the dumps.

Denver, Aug. 1.

Clear Creek County.

(Special Correspondence).—The Independent M. Co. has recently purchased the old Griffith mine and are preparing to build a new concentrating mill for handling the old dump as well as the low-grade ores from the mine. The purchase price was $40,000 to be paid in seven months; twenty-five to thirty tons per month are being shipped at present. A new boiler will be put on the property. This company is also operating in East Argentine district. John Larson is manager, and Simon Anderson is superintendent.

Georgetown, July 28.

(Special Correspondence).—It is reported that the Empire Co. intend building a new smelter at Empire station, on Clear creek. A number of tests have been made, sufficient ore procured and the site of the smelter selected.——The Commodore Co., in which A. E. Reynolds is interested, is pushing its Commodore tunnel into Red Elephant mountain to develop mines in that mountain.——The Big 40 tunnel, being driven from Chicago creek to Clear creek by the Big 40 M. & T. Co. of Denver, has opened an ore shoot in the first lode.——The Two Sisters, or the American Sisters, are sinking a shaft to be sunk 200 feet.——The Joe Reynolds mine is shipping high-grade ore. A new ore washer has been put in at the mouth of their working tunnel to wash the dirt taken from the old stopes before it is sent to the concentrator. This mine is being worked through a tunnel driven by the company to drain the old workings, but may eventually be worked through the Big 40 tunnel and the Gold Valley tunnel.——The Mint lode at Empire is working.

Empire, July 29.

(Special Correspondence).—Stephens & McGroth have a lease on the old Mendota mill and dump and upper workings of the mine and are shipping 100 tons of concentrates per month. The dump ores run high in zinc. ——The new mill of the Dives-Pelican Co. is in operation, but they are putting in a larger size motor, as the one now in place is not of sufficient size to allow them to run full capacity.

Silver Plume, July 29.

(Special Correspondence).—On the ground on Chicago creek, where gold was first discovered in Clear Creek county, by George A. Jackson in 1858, is the new stamp and concentrating mill of the Waltham M. & M. Co., M. W. Tanner, president; A Anderson, treasurer. The mill contains twenty stamps, Elspass mill, two Wilfleys and one jig and has a capacity of 100 tons per day. The cyanide plant contains six steel tanks with a capacity of 100 to 150 tons each. Everything in the mill is automatic. The shaft on the property is down 150 feet and is to be sunk to the 500-foot level.——The Bonita mill, F. Read, manager, is adding 1000 square feet of canvas tables to better enable them to handle the ore they are receiving.

Idaho Springs, July 31.

A right of way through the Silver Gem tunnel at the head of Silver Age gulch has been secured by the Fostoria G. M. Co., which owns the old Hall ranch, an old agricultural patent lying north of the dividing line between Gilpin and Clear Creek counties, and the tunnel will be extended several hundred feet to reach the principal veins on the ranch. A 60 H. P. boiler and a 4-drill

air compressor will be placed at the mouth of the tunnel. The Silver Gem tunnel is in 917 feet and is expected to cut the St. Joseph lode, after which it will cut the Galatea vein. W. E. Campbell of Idaho Springs is secretary and manager.——At the Ward mine on Jackson's bar at Idaho Springs, men are sinking the present shaft, now 165 feet deep, an additional 100 feet, the work to be done with double shifts using machine drills. A large flow of water is coming in, but it will not interfere with operations at present, as the mine is equipped with both steam and electric plunger sinking pumps. The cyanide plant is handling the entire tailings output of the mill. ——Work was to be started August 1 on an electric road to the mouth of the Wilcox tunnel from Clear creek. The line will run around the face of Lafayette mountain on a 6% grade, and will be from 1500 to 2000 feet above Georgetown. The road will be used almost entirely for carrying the Waldorf ores to market. The road will be built by C. J. Wilcox, manager of the Waldorf M. Co.

The Georgetown Courier says that considerable development work is being carried on in the Daily district. T. Tyler of the Duluth & Colorado M. Co. states that many persons are in the field. The Continental tunnel is in 130 feet.——The Tam O'Shanter Co., operating claims adjoining the Puzzler group, is employing men in development work.——The Red Mountain Co. is employing two shifts and excellent headway is being made. The property is showing good values in gold and silver. The crosscut tunnel started a few months ago is in 200 feet.——The Helen-Harold Co. is developing. L. W. Aldrich is putting in an upraise to secure good air.—— The Butler M. Co. has put in its machinery. The shaft is to be given another lift of 100 feet.——The Dunton claims are being operated by the Vigilant M. Co., under the management of J. Lundstrom. The lower adit is being driven ahead.

Manager C. H. Morris has made arrangements for more work at the mines of the Charter-Raton M. & M. Co. on Breckenridge mountain, near Empire. The tunnel is in 150 feet.

Gilpin County.

The new mill of the Gold Dirt M. & M. Co. at Perigo has been completed and is expected to be running by August 10. The stamps are rapid drop, each weighing 1100 pounds. The plant will be lighted by electricity. The mill ore will be hoisted from the tunnel level through a 100-foot upraise to the rear and top of the mill by elevator. The process employed is plate amalgamation, concentration and cyaniding. J. R. Anderson is manager.

Development at the Snowdon property, near the head of Silver creek, is being done by the Missouri-Colorado M. & M. Co. under the superintendency of T. J. Stroud. They are drifting in the shaft at the 100 foot point and at the 50-foot point they are stoping. No effort is being made to ship ores at present. They expect to resume sinking the shaft.—— J. F. Colby, owning the Mary and Starling claims on the north side of Silver creek, is timbering the Starling tunnel, intending to work that tunnel to open up the Mary vein.—— It is reported that the Claudia J. vein has been cut in the crosscut at a depth of 100 feet. Arrangements are being made for a steam hoist. It is owned by W. Kelly of Apex. —— The Branham syndicate, with F. L. Branham in charge of operations, owns the Golden Crescent group on Black mountain on the south side of Silver creek. —— The Golden Rod M. & M. Co. have not been working for some time on account of the large amount of water in the main shaft which has reached a depth of 235 feet, the development in the mean time consisting of driving the tunnel to cut the shaft. This tunnel is in 70 feet, and when it cuts the shaft it will drain the surplus water, when operations will be resumed in the main shaft workings, as by that time it is believed that the water can be handled to advantage. —— At the Maine Louise group on the south side of Silver creek, J. Taylor and G. B. Wilkinson propose to extend the main tunnel to get under the old workings. —— The Little Lallie Mines Co., operating on the east side of Michigan hill, have W. E. Garver in charge of developments. —— The Pine Creek Con. M. & M. Co. has resumed work on its Barrick group of mines on Michigan hill, the work being in charge of W. S. Barrick.

Grand County.

The new mill of the Williams Fork M. & M. Co. is in operation near Empire. The 1400-foot tram from the mouth of the tunnel to the mill has been completed.

Gunnison County.

The Buena Vista M. Co. has put in machinery on its property at Hancock, and will resume operations on its tunnel into Mount Chapman from the northeast side. The company proposes to drive this tunnel 2000 feet, cutting through Mineral hill and into Mount Chapman. Several veins will be cut.——Regan & McCarthy of Cripple Creek have leased and bonded the El Dorado property, in Waunita park, and commenced operations. Machinery has been placed on the shaft, and it will be sunk deeper.——At Camp Sherrod the Sunlight G. M. Co., which has been driving a long tunnel into Mount Chapman from the west, has opened some ore that runs $50 per ton. Manager W. M. Bacon has a car of ore ready for shipment. The tunnel is in 200 feet.——The N. B. C. Co. has started a tunnel into Brittle Silver mountain, having let a contract for a 500-foot tunnel. ——The Camilla M. Co., representing W. G. Smith and other Denver people, will resume operations on its tunnel on Pomeroy mountain. It is now in 800 feet and has cut several veins.

The Golden mine in Paradise basin is being worked by L. Stanley and I. Brown of Gunnison.——Geo. Kellogg, of the Chloride at Pitkin, has secured a lease on the Mono mill on Ohio creek and has men repairing it, and will treat by cyanide all the low-grade product of the mine.

Lake County.

The Twin Lakes Miner says Hughes & Osburn are operating their Lincoln gulch properties.——J. M. Low is working the Young & Morgan claim at Red Mountain. ——Wm. Wheeler and T. Corlett are working the Iron-Gold group at Red Mountain.——The Manhattan M. & P. property has let a contract to Garfield Chilson for extra development work.——Arthur Kindel et. al will start extracting ore next month from the Kindel claims, in Sayres' gulch.——The Blaine Electric is making rapid progress in their tunnel in Willis gulch, and are employing a number of miners.——The tunnel of the Mt. Storm property is progressing rapidly since Frank Low and Steve Dodge have secured the contract.—— Operations have been resumed on the Dewar and Bowman properties at Red Mountain, by Harry Bowman. E. J. Dewar will arrive later.——Work has been resumed on the Byby group belonging to E. Ludwig of Denver, and G. Hoover has secured the contract on the new crosscut tunnel that will tap the several veins at depth. The property is on Taylor Pass.

In Leadville the Western M. Co. is sinking two shafts, one above the Penrose and the other to the south of it. The upper shaft is the Home Extension, under lease to the Cloud City Co., which is 600 feet deep and will be sunk another 200 feet, to be on a level with the bottom of the Cloud City, and when sinking is completed the two shafts will be connected. The other shaft to be sunk is the Bohn, which is down 550 feet and will have to go down another 350 feet to reach the ore shoot from the Penrose.

La Plata County.

(Special Correspondence).—At La Plata the May Day new tram is running. They are shipping twenty-five tons of good ore daily. The second tunnel, being run to cut the vein at a depth of 1000 feet, is in 1100 feet, with 1000 feet more to be driven. Machine drills and three shifts of miners are at work.——A third shift is to be put on at the New Hopes mine as soon as the road is cleared of snow. Wm. Price of La Plata is manager. The tunnel is in 1300 feet, which leaves 450 feet to be driven before the vein is reached. The tunnel is being driven with machine drills, making 6 feet daily.——The Lucky 4 mine, in Burnt Timber gulch, owned by Cripple Creek parties, recently became one of the shippers in this section. Manager Sye Roe is working two shifts and is turning out five tons of ore daily.——The Bonnie Girl mill is being built and the management think they will start up by Sept. 1. The mill is a 50-stamp concentrating plant and will be operated entirely by electric power. Superintendent Al Beason has charge of the work.——Eastern parties are looking at the Neglected mine and are thinking of starting it.

La Plata, July 29.

Mineral County.

At the Amethyst mine, near Creede, A 100-ton milling plant is being put up. The plant was designed by L. H. Norton, manager, and J. J. Fitzgerald, superintendent of the milling department of Creede United M. Co. The equipment includes a 9x15 Blake crusher, Bolthoff automatic feeder, two sets 14x27 rolls, four trommels, four 4-compartments jigs, tables and two 5-foot Chilean mills. A novel mechanism is the shaking launder for dewatering the jig middlings before delivery to the mills. Power is furnished by two 80 H. P. boilers and a 14x36 Corliss-Murray engine. It will probably be working within three months. Cyrus Miller of Denver is the general manager and Frank Ullman superintendent of the Amethyst Co.——The East Willow mill above Creede is in operation, treating forty tons of ore daily. Chas. Loughridge is general manager.

Ouray County.

The Joker tunnel of the Red Mountain R., M. & S. Co. is in 1700 feet, the depth at the breast being about 350 feet. In its course of 7000 feet it is expected to cut the Guston ground at a depth of 417 feet, the Robinson at 500 feet depth, the Yankee Girl at the sixth level, and the Genessee at the 800-foot. Mining has been handicapped by the acid surface waters, which will be removed through the Joker tunnel. During the six months ending June 11, the tunnel was driven 1300 feet. During March 282 feet were driven, the ground being broken 12x14 feet, the tunnel in the clear being 7x8½ feet. Leyner drills, size 5A, are in use. Back holes of 11½ feet and cut holes of 13½ feet were drilled. Including drillers, muckers, sharpeners, twenty-eight men were employed. The tunnel is mainly in a hard blue porphyry. The tunnel is timbered for 1000 feet, the timbers being square-setted. A 250-K.W. dynamo has been put in for electric lighting and haulage. W. C. Aston has charge of work, and G. Crawford is manager. The general superintendent is G. B. Craft of Ouray.

The mill of the Treasury Tunnel M. & R. Co. at Red Mountain has twenty stamps dropping, with twenty more ordered and to be put in as soon as possible. The Treasury mill is said to be now producing twenty tons of concentrate a day—a ton to the stamp. W. J. Hammond is manager.——In the Bachelor district the Calliope is shipping as well as the Bachelor and within three months the Neodesha, on which the Arps Bros. have started three shifts to drive a 400-foot tunnel, will be producing. John Kelleher has charge of the Neodesha and Bachelor.

Park County.

It is proposed to run a transportation and development tunnel from near Alma through London mountain of the Mosquito range to the Ibex mine in Lake county. The distance is over 4 miles, and will give a depth of over 2500 feet—cutting the London veins at a depth of 2550 feet, 850 feet below the present 1700-foot workings. R. M. Sherwood and W. J. Kurt, of the London Mountain Railroad, Tunnel & Mining Co., are interested.

J. H. Thorne has started work at the Snowstorm placer, near Alma.——The Hilltop mine on Horseshoe gulch, 4 miles from Fairplay, has been leased by John Geering.——Wm. Bean has been shipping copper gold ore from the May Queen mine, near Alma.—— Geo. Shelton is shipping 200 tons of sulphide ore monthly from the Kentucky Belle, near Alma.

San Juan County.

Tunnel work is to be resumed by the Golden Monarch M. & M. Co. at its claims, near Gladstone.——The 20-stamp mill of the Gold Prince mine is handling 40 tons daily. Work is to be started at the new 500-ton mill at Animas Forks.

The Sound Democrat claims and millsite at the head of Mastodon gulch, near Silverton, have been sold to J. B. Lazell and J. W. Walker for $100,000 by J. James and W. G. White.

San Miguel County.

It is reported that Alex. Greig will resume work at the Nevada mine, near Ophir.

Tests of vanadium-bearing rock found on the San Miguel river, near Newmire, are to be made by the Vanadium Alloys Co., with office at 25 Broad street, New York City. W. T. Rynard, manager, and H. A. Hillman have been at Telluride examining the deposit. It is stated that a 25-ton mill is to be built to concentrate the product.

Summit County.

The Wachter & Weaver property in McCullough gulch, near Breckenridge, is being developed by a tunnel.——F. A. Yauger, manager of the Beaver Creek Gold Mines Co. at Alma, has been getting machinery to put the Lucky mill at work on ore from the Beaver Creek Co.'s property.——The Wild Irishman, on Glacier mountain, Montezuma, and operated under the management of T. Connors of Leadville and Kokomo, is being developed by running a lower tunnel which is to be 2000 feet in length. A vein of ruby silver ore has already been cut.——Superintendent E. W. Fairfield reports the mining situation in the Silver Wing mine at Montezuma as good.

E. T. Brooks has completed his 1000-foot contract on the French Creek tunnel, in French gulch, for Lennox, Evans & Co. The tunnel has been driven 1358 feet.—— The Mary Verna and North American properties at Frisco are to be equipped with air compressors and power drills and the tunnels driven 3000 feet.

Teller County.

It is reported that a new ore shoot is being opened up on the 12th level of the Last Dollar mine on Bull hill, Cripple Creek.——A new cyanide plant is being put up at the Des Moines Co.'s property on Bull hill.——The new compressor has been started at the Blue Bird mine on Bull hill.——The Portland Gold M. Co. has opened up a new vein at a depth of 1350 feet, in the No. 3 shaft, located on the crest of Battle mountain, Cripple Creek. ——The experimental mill erected at Stratton's Independence has been closed after one year's service. The mill was built to test the low-grade ore in the great dump by the Cassell process. It is reported that the low-grade ores of the dump, which approximate 1,000,000 tons and possibly average $4 per ton, can be treated at a net profit.

The Winner Gold M. Co. has put in a 20 H. P. hoist, with blacksmith shop on its Winter Hill holdings near Midland. The company has seventy acres, on which development work is being done. A. M. Levy is general manager.——Edward Mayfield has leased the Van Fleet sampler, near Goldfield, and will probably run it as an independent plant. He proposes to use cyanide. The closing of the Standard mill of the United States R. & R. Co. at Florence has caused anxiety as to what will become of the large body of ore that was formerly shipped to that plant.——The cyanide mill built by the Exposit on Co. at the Los Angeles mine, on Bull hill, Cripple Creek, is now in operation, fifty tons of ore being treated daily. The plant has three 150-ton tanks and in time the full capacity of the mill will be treated. Larger crushing machinery is to be put in when necessary.

IDAHO.

Blaine County.

Vancil & Grimm have struck ore in their claims, 8 miles west of Hailey.——A vein of galena has been cut in the Oswego mines, near Hailey, by Superintendent Weaver.

Idaho County.

The Hogan mill at Oro Grande is being enlarged.

R. W. Purdun, general manager of the Sunnyside mine at Roosevelt, and Superintendent Treewick have been making tests of the ore preparatory to putting in a cyanide plant.——The Standard ore is increasing in value as the work goes on. This company will soon have its mill in.——The machinery for the Twentieth Century mine is coming in to Roosevelt.

W. O. Brown, manager of the Concord mine in Buffalo Hump, reports that good work is being done in the Hump this season and some excellent ore is being found. Extensive development work is being done on the Concord property, with good results.

Lemhi County.

W. S. Burton, superintendent of the Gold Dust mines, near Leesburg, intends remodeling the mill.

Shoshone County.

The Benton M. Co., of Burke, is developing claims on Gorge gulch. The last 50 feet of work on the No. 3 level has cut a shoot of good concentrating ore. The No. 3 level is in on the middle vein 900 feet, having a vertical depth of 400 feet. This level will ultimately gain a depth of 1000 feet on the edge. The principal owners of the Benton Co.'s stock are: John Callahan, of Burke, president and manager; J. F. Callahan, of Burke, Theodore Anderson, lessee of the Rex mine, and W. Smith, of Portland, Oregon. The mill equipment consists of one rock crusher and three sets of rolls, eight Wilfley tables, a magnetic separator, separate ore bins for lead and zinc concentrates and settling tanks. The mill will fine crush all the ore for the purpose of getting the best separation possible. None of the feed will pass the rolls until it can pass through at least a 30-mesh screen. This fine crushing and the electric separator are the features of the mill and its object is to produce both lead and zinc concentrates. It will have a capacity of 100 tons of ore per day. Were it not for the desirability of separating the zinc and the lead no milling would be necessary, as the ore is all high in either lead or zinc sulphides, as well as in silver. It is to treat ore from the Granite mine.

Shortage of water is already doing some damage on Nine Mile. The Rex mill has been closed temporarily this week on account of it. A fair amount of rain would supply enough water, and this is the only probable source of supply. T. Anderson, the lessee, states that a few men will be employed at the mine doing development work.——While the mill at the California and Black Cloud has not been materially affected as yet, there is no surplus of water.——The new mill of the Success Co., to

have been started by August 1, has very high pressure and it is hardly possible for the water to get so low as to interfere with its running.

At the Frisco mine at Gem there are three parties working leases in the upper levels and shipping five cars a month of ore and concentrates. Gus Ehrenberg employs ten men steadily and for the past four months has been averaging 150 tons of ore and concentrates a month from his workings. The mill is under lease to him and his plan of operation is to accumulate enough milling ore for a three days' run and then start up the mill and keep it going until he has cleaned up. The other two leasing outfits do not mill any of their ore. All they extract is sorted by hand and such as is not high enough grade to ship is left in the stopes or on the dumps.

MICHIGAN.

Houghton County.

President W. A. Paine of the Copper Range Con. says that the Champion does not contemplate the opening of a fifth shaft this year. The four shafts now developed —B, C, D and E—provide all of the ground that is needed at present. It is impossible to say when shaft F, to the south of E and toward the Globe property, will be started.——The Mass mine railroad extension to shaft C is being connected to the Mineral Range Railroad. The Mass has been shipping rock regularly from shaft C. This rock is hauled down the heavy grade by team to the railroad connections at shaft B. The length of the railroad extension will be 4000 feet. Shaft C is opened to a depth of 600 feet. The shaft is sinking on the Butler lode, but through crosscuts the Knowlton lode is also being developed. At shaft A sinking is now progressing below the fifteenth level and at B below the sixteenth level.

The Isle Royale exploratory drift on the Portage lode is 600 feet long at the 800-foot level. It equals the showing made below the 1000-foot level in crosscuts from No. 1 shaft. No. 2 shaft is down 1800 feet, sinking in copper above the mine's average. Section 11 shaft is 150 feet deep; 900 feet of drifting has been done. The shaft is bottomed in good ground. The Isle Royale mill is treating 650 tons daily. As yet the management has no plans for the Baltic lode.

MISSOURI.

Jasper County.

The Joplin News-Herald reports that the Maud E. mill at Chitwood, belonging to B. L. Van Hoose and S. J. Chitwood of Carthage, has been started.——The Boston-Springfield mine, on the Gordon ground, has been leased to a new company and the mine will be reopened. New pumps will be put in and the work of draining the ground begun.——Two mills are to be torn down and rebuilt—the Big Kate at Neck City and the Atlas at Carterville. The Big Kate is also to be moved onto the Cockleburr mine, on the Reliance lease, and the Atlas will be moved to the mine of the General Lead & Zinc Co. at Prosperity.——The Coil Co. are sinking their shaft near the Bumble Bee. J. J. Wickham is manager.

MONTANA.

Deer Lodge County.

In the Moose Lake mining district, 38 miles west of Anaconda, the Moose Lake M. Co. is opening up its claims. The company has a 10-stamp mill and a 40-ton cyanide plant is to be added. They own 1000 inches of water in Carp creek and intend to generate power with the flow.——Ore is being shipped from the Abe Lincoln, a claim adjoining the property of the Moose Lake.

Granite County.

Smart Creek mining district, near Philipsburg, is attracting attention since the bonding of the Red Metal and Copper State properties to Butte people, who are proceeding with development. The Eagle, owned by U. F. Hughes, is also being worked. A tunnel has been run 250 feet to cut the vein, upon which a shaft about 125 feet had been sunk.——J. Bush is also developing the Nancy Hanks in the same district.——Sherr & Looney are working the Nonparell in the Princeton district with a small force. The Nonpareil is a lead-silver proposition and ore will be shipped to the smelter at Pen d'Oreille, Idaho, for treatment. They have been working the mine through new shafts, but the old one, which is down 400 feet, is being retimbered and the hoisting plant at the shaft will be put into working shape.——At the Albion, above Princeton, Wagoner and his associates are developing. It is reported that a mill is to be put in. ——The Royal Gold is again shipping. The property is owned by Conrad Kohrs and others. The stamp mill now on the property is being put in repair and will soon start running on good milling ore.——The Scherr Bros. are working the Old Witch mine, in the Princeton district, under a bond and lease.

Jefferson County.

The Apollo claim, near Basin, owned by H. L. Frank, of Butte, is being worked by D. Driscoll under a bond and lease. He has several men working on the property and has built ore bins at the side of the road where it can be handled conveniently by the teams. The ore is free milling gold and is to be hauled to the 10-stamp mill on Basin creek, which is being repaired.

Madison County.

A. C. Sanders, superintendent of the Mammoth M. & P. Co., is putting in new machinery at the mine at Mammoth.

Silver Bow County.

The mill of the Montana Zinc Co. in Butte is ready for work, the improvements and repairs commenced a few weeks ago being completed. During the suspension a new revolving dryer was added and repairs made.

About a year ago changes were made in the Washoe smelter, to enable the plant to handle the fine ores and flue dust in a more satisfactory manner than the one in use. Under the old methods the contents of the ore cars were dumped bodily into the furnaces. The heavy ore smelted easily, but the fine ore collected at the bottom of the blast furnaces and it took a great deal of blast and heat to make it yield. In the ordinary blast furnace in use in Montana this heavy blast that was necessary to get a perfect pour caused the generation of large bodies of gas, which the company was unable to use. Reverberatory furnaces were installed which were confined solely to the handling of fine ores and flue dust. This enabled the blast furnaces, running on coarse ores alone, to increase their capacity largely and make an increase in the amount of product handled by each furnace of about 40%. In this way the Washoe avoided the briqueting of its flue dust, which is now merely put into the reverberatory together with the fine ores which they treat. Besides, there is much less of the flue dust in the large stack at the end of each day's run than was the case when the ore was treated unsorted. By running the coarse ore alone less fuel is required and the fusion is made more rapidly than is the case when a higher temperature had to be employed. Coke is used exclusively in the blast furnaces, while coal is used in the reverberatory. This makes a great saving to the company, as the gases which are generated by the coal and the ores are conducted in ordinary pipes under the boilers and used for the generation of steam for all the varied purposes of the company. The saving thus effected amounts to from 35% to 40% in the fuel charges of the furnaces. While the item of flue dust has been decreased, the direct method of handling this product represents a saving of $1000 a day. The changes that were made to effect these savings represented an outlay to the company of a little less than $15,000, and their total effect is that they have reduced the treatment charges 40%. The only briqueting now done at the Washoe is in connection with the saving of the slimes.

NEVADA.

Elko County.

A large pump has been put in at the Dexter mine at Tuscarora and the lower levels are being drained.—— Work has started on the Commonwealth and Queen, recently sold to New York and Denver people.

Esmeralda County.

Another attempt is to be made to extract the values from the 400,000 tons of rich tailings that lie on the dump of the old Bellville mine, 10 miles from Sodaville.

Drifts are being run both ways from the 350-foot level of the Florence mine at Goldfield. The copper values are said to be increasing. A station has been cut and a drift is being run southeast at the 310-foot level of the Dixie at Goldfield.——On the Honsinger lease on the February at Goldfield the shaft is being sunk 100 feet from the 100-foot level. A gasoline hoist is in use.——It is reported that the Bonnie Clair M. & M. Co. will put in a stamp mill and cyanide plant in the Tokop district.

Lincoln County.

Ore from the Chiquita mine at Good Springs is being milled at the Keystone mill at Sandy.——It is reported that Byron, Rupe & Armstrong will put in a mill to treat ores from the Red Cloud. A gasoline hoist has been put in.

In Pioche canyon landslides have buried a stamp mill belonging to the Southern Nevada Gold Ore Co., imprisoning two miners, who were rescued in an unconscious condition and taken to Las Vegas. They are not thought to be fatally injured. Many mining companies suffered heavy losses, but the railroads were the greatest losers.

C. E. L. Gresh, manager of the Black Hawk M. Co. of Eldorado canyon, has opened rich ore on mine No. 2 of the company's property, comprising the Wedge, Rand and Honest Miner claims. —— The Cyrus Noble main shaft at Searchlight is down 402 feet and sinking for the 500 level is being pushed. Water was struck at 351 feet. As soon as sufficient water is developed a mill will be put on the property.

Lyon County.

The Eureka mill, one of the oldest and largest reduction works on the Carson river, has been sold to J. E. Monroe of Reno. The deal embraces the mill building and all real estate, consisting of 640 acres, a railroad 2 miles in length and all its rolling stock, together with the cyanide plant.

Nye County.

It is reported the Congress M. Co. will start development work at the old Chespa mine, near Johnie, with John Ross as superintendent. H. Ramsay is general manager.

Washoe County.

Big strikes are said to have been made in the White Horse mining district by DeWitt Bovee, who is driving a long tunnel on the Ora group, ½ mile west of Olinghouse.

OREGON.

Baker County.

The 10-stamp mill at the Tabor fraction property at Bourne is almost completed. A. G. and R. H. Hanauer of Spokane, Wash., are interested. The owners say they intend to double the capacity of the mill and put in a cyanide plant for the treatment of tailings next winter.

Considerable development is being done in the Eldorado section south of Tipton. D. B. Stalter, manager of the Heppner M. Co., is making arrangements to put in a stamp mill to treat ore from the Mayflower group.—— Near Greenhorn, the Weston, owned by W. H. Gilbert and H. Shoemaker, has a shaft 50 feet deep. Work was stopped owing to influx of water. Now a hoist and pump have been put in. Sinking has begun again.

Grant County.

The owners of the Equity mine in the Quartzburg district have put on a larger force and contemplate building a 75-ton mill and hoisting plant. Much work is being done on the four levels and good ore reserves are being established.

Josephine County.

Considerable work is being done in the Mule Creek district, near Marial P. O. Mendenhall & Co. of Gold Hill will put in a 3-stamp mill at the Mendenhall mine, on the west fork of Mule creek, 2½ miles from Rogue river. T. Billings has charge.——A. E. Frye, F. Frye and E. A. Ruth have sold their gravel mine on Rogue river, 3 miles below Mule creek, to Eastern parties, who will put in two hydraulic giants to be supplied with water from East creek by a 26-inch pipe, 1½ miles long. ——At Big Bend a company of Minneapolis and St. Paul capitalists have bought 230 acres of placer ground and have had men preparing for a hydraulic plant. The water will be brought 4 miles, from Foster creek. The stream will be 1½ foot deep and 4 feet wide, and the water will go to two No. 4 giants under a head of 300 feet.—— H. J. Mattoon has been working the Mark placer at the mouth of Mule creek.——Manager Frank Fowler, of the Gold Pick mine, on Bolen creek, near Grants Pass, is putting in a 3-stamp mill and water wheel. A ditch, ¾ mile long, has been completed that will bring 250 inches of water from East Bolen creek and deliver it to the wheel under a head of 225 feet. This will furnish power for a large mill and, Bolen creek being fed from the mountains, the water supply will continue during the summer months. Lumber for the mill was hauled from near Selma to Sucker creek and packed in over the trail.——A. W. Gilbert and C. E. Platts are developing copper claims on Bolen creek.

Lane County.

The Great Northern Dev. Co., which bonded the Great Northern group, Blue River district, east of Eugene, from the Great Northern M. & M. Co. for $45,000, has taken up the bond. The 4-stamp mill on the property has resumed work. The new aerial tramway has been completed. It is 1200 feet long. The new water power plant and canal have been completed and the plant will be run by water with steam auxiliary.

SOUTH DAKOTA.

Fall River County.

The Black Hills Fullers Earth Co. has been incorporated to work a deposit 12 miles southeast of Hot Springs. The deposit is a cretaceous stratum in black lake bed shale. The earth is of dark blue slate color. E. S. Kelley of Hot Springs is president.

Lawrence County.

The property of the Minnie M. Co., which consists of a number of claims between the property of the Golden Crest and the Gilt Edge Maid, near Galena, has been leased and bonded to Fritz Weber, who intends to sink a two-compartment shaft.

The Victor G. M. & M. Co., working claims 4 miles east of Deadwood, have driven their 400-foot tunnel 150 feet. I. N. Lawrence is general manager.——The Mariposa Co. at Mystic, under the management of J. Wise, has put men on a long crosscut tunnel.——It is reported that work is to be resumed at the Clover Leaf mine in September.

UTAH.

Beaver County.

D. P. Rohlfing, manager of the Frisco Contact and Lulu properties at Frisco, has put a blower in the Frisco shaft to improve the ventilation. The shaft is down 285 feet. The shaft will be continued to the lime in case it is reached within 500 feet, and, if not, a crosscut will be made to it at that depth. At the present time over 800 gallons of water per day is making. Water is valuable on account of its scarcity. At the Lulu drifting is progressing on the 400-foot level.

Juab County.

Three shifts are sinking the shaft at the May Day mine, at Eureka, from the 300-foot level to the 500-foot level, after which the ground will be explored.——The property of the Martha Washington M. Co. has been sold to J. M. Taylor of Silver City.

The shipments from Tintic district for week ending July 29 were: Centennial-Eureka, 50 carloads; Gemini, 10; Bullion-Beck, 5; Yankee Con., 5; May Day, 2; Eagle & Blue Bell, 13; Swansea, 7; Eureka Hill (leasers), 4; South Swansea, 2; Victoria, 7; Ajax, 2; Carisa, 2; Mammoth, 21.

Salt Lake County.

Manager W. C. Orem of the Utah Apex M. Co., operating at Bingham, reports the lower tunnel in 300 feet. They intend to run 1000 tons of mill ore through the custom plant owned by E. A. Wall as soon as the mill can take it. Now it is running on ore from the Phœnix mine.

The Bingham Bulletin publishes the following data on Bingham mines:

Mine—	Men.	Tons.	Payroll.
Highland Boy	350	850	$32,000
Yampa (mine and smelter)	425	425	25,000
Utah Copper (mine and mill)	400	700	20,000
United States	300	425	12,500
Bingham Con	300	500	20,000
Boston Con	120	250	7,000
Bingham-New Haven	50	50	5,000
Ohio Copper (mine and mill)	95	225	6,000
Utah-Apex and Red Wing	60	45	4,500
Fortuna	45	50	3,500
Phœnix	60	100	7,500
Silver Shield	22	....	2,100
New England	20	25	1,500
Butler-Liberal	20	....	1,500
Other properties	150	25	10,000
Totals	2,417	3,670	$158,100

The Congor mine in Bingham is to be started up again after an idleness of several years, during which the lower workings were allowed to fill with water. G. G. Hall, the manager, has men putting in new equipment. A new hoisting plant has been ordered and is on the ground, and new boilers are being put in to replace the old ones. The lower workings of the mine are reached by way of an incline shaft 500 feet deep.

Tailings operations along the creek below Bingham are becoming important. The largest is that of Rogers & Lerwill at Lead mill. This is equipped with a device of Rogers' invention, which consists of an endless belt and designed to treat slimes. The owners have been troubled with a shortage of water.——Brooks & Locke have a plant above the smelter, consisting of two tables, two jigs, canvas tables, electric motor, etc.——Shackelford & Flig are putting in a plant above Lead mill. Their equipment consists of a Wilfley table, two jigs and a gasoline engine.——Manager H. M. Crowther, of the Continental Atlas mines at Alta, reports that his company

has begun concentration of molybdenum ores. While the equipment for the handling of this class of ores has not been perfected, Manager Crowther says the product being obtained has a value of $200 to the ton. With the existing facilities it is said that one ton of molybdenum concentrate can be turned out daily.

Uinta County.

O. Wilkins, who has spent several months in Vernal, reports placer mining at Green River, near Jensen, in the newly discovered district, steadily going on, although the high waters of the spring and summer have interfered with the work. Men are taking out $1.50 to the square yard with rockers.

WASHINGTON.

Ferry County.

Reports from Meteor camp, on the south half of the Colville reservation, tell of greater activity than for two years. The Meteor Co. is working seventeen men, and arrangements are being made to put on a larger force. A tunnel is being driven to crosscut the vein. A full crew is working on the Nonparell. This company is driving a long tunnel to tap the lead. It is reported that the shaft of the New York is in good ore. The Stray Dog is preparing to continue work.

Skamania County.

R. C. Lange, manager of the Spirit Lake Power & M. Co., which is operating near Spirit lake, intends to drive a 3000-foot crosscut to open veins and raise to the surface. The power plant and drills are to be put in.

Snohomish County.

(Special Correspondence). — Trustees have inspected the Bonanza Queen mine at Monte Cristo. The raise of 1000 feet from the crosscut to the old workings is nearly finished. Material for an aerial tram, 1 mile long, from the crosscut to the Monte Cristo railroad, has been purchased and will be put in.——The old slag dump at the American Smelting & Refining Co.'s Everett plant is again being run through the furnaces to extract the values left by previous treatment.——F. W. Peabody's Sidney mine at Monte Cristo is shipping ore to the Everett smelter. A pump has been put in to keep the mine dry until a crosscut to tap the vein at a depth of 180 feet is completed. The crosscut will be 500 feet in length. Sinking and stoping will be continued.——J. Pecalo, superintendent of the Lucky Day M. Co., has discovered a vein on Silver Tip mountain west of Monte Cristo, carrying a high grade of native copper.——A new air compressor is being put in at the Packard M. Co.'s mine at Monte Cristo.

Monte Cristo, Aug. 1.

Stevens County.

W. Connelly of Spokane has interested an Illinois company in the New England claims, 5 miles from Northport, on Deep creek, opposite the Last Chance. The New England is a zinc producer, and the Illinois people have taken a bond at $20,000, providing for two semi-annual payments and a year's continuous work. The owners are L. Cook, B. Stout, J. Johnson and I. Guzelius.——The owners of the Galena Queen, near the New England group, are sinking on the ledge. A depth of 60 feet has been reached. C. E. Plumbtree has the contract for sinking.

Whatcom County.

The Bonito G. M. Co. has been formed with W. P. Bell, of Everett, president; E. Lenfest, of Snohomish, vice-president; J. V. Bowen, of Snohomish, treasurer; W. Whitfield, of Snohomish, secretary; A. W. Hawkes, of Snohomish, general manager. The company will work the Eureka mine, in the Slate Creek district, and intend to start the plant on October 1. The company has a 10-stamp mill and a 2000-foot tunnel with 2600 feet of tram.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District.

For the week ending July 29 the Boundary ore shipments were: Granby mines to Granby smelter, 13,630 tons; Mother Lode to British Columbia Copper Co.'s smelter, 2272 tons; Emma to Nelson smelter, 418 tons; Oro Denoro to Granby smelter, 33 tons; Last Chance to Nelson smelter, 20 tons; total for the week, 16,373 tons; total for the year to date, 523,217 tons. Boundary smelters treated ore the same week as follows: Granby smelter, 13,850 tons; British Columbia Copper Co.'s smelter, 3960; total for the week, 17,810 tons; total for the year, 535,742 tons.

Work is being pushed on the new power plant at Bonnington Falls, on the Kootenay river, to supply power to mines in the Boundary district. Power will be transmitted from this plant as far as Phœnix, a distance of 80 miles.——Shipments are starting from the E. P. U., near Greenwood, as repairs to the tramway have been completed. Drifting is going on at the 200-foot level. Three shifts of men are at work in the main shaft of the Crescent, which is down 80 feet, and will be deepened to the 100-foot level, when drifting will be done.

Regarding additions to the machinery, plant and other equipment of the Granby Con. M., S. & P. Co.'s mines at Phœnix and smelting works at Grand Forks, the British Columbia Mining Record says that complete equipment, at a cost of $75,000, of a terminal for the branch of the Great Northern railway, entirely separate from that in use by the Canadian Pacific railway, has been provided, this including receiving ore bins, ore crusher with a capacity of 150 tons per hour, crushed ore bins and facilities for loading about 1000 tons of ore on a train of thirty-five cars in twenty-five minutes. No. 3 tunnel, which is about ¾ mile in length, has been double tracked and equipped with a 75 H. P. electric motor and 10-ton steel ore cars. The new main double-compartment incline shaft, which is being sunk to the 500-foot level, is nearly completed. A 200 H. P. electric hoist is to be put in. Balanced skips, each of a capacity of three to four tons, will be used. The size of shaft and capacity of equipment will admit of hoisting 3000 tons in two 8-hour shifts. The two 48x210-inch water-jacketed furnaces, now being put in at the company's smelter, are fitted with twenty-four tuyeres on each side. The automatic charging cars are the invention of the manager, A. B. W. Hodges. These cars are side dumping and each is divided into four compartments. This arrangement insures the proper distribution of the ore in the furnace, the necessary proportion of "roughs" going toward the center. Two of these cars, coupled, are run into each of the ordinary sized furnaces on side rails. For the larger furnaces three will be used. The cars are moved between bins and furnaces by electric motors. All slag is dumped hot, being handled from the furnaces in 6-ton pots. The new double-cylinder blowing engine for the converter room, in which there are two converter stands and ten shells, has a capacity of 6000 cubic feet of air per minute, thus bringing the total available air up to 10,000 cubic feet. A 300 H. P. motor operates the new engine. An automatic slag conveyor, similar to that in use at the Washoe smelter, Anaconda, Mont., elevates the converted slag. A second mixing mill, for converter linings, has been added. The new Connersville blower, driven by a 300 H. P. electric motor, has a capacity of 30,000 cubic feet per minute, as compared with the 12,000 cubic feet capacity of those previously installed. An addition of 800 feet has been made to the dust chamber, giving a total length of 2000 feet. Machine shops and blacksmith shops have been improved.

Cariboo District.

R. H. Hanauer of Spokane, Wash., and A. G. Hanauer have acquired a controlling interest in the Bear hydraulic mine, 11 miles from Barkerville, and are preparing to equip the property. Experimental work on the Bear has extended the channel for a width of 350 feet with both rims. The gravel is free, containing comparatively little clay. B. A. Lascelles is directing the work. Two ditches are being constructed. One of these will bring in the water from Cunningham creek, a maximum flow of 2500 inches being obtainable for ground sluicing. The second ditch will carry water from Antler creek, 3000 inches being available from this source for the two giants the owners will put in immediately. A cableway will be constructed to handle boulders and a sawmill set up on the property.

East Kootenay District.

The tests of Michel coal by the C. P. R. proved satisfactory and sustained the convictions of the coal company officials as to the quality of their coal for steaming purposes. The ordinary evaporative power of coal in the practical working of locomotives is from six to seven pounds water evaporated to one pound coal consumed. The tests conducted by Mr. McEvoy showed an evaporative power up to 10.6 pounds of water to one pound of coal consumed. The most interesting test was on the local express between Winnipeg and Brandon, with twenty stops between those points. It was found that 3820 pounds of coal was sufficient to make the trip of 137 miles. The Michel collieries, 23 miles northeast of Fernie, are operated by the Crows' Nest Pass Coal Co., R. G. Drinnam general superintendent.

Nelson District.

The Dundee M. Co. has decided to put in a compressor at the Dundee mine, near Ymir, and also to build a 5-stamp mill. A 140-foot tunnel has been driven into the mountain and better indications are reported. T. B. Sumner and E. Husted of Everett are president and secretary.

Rossland District.

The White Bear mine, which closed down on account of a shortage in its motive power on May 23, will resume operations on August 1. F. Demuth, manager, says that work will be recommenced on the rich shoot of ore on the 700-foot level. The drilling at first will be done by hand, awaiting the arrival of the 400 H. P. motor to furnish power for the mine and the concentrating mill.

The tonnages of ore shipped from and crushed at the Rossland mines for the week ending July 29 and for the year to date were as follows:

Mine.	Week.	Year.
Le Roi	1,975	72,106
Le Roi (milled)	210	720
Center Star	2,310	56 190
War Eagle	1,500	40,370
Le Roi Two	60	4,462
Le Roi Two (milled)	....	4,330
White Bear	....	1,100
White Bear (milled)	....	2,220
Jumbo	3,000	5,829
Spitzee	60	4,539
Velvet-Portland	....	1,977
Gopher	....	60
Homestake	....	30
Lily May	....	60
Totals	6,415	195,193

At the Center Star at Rossland electric haulage is to be substituted for man power in transporting ore from the mouth of the shaft to the bunkers and the waste from the shaft to the waste heaps. Workmen are strengthening the trestles so that they may be able to bear the increased weight. Horse power was tried for a time, but the horse used was killed.——E. Stevenson of Rossland has leases on the Crown Point, Hidden Treasure and the White Swan claims, on the slope of Lake mountain, 2½ miles southeast of Rossland. He has ten men working.

Slocan District.

There are 250 men working in the mines around Sandon. The leasing system has helped the camp. The Buffalo claim and the Lone Bachelor have been opened up.——At the Payne mine Walter Smith is working fourteen men and shipping ore.——The Slocan Star and the Lucky Jim are shipping.——The Hewitt group, 3½ miles southeast of Silverton, has been bonded to W. S. Logan of Nelson for $250,000.——At the Jackson mine, 5 miles from Whitewater station, the mill is running two shifts and turning out an average of fifteen tons of zinc and two tons of lead per day. The zinc is being piled up, there being 400 tons on hand ready for magnetic separation.——At the Last Chance eleven men are employed and development is proceeding with good results. Ore is being sent down daily.——The American Boy mine, near Cody, is working twelve men and Manager T. McGuigan expects to increase the force as soon as the workings dry out.

West Kootenay District.

W. F. Henderson has organized the Gold Park M. Co. to operate the Marquis & Gilbert properties at Poplar. The company will begin work at once.——It is reported that a mill is to be put up at the Swede group to treat ore from the recent discovery.

MEXICO.

Chihuahua.

Heffron & Piper have a 7-stamp mill on their Dos de Abril mine, 15 miles from Dolores, and expect to start the amalgamating mill August 15.——The Tres Amigos G. M. Co. is working mines at Guaynopa. B. L. Croff is president and general manager, and Murray Lee, superintendent of the mines.——The Watterson Gold, Ltd., at Ocampo, has received all of the material for its cyanide plant and is expected to have it ready for operation in two months.——At the Pinos Altos mines, in the Ocampo district, the work of remodeling the old 55-stamp mill is progressing well, and it is expected that twenty stamps will be in operation within a month.——At the Concheno mines at Concheno the mill is ready to be started now that the main shaft, 600 feet deep, has been enlarged from two to three compartments. Superintendent Murray enlarged the shaft and timbered it up in six weeks. The work of increasing the capacity of the cyanide plant from 60 to 100 tons daily is to be commenced.——At the Cruz mine, near Ocampo, a steam hoist has been put in by T. Williams of Chihuahua city, superintendent.

Guanajuato.

A cyanide plant, a stamp mill of 250 tons capacity, six pumps and other machinery are being put in at the Guanajuato R. & M. Co.'s plant. The machinery is to unwater the Valenciana mine. Joseph Slater and Orrin Thacker of Columbus, Ohio, associates of C. L. Kurtz, president of the company, are at the mines.

Jalisco.

John McGrath of Boston, Mass., formerly manager of the Buena Vista mines at Tepic, and F. J. M. Rhodes have surrendered their bond and lease on the Zuloaga mine in the Bolanos district.——T. C. Myers has purchased the interest of H. K. Meyers of Philadelphia in the Culebra mines, near Etzatlan, and will develop the property.——A steam hoist, capable of raising 500 tons of ore daily, has been purchased by Ferdinand Sustersic, manager of the Ampero M. Co. at Etzatlan, and will be put in the old Santo Domingo shaft of the Santo Domingo mine. The shaft will be made three compartment. The experimental reduction plant, near the Santo Domingo mine, is nearly finished. The company has on hand about 1,000,000 tons of milling ore, and as soon as the exact character of the treatment necessary is determined, a reduction plant with a capacity of 100 tons daily will be built.

Commercial Paragraphs.

BAILEY-SMITH MACHINERY CO. is a newly incorporated company, with office and salesroom at 91 Fremont street, San Francisco, Cal.

THE Independent Pneumatic Tool Co. has bought the plant of the Aurora Automatic Machinery Co. at Aurora, Ill., and are making a general line of pneumatic tools. Their offices are in the First National Bank Building, Chicago, with an Eastern branch at 170 Broadway, New York. John F. Brady is president.

ORDERS have been received by the Westinghouse Electric & Manufacturing Co. of Pittsburg, Pa., from Nelson Morris & Co. for nineteen type CCL induction motors, varying in sizes from 5 to 50 H. P. and totaling 410 H. P., and for eight motors of the same type from the Decatur Car Wheel & Manufacturing Co., Birmingham, Ala. The Illinois Steel Co. has ordered eighty direct current motors, having an aggregate capacity of 3920 H. P. The Hawaiian Electric Co. of Honolulu has contracted for two 1200 K.W., three-phase, 2200-volt, engine type generators, two 125 K.W. exciters and seven 500 K.W., oil-insulated, self-cooling transformers.

THE Cameron Steam Pump Works of New York City send two celluloid bookmarks, printed in colors from appropriate designs, substantial and admirable for the use for which they were intended. In each they have utilized their trade mark, an acorn-shaped air chamber, to furnish the base of the design, which is printed in black and on which in one design is shown a Scottish bagpipe player in full regalia, wearing the Cameron plaid and piping lustily as he marches across the heather. In the other design is shown in colors a winsome lassie, wearing the Cameron plaid and dropping a graceful courtesy, and the phrase, "Thank you kindly;" both are veritable works of art.

COLORADO IRON WORKS CO. of Denver, Colo., report the following orders: Carload of jackets for the Mazapil Copper Co., in Mexico; slag pots, ladles and moulds for the Ohio-Smelting Co., in Colorado; one 42x160 silver-lead blast furnace for the St. Joe Lead Co., in Missouri; two carloads of slag trucks and bowls for the Cananea Con. Copper Co., in Mexico; accessories and equipments for reconstruction of furnace for the Compania Minera la Quimica y Anexas S. A., in Mexico; additional equipment for the Minas Ferrocarril de Santa Maria de la Paz y Anexas, in Mexico; one 42-inch circular copper furnace and equipments for the Ohio-Mexican Mining Co., in Mexico. Milling orders are placed as follows: Machinery and equipment for the Hercules Mining Co., in Idaho, consisting of thirteen C. I. W. impact screens, two sets 36x16 Humphrey crushing rolls, etc.; one impact screen to the Annie Laurie M. Co., in Utah. Mining accessories: Ore cars, buckets, etc., to the London M. & R. Co., in Colorado, and one Bartlett simplex concentrator to the Denver Ore Testing & Sampling Co., Colorado.

Books Received.

Twenty-Third Annual Coal Report of the Illinois Bureau of Labor Statistics, 1904, from David Ross, Secretary, Springfield, Ill.

Report of the Royal Commission on the "Ventilation and Sanitation of Mines of Western Australia" contains the results of an exhaustive study into the subject. It is published by the Department of Mines, Perth, W. A., for 5 shillings.

"Gold and Tin Dredging Practice," by H. L. Lewis, is a pamphlet made up of republished articles on recent dredging practice in Australia, New Zealand and California. It is published by the Mining Journal, London, Eng., and will be sent by the MINING AND SCIENTIFIC PRESS for 50 cents.

Much of the disease of the average mining camp might be prevented by observing the precautions given by H. A. Bashore in "The Sanitation of a Country House." It deals with the location, hygienic construction, water supply and waste disposal. The treatment is practical and applicable to either permanent or temporary camps. It is published by John Wiley & Sons, New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $1.00.

"Methods and Costs of Gravel and Placer Mining in Alaska," by C. W. Purington, Bulletin 263 of the United States Geological Survey. This contains an account of methods of prospecting and operating placer mines under adverse conditions. The material presented is of the utmost practical value as a guide under similar conditions, and should aid in opening up the country. The illustrations are particularly good. The whole represents a judicious compilation of practical data.

"The Copper Handbook," Vol. V, 1905, by H. J. Stevens, is devoted to the history, uses, terminology, geology, geography, chemistry, mineralogy, finances and statistics of copper. The book describes the copper mines of the world, 3489 in number. In the five years of its issue "The Copper Handbook" has grown from a strictly local publication, the first issue having been devoted exclusively to Lake Superior mines, to a standard reference book. The data given is essential, concise and apparently reliable. It is published by H. J. Stevens, Houghton, Mich., for $5, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS on receipt of price.

Vol. XXIV, No. 7, "Proceedings of the American Institute of Electrical Engineers," contains the following papers and discussions: High-Power Surges in Electric Distribution Systems of Great Magnitude, by C. P. Steinmetz; Water Powers of the Southeastern Appalachian Region, by F. A. C. Perrine; A New Carbon Filament, by J. W. Howell; Alternate Current Machinery—Induction Alternators, by W. Stanley, assisted by G. Faccioli; Note on a Simple Device for Finding the Slip of an Induction Motor, by C. A. Perkins; Notes on the Power Factor of the Alternating Current Arc, by G. D. Shepardson; Eddy Currents in Large Slot-Wound Conductors, by A. B. Field; Data Relating to Electric Conductors and Cables, by H. W. Fisher; An Experimental Study of the Rise of Potential on Commercial Transmission Lines Due to Static Disturbances Caused by Switching, Grounding, by P. H. Thomas; Constant Current Mercury Arc Rectifier, by C. P. Steinmetz; Synchronous Converters and Motor Generators, by W. L. Waters; The Organization and Administration of National Engineering Societies, by J. W. Lieb, Jr.; Light Electric Railways, by J. R. Cravath.

"Civil Engineering," by G. J. Fieburger, professor of engineering United States Military Academy, is designed for the instruction of cadets being fitted for a profession in which the principles of civil engineering are applied daily. As a short course for any one desiring a thorough grounding in these principles the book is admirable. It fully treats stresses, beams, columns and rivets, with both analytical and graphic determination of stresses and effects of fixed and moving loads. Two chapters are devoted to masonry arches, dams and retaining walls, followed by a brief treatise on the pressure and flow of water. The characteristics of timber, metals and stone are treated successively. The general principles of construction of masonry, foundations, bridges, trussed roofs and floors, highways, water supply and sewerage are indicated. While brief, the treatment is concise, logical and easily read. The methods and formulæ given are up-to-date and recognized as standard. With this text and a Trautwine there are few problems that a civil engineer might meet in his practice that could not be solved, even if he had forgotten the first principles. It is published by John Wiley & Sons, New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of $5.

Trade Treatises.

The Searchlight Publishing Co. is organized at 24–26 Murray street, New York, to forward the publishing and advertising interests of manufacturers, publish the "Searchlight," keep the Searchlight information library up to date, and to publish books.

The Bartlett "Simplex" concentrator is illustrated and described in detail in a neat pamphlet from the Colorado Iron Works, Thirty-third and Wynkoop streets, Denver, Colo.

Dividends.

Bunker Hill & Sullivan M. & C. Co., dividend No. 95, $150,000, payable August 4; total paid since Jan. 1, 1905, $2,475,000; total to date, $4,746,000.

Latest Market Reports.

SAN FRANCISCO, August 4, 1905.

METALS.

SILVER. — Per oz., Troy: London, 27¼d (standard ounce, 925 fine); New York, bar silver, 59½c, refined (1000 fine); San Francisco, 59½c; Mexican dollars, 46c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, $15.50; Lake, 1 to 3 casks, $15.37½@15.50; Electrolytic, 1 to 3 casks, $15.50; Casting, 1 to 3 casks, $14.87½@15.12½. San Francisco: $16.00. Mill copper plates, $17.00; bars, 18@24c. London: £68 6s 3d spot per ton.

Copper has taken a slight upward turn, showing that the market remains firm under increased summer production. There is said to be practically no floating supply, which will have a tendency to maintain the price at the present figure, if not to increase it. There has been a slight falling off of price in London during the past week, the present quotation, though higher than that of last week, being somewhat lower than that of two or three days ago.

LEAD.—New York, $4.60; Salt Lake City, $3.50; St. Louis, $4.42½; San Francisco, $3.70, carload lots; 4¼c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £14 ₱ long ton.

SPELTER.—New York, $5.70; St. Louis, $5.18; London, £24 ₱ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $32.80@32.85; San Francisco, ton lots, 33¼c; 500 lbs., 34c; 200 lbs., 34½c; less, 35½c; bar tin, ₱ lb., 35@37½c. London, £151 10s 10d.

PLATINUM.—San Francisco, crude, $18.50 ₱ oz.; New York, ingot, $20.50 ₱ Troy oz. Platinum ware, 75@$1.00 ₱ gram.

QUICKSILVER.—New York, $41.00@$41.50, large lots; London, £7 7s 6d; San Francisco, local, $38.50@39.00 ₱ flask of 75 lbs.; Denver, $42.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 18.50c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb, .04c.

NICKEL.—New York, 55@60c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 33@37c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ₱ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.60; gray forge, $16.00; San Francisco, bar, 3c ₱ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $23.00@$23.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ₱ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $2.15@2.65 ₱ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ₱ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 12c; Hallett's, 13c; San Francisco, 1000-lb. lots, 11c; 300@500-lbs. 12c; 100-lb. lots, 13c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ₱ set; 14 oz., 40s., 9¾c.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c;. in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c ₱ lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.10@1.20 ₱ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

OILS.—Linseed, boiled, bbl., 64c; cs., 69c; raw, bbl., 62c; cs., 67c; Lucol oil, boiled, bbl., 56c; cs., 61c; raw-bbl., 54c; cs., 59c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

BORAX.—Concentrated, 7@8c ₱ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

BONE ASH.—Extra No. 1, 5@6c ₱ lb; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ₱ lb.

MOLYBDENUM.—Best, $2.75 ₱ lb.

CHROMIUM.—90% and over, ₱ lb., 80c.

URANIUM.—Oxide, ₱ lb., $3.50.

MERCURY.—Bichloride, ₱ lb., 77c.

TUNGSTEN.—Best, ₱ lb., $1.25.

PHOSPHORUS.—American, ₱ lb., 70c.

SODIUM.—Metal, ₱ lb., $1.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb. 7¾c; less than 500 lbs., 8c.

MANGANESE.—Black oxide, ₱ lb., 2¾@4c.

MAGNESIUM.—Pure, N. Y., $1.60.

BISMUTH.—Subnitrate, ₱ lb., $2.10.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 55c.

FIRE BRICK.—Domestic, carloads ₱ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ₱ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR WEEK ENDING JULY 25, 1905.

795,471.—ORE REDUCING APPARATUS—W. T. Armstrong, San Jose, Cal.
795 473.—ANNUNCIATOR—S. B. Bankson, S. F.
795,385.—AIR BRAKE—N. V. H. Bergenheim, Oakland, Cal.
795,487.—PUZZLE—C. B Courtney, Weston, Or
795,584.—GUN SIGHT—C. S. Daniel, Hoquiam, Wash.
795,586.—CATTLE GUARD—W. E. Dement, Blaine, Wash.
795,589.—STOCK FEEDER—J. J. Dowell, S. F.
795,792 —FRUIT PRESS—J. G. Fassett, Pasadena Cal.
795,590.—BICYCLE SUPPORT—E. H. Foster, Baker City, Or.
795,795.—ACCORDION—J. Galleazzi, S. F.
795,700.—MEAT SUPPORT—Heidenreich & Fontaine, Lagrande, Or.
795,610.—RAILWAY SPIKE—B. F. Herndon, Florence, Ariz.
795,702.—WATCH—Hohmann & Kaatz, San Diego, Cal.
795,770.—COAL LOADING APPARATUS—J. L. Howard, Oakland, Cal.
795,619.—WARDROBE, ETC.—J. Jones, Oregon City, Or.
795,707.—PENHOLDER - C. A. Klein, S. F.
795,723.—MUSIC LEAF TURNER—J. McNeil, Oakland, Cal.
795,405.—FENCE POST—C. J. B. Moore, Calistoga, Cal.
795,409.—OIL BURNER—F. E. Nelson, Santa Barbara, Cal.
795,729.—PACKAGING FRUIT—L. Olzen, S. F.
795,417.—EXCAVATING BUCKET—R. H. Postlethwaite, S. F.
795,450.—DRILL—W. D. Rankins, Modesto, Cal.
795,734.—PRODUCING BODIES—J. E. Seeley, Los Angeles, Cal.
795,656.—RAILWAY SIGNAL—W. B. Smith, Redlands, Cal.
795,739.—WATER LEVEL INDICATOR—R. H. Stollar, Longbeach, Cal.
795,667.—PUMPS—W. Wallace, Bakersfield, Cal.
795,323.—ELECTRIC APPARATUS—D. M. Watson, Portland, Or.
795,672 —HARVESTER—F. H. Willms, Knights Ferry, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

ORE REDUCING APPARATUS.—No. 795,471. July 25, 1905. W. T. Armstrong, San Jose, Cal. This invention relates to an apparatus for reducing ores and separating and recovering therefrom the valuable metallic and other ingredients. Its object is to provide a simple portable roasting-furnace for use of prospectors and others The apparatus consists of a tube of uniform diameter threaded at the ends, removable closures for said ends and rendering the tube substantially air tight, said tube having an inner lining capable of being reduced to a carbonaceous form by heat, a condenser and a pipe leading from the tube to the condenser, said tube adapted to contain a body of carbon forming material mixed with ore, and said pipe having the end within the condenser provided with a check valve to prevent backflow into the tube.

DEVICE FOR PACKAGING FRUIT AND THE LIKE —No. 795,729. July 25, 1905. L. Otzen, San Francisco, Cal. The object of this invention is to provide an integral and continuous former and means by which such a former may be removed from the fruit without hinges or joints. It consists in a fruit pressing device, a box with open top and bottom and a pressure plate fitting therein, a plunger and a platen movable therewith, a guide by which the box is alined with the press mechanism, means for transmitting pressure from the plunger to the pressure plate in the box, means for lifting the box after compression has been completed, and springs acting between the plunger and pressure plate to hold the latter down while the box is raised.

COMBINATION CLOTHES RACK, WARDROBE AND BATH CABINET. —No. 795,619. July 25, 1905. John Jones, Oregon City, Or. The object of this invention is to provide a light, simple, portable device that can be easily adapted as a clothes rack, a wardrobe, or bath cabinet, which can be set up anywhere, and which can be easily knocked down for shipment or transportation, and which in the setting up requires neither bolts or screws nor outside tools. The invention comprehends a suitable support and a series of arms pivoted thereon and adapted to turn in vertical planes, so as to lie parallel with each other and close to the support or to be extended fan-like into horizontal position.

SIDEHILL HARVESTER.—No. 795,672. July 25, 1905. F. H. Willms, Knights Ferry, Cal. This invention relates to an apparatus for the cutting of grain and like products. It is particularly designed to maintain the thrashing and cleaning portion of the mechanism in a substantially horizontal position, both transversely and longitudinally, and independent of any variations in the grade of the land which is being passed over by the machine. It consists in the combination of devices by which the body of the machine is allowed to swing by gravitation while the wheel frame and other parts are subjected to movement caused by inequalities of the land.

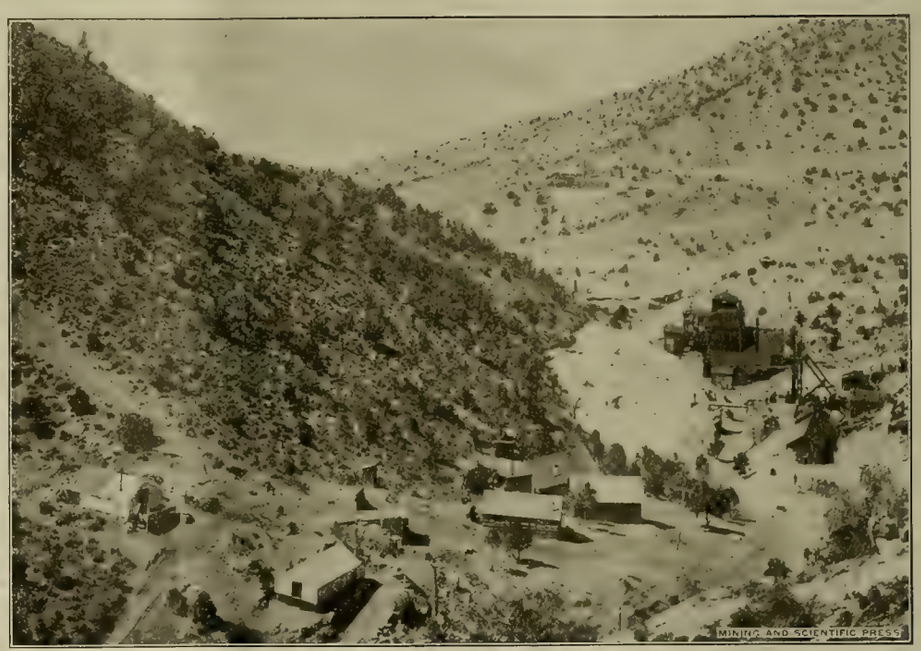
MINING AND SCIENTIFIC PRESS.

Whole No. 2351.—VOLUME XCI. Number 7. SAN FRANCISCO, CAL., SATURDAY, AUGUST 12, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

The Relation of Plant to Mine.

Notwithstanding the oft-repeated warnings of the mining press, and the spectacle of the numerous monumental blunders—to call them no worse—in mine equipment, the practice of building reduction plants entirely out of proportion to the capacity of the mine, and of installing plants in which one portion is wholly out of balance with the others, continues. A newly organized company has come into possession of several small mines in an old district of the Southwest, where the industry has been fagging for some years past, owing to a number of causes. The new company evidently intends to put some vigor into things, as it is stated the expectation is to build a 20-stamp mill and roasting and cyanide plant of fifty tons daily capacity. The ores of the district in question are remarkable for their free-milling qualities. The sulphides present in the ores are chiefly pyrite, with small amounts of chalcopyrite, blende, galena and mispickel. Free gold, visible to the eye, is of frequent occurrence. The rational process in the treatment of this ore is the crushing of the quartz in a stamp mill, concentration after amalgamation (and this, by hydraulic classification and division of the product to concentrating machines of proper design, should be readily and cheaply accomplished), and subsequent treatment of the concentrates. The method of treatment of the concentrated sulphides, in a district such as this, remote from convenient and inexpensive transportation facilities, is one requiring careful study and experiment. The chlorination process is available and it is known that a high percentage of values can be extracted by this means. The cyanide process is also a possibility here, and very probably it would work satisfactorily on these sulphides after roasting, but that a 50-ton roasting and cyanide plant would be necessary where the capacity of the 20-stamp mill is not likely to greatly exceed this amount, and where the quantity of sulphides does not exceed 2%, is not the first thing that comes to mind. It seems improbable that it is the intention to roast the entire product of the mine where the conditions are as here described. It is possible, however, that the local papers have erred in stating the company's intentions. It would be far more satisfactory to know that the latter suggestion is the case than to contemplate the result of another folly in a district previously unfortunately handicapped by inexperienced management and several installations of improper machinery.

The Cactus Mill and Trestle, Newhouse, Utah. (See Page 109.)



The Cactus Mine, Near Newhouse, Utah. (See Page 109.)

Concentration Mill of the Waltham Mining Co., Idaho Springs, Colo. (See Page 114.)

A GREAT many prospectuses descriptive of mining properties, shares in which are being offered the public, reach the editor's desk. Some of these are gems of typographical art and literary excellence, others are less so. The magnificence of the prospectus is not, however, a fair measure of the merit of the property described, any more than is the ordinary folder throughout which ignorance is stamped on every page. One of the latest pseudo-scientific effusions to be presented contains some remarkable statements. Among them is the following: "The hanging wall is porphyritic-limestone-quartz. The foot wall has not been found." One can not help speculating what frightful combination of wall rocks will be encountered when the footwall is reached. Further on this scientist informs his readers that "the ores of this region were formed undoubtedly by metasomatic alteration including pyritic mineralization and oxidation, and its attendant phenomena of transportation and enrichment. * * * The Malpi rock and volcanic formation prove beyond a doubt that the ledges go down and are true fissure veins." Prospectuses often contain exaggerated misstatements, and the intent to deceive is evident to the experienced, but this latest prospectus is evidently an effort at the honest presentation of some of the facts as observed by one of small scientific attainment—verily, "a little knowledge is a dangerous thing," particularly when it takes the form of a mining prospectus purporting to present conditions as they actually exist, to obtain money to develop a new property. The average investor is generally unable to distinguish between the genuine and spurious article.

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MINING engineers and others whose business it is to examine and pass judgment upon the present value and future possibilities of a mine, while guided to a great extent by the results of their sampling, nevertheless, allow judgment to be influenced in no small degree by intuition. After all, intuitive judgment, which comes of actual experience, may not be so bad as that which blindly follows the results obtained by a mechanical operation, no matter how carefully performed.

NEARLY every mining State, from the Rocky mountain region westward to the Pacific, has abundant mineral resources, which are not only undeveloped, but which remain undiscovered. Gold, silver, copper, zinc, lead, tin, antimony, iron, mica and oil each receives abundant attention and prospectors are constantly alert to the signs of any or all of these familiar metals and minerals, but there are other minerals which have a present and growing value by reason of their scarcity and the increasing demand for them. That the rare metals and earths are not abundant it is scarcely necessary to mention, but such do occur, and it is more than probable that if prospectors generally were more familiar with these minerals their discovery would be of much more frequent occurrence. To this end it has been suggested by Prof. V. C. Alderson, president of the Colorado State School of Mines at Golden, in that State, that schools of mines and State mining bureaus be equipped with departments of research, the work of investigation and discovery being given into thoroughly competent hands. The present summer two professors of the Golden school have been in the Dolores region of Colorado exploring for vanadium and uranium minerals. Other minerals, other than the metallic, are later to receive attention. This is merely suggestive of what may be accomplished in almost any of the Western mining States through the channel of properly directed effort. Rare minerals are known in Colorado, South Dakota, Wyoming, Utah, California and throughout the West generally, and all, seemingly, that is required is that competent men be employed by the several States to search for these minerals and, discovering them, possibly lay the foundation for a number of new industries. As a matter of course, these things cannot be done through unaided individual effort, but through the aid of the States, much of value may be accomplished in this direction.

Merit of Small Importance in Speculative Investment.

Mines are not always taken up and developed on intrinsic or relative merit. Good prospects are not uncommon in some districts where mining has become an every-day business, divested of the glamour incident to days of rich strikes and the consequent excitement, but their attractiveness is gone. When mining settles down to a business basis comparable with other industrial pursuits, much of the allurement is dispelled, and the tendency to speculate is dampened. It is regarded as a sure thing, too definite in its results to make it an object to those seeking sudden fortune by hazardous investment, to "take a chance."

It is a strange but noteworthy fact that in the operation of mines on the Comstock Lode of Nevada, shareholders will uncomplainingly put up assessment after assessment, as long as a shaft is being sunk, or a long blind drift run, and there remains a speculative chance of striking a bonanza Under these repeated calls for more, and still more money, the shares will have an upward tendency in the stock market, but as soon as an ore body is developed, and a dividend paid, the "bottom drops out," and the stock falls, the speculators finding a better opportunity in gambling in the uncertainties of adjoining and possibly worthless property. This has been proven time and again on the Comstock. The investing public wants a stock that moves rapidly—either up or down—they do not seem to care much which. When a new district is discovered and rich strikes are daily reported, stock companies are quickly organized on mines in the new district, and shares are offered "at prices within the reach of all," accompanied by abundant but usually irresponsible promises of large returns. The public eagerly buys. All other districts are for the time being forgotten, or cast aside, their stocks being regarded as poor investments. One may invest in a substantial stock in a dividend-paying mine. At the end of a year the mine is still paying, but the stock is quoted at about the same price as before. There seems too little of the element of chance in these substantial stocks. In the meantime stock in the "Solomon's Temple" mine has rapidly fluctuated between 3 cents and $1.50 per share. Hundreds of thousands of dollars have been lost and made by those playing the game, and yet the "Temple" has never paid a dividend, and in all probability never will When the investing public—and particularly the army of small investors—clamor so earnestly for lively stocks it seems too bad not to accommodate them, and consequently a large number of obliging promoters and stock manipulators fix up and deal the game regularly and profitably to themselves.

Meanwhile in other old, substantial and well developed producing districts are numerous prospects lying idle for the lack of necessary capital to equip and develop them—properties which would in all probability yield a good percentage return on the investment for a long period of years, but these have no attractiveness for the small speculator, and such real opportunities remain unnoticed.

In former years mines were generally equipped and developed by individuals, or unincorporated associations, the act of incorporation often taking place some years later when the value of the mine had been proven. Then the investors visited the property personally, and often took the management themselves. Now, many investors in the stock of mining companies not only do not visit the property, but often have only a vague idea of its situation, unable to state in what county it is located, and sometimes even the State is a matter of conjecture. Not infrequently the amount invested in operations of this character by single individuals reaches many thousands of dollars. The investment has been made on the representations of a stranger who is a good talker and whose promises of rich returns are generous. Men invest in such concerns who are ultra conservative in their ordinary commercial business affairs, but the opportunity to quietly speculate without injury to their standing in the commercial world seems irresistible, and they enrich the enterprising promoter to the extent of any loose thousands that may be available. From this large merchant investor, the list runs down to clerks, small storekeepers and laboring people, of both sexes, each anxious to make much out of little. The result is too familiar to all to need comment.

Ventilation of Mines.

Considerable interest has been taken recently in the problem of mine ventilation, particularly at Butte, Mont., where many of the lower levels are hot, and where the air is laden with noxious vapors, exhalations and gases. Some of these mines are on fire—that is, the sulphide ore is slowly burning, the sulphur in the ore supplying the necessary fuel, and the little remaining oxygen in the vitiated mine atmosphere keeping it going. Fortunately, these fires exist in only a few places, and no doubt in time the ore will be entirely removed from around the burning sections, and fires will then burn themselves out for lack of material upon which to feed, when the ore may be removed. Many of the mines of Butte, like those of other large mining camps, are already connected by underground workings, or such connections may easily be made, but in numerous instances doors or bulkheads have been placed in these connections to prevent trespass. It has been suggested that mine ventilation might be vastly improved by substituting doors of iron bars for the airtight wooden ones, thus allowing fairly free passage to the air current, while defeating the cupidity of envious or unscrupulous neighbors.

Of great interest in connection with this subject of mine ventilation and sanitation is the report of the royal commission of Western Australia on the ventilation and sanitation of mines. This commission was directed to make inquiry as to the condition of ventilation and sanitation of the gold mines of Western Australia, the effects of the said conditions on the health of the persons employed in the mines, and the measures which should be taken, where necessary, to bring about an improvement thereof.

This inquiry was one of the most thorough and extensive ever officially undertaken in reference to metal mines. In the operation of coal mines the question of ventilation is a most important one, and for many years has received abundant attention; but while conditions of ventilation in metal mines in many districts—particularly in those where the mines are dry—are bad, no such far-reaching investigation had been previously undertaken. It was determined by the commission that the principal causes of ill health among underground workers were rock dust held in suspension in the air, due to rock drilling and the handling of ore in the mines, and the presence of too large an amount of carbonic acid and gases resulting from the explosion of nitro-glycerine and other explosive compounds. The greatest number of fatalities were due to the fumes from these explosives.

The findings of the commission as to the causes of foul air in the mines, and the suggestions for the improvement of existing conditions, are most interesting and important, and will be referred to at greater length hereafter.

IN some of the important coal mining districts of the eastern United States the operators are complaining of the numerous holidays demanded by the miners and men working at the coke-making plants. During the year 1905, it is stated that in the Pittsburg district of Pennsylvania there were 150 holidays, occurring through the observance of Russian, Slavonic, Italian and Hungarian holidays, and the National, State and other holidays of the United States. In addition to these, some of the men demand time to observe certain saints' days. This frequent breaking up of working crews has become a most exasperating feature of mine management.

CONCENTRATES.

WATER in a state of rest exerts pressure equally in all directions.

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OIL at 6 cents per gallon and coal at $5 per ton about balance as to cost.

✻✻✻✻

THE gold production of the United States for 1904 is stated to have been $84,551,300, an increase over that of 1903 of nearly $11,000,000.

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A STEEL HEADFRAME may "attract the lightning," but no record of the destruction of a steel frame from this cause has been published. Wooden frames are more likely to suffer from lightning than steel.

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THE question of the relative efficiency and cost of mine ventilation by fans or air compressors must be determined by existing conditions. It is very expensive to ventilate mine workings by means of a small compressor plant.

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WHETHER or not it will be profitable to strip a piece of mineral ground depends entirely upon the cost of operation and the relation of this cost to the result in working the ore body, gravel or other mineral deposits beneath.

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VERY few of the gold dredgers now at work in California are taking the gravel from the true bedrock. It is mostly obtained from a false, or higher, bedrock—a layer of volcanic tuff or mud covers the real bedrock, and also probably older gravel.

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GOLD occurs in sandstone as well as in metamorphic and eruptive rocks. In some instances the occurrence of gold is not accompanied by intrusive rocks, though usually dikes are present or in proximity to the occurrence of ores in sedimentary rocks.

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FRESH zincblende just from the mine, and which is but little if at all oxidized, has no appreciable effect on cyanide solutions, but that in the oxidized zone, or which has been for some time on the dump and subjected to oxidizing influences, decomposes cyanide solutions.

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THE capacity of a blast furnace for either lead or copper ores depends to a great extent upon the ores, but no furnace can be successfully or economically run with a capacity of less than thirty tons daily. The larger furnaces are much more economical in fuel, labor and general expense to the ton of ore handled.

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WHERE ladders are placed in a vertical shaft there should be platforms laid at least every third set, usually every 15 feet. This insures the safety of men who may be obliged to climb out long distances——a difficult and dangerous task where there are long stretches of vertical ladder unbroken by platforms or other resting places.

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THE occurrence of dark colored figures, resembling moss and trees in the fracture planes of many rocks, and commonly called "forest rock," is due to the capillary infiltration of mineral oxides into these planes. Usually, these dentritic infiltrations are iron and manganese oxides, though after oxides and salts of the metals make similar deposits.

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THE superficial parts of some of the copper mines of Butte, Mont., were first worked for placer gold by sluicing. Later, in depth, the ores were milled for gold and silver values, and still later for the copper contents of the ores. The Alice, Lexington and other veins on that lode are of a different character from most of the copper mines of Butte district.

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RAPID running increases the wear of hoisting ropes and it is, therefore, better to increase the load than the running speed. In doing this the limit of safety must be considered. A ¾-inch plow steel rope has a breaking strength of twenty-five tons. The safe allowable load is five tons. This includes the weight of skip or cage, the rope itself, and the rock placed in the skip.

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THEORETICALLY, one ounce of zinc shavings should precipitate six ounces of gold or three ounces of silver from cyanide solutions containing them, but in practice a very much larger amount of zinc is required than is indicated by the theoretical reactions taking place in the precipitation boxes. It has been shown, however, that the richer the solution in gold the less the amount of zinc required per ounce to precipitate it.

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IT is the custom in nearly all the deep mines throughout the West where a large number of men are employed for the men to take their lunches underground with them on going on shift, or to have them sent down at the proper time, the food being eaten underground. At some of the larger mines it would require an hour or more to raise the men, give them thirty minutes on the surface and send them back to the working places. This is ordinarily considered an expensive loss of time.

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MOST black sands from placers and the beaches of lakes, bays and the ocean, contain more or less magnetic iron, but all of the grains of iron ore present in such sands are not magnetic. There is often present titanic iron, hematite, and limonite, pseudomorphs after pyrite. The magnetic iron results from the degradation of basic rocks in which magnetic iron abounds, both as an original constituent and of secondary occurrence resulting from the alteration of iron bearing minerals, such as hornblende.

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THE question of the right of an apex owner of a vein to follow his vein on its dip beneath the patented land of a senior agricultural locator has never been directly determined by the Supreme Court of the United States. A case involving this question was presented to the Supreme Court several years ago in the case of the South Spring Hill G. M. Co. v. Amador-Medean G. M. Co., but the properties involved in the suit passed to the ownership of the same persons, and the case was thereupon withdrawn from the courts.

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THE water rushing through the head gates of a dam may be prevented to a great extent from cutting by the construction of an auxiliary rough dam across the stream below the gates. By allowing the water to pass through the gates under control, opening the gates slowly until the lower basin is filled, the gates may then be left wide open as long as there is a sufficient flow of water to fill them. When the low stage of water comes the gates will be closed, but with coming again of the flood season the same thing may be repeated.

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WHERE plows and scrapers can be employed on ditch work, the cost of excavation can be reduced considerably over shoveling by hand. In digging a ditch along a hillside, under ordinary conditions, a man will loosen with a pick and shovel out from 7 to 9 cubic yards of material in 10 hours. In mountainous places narrow and deep ditches are more satisfactory than broad and shallow ones. The former cost less and require generally less repairs. Surprisingly little damage is due to washing of the sides on steep grades in the mountain sections of ditches.

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IN iron smelting the blast is heated by the inflammable gases resulting from combustion of the materials in the furnace. This inflammable gas is chiefly carbon monoxide. Very little of such gas is evolved in copper or lead smelting in cupola furnaces, and consequently the blast must be heated by other means. In reverberatory practice there is always abundance of heat from the fuel used and from the burning of sulphur in the ore, and this heat can often be utilized for heating air for the blast furnaces or for steam making and for other purposes.

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ARCHÆAN and Algonkian rocks are both pre-Cambrian in age, but the two are often confounded, particularly where the area of rock exposed is comparatively small. Geologists consider those rocks only Archæan which are the oldest rocks known, with no limitation in depth, being, in fact, the original crust of the earth. It seems somewhat doubtful if such rocks actually exist exposed on the surface. In some instances, the Archæan appears to grade into the Algonkian, though the latter are supposed to be clastic rocks derived from the degradation of the older Archæan crystalline rocks.

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THERE are those who believe that the growth of certain kinds of vegetation is promoted by the presence of the oxides of various metals in the soil. Thus, there is said to be a "lead plant," the presence of which is thought to indicate the existence of lead ores in the rocks beneath the surface. Certain other plants are supposed to indicate the presence of other minerals. These are known as "indicative plants." The idea is an old one, but has been heard little of in late years. It is scarcely likely that there is anything of importance in it, or these indications would have been more closely observed and followed to a definite conclusion long ere now.

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BY metamorphism normal rocks lose their identity more or less completely. A limestone is often found changed into a crystalline marble, or if it were originally an impure limestone it might be altered into hornblende schist, in which barely a trace of the original calcium carbonate remains. A siliceous iron carbonate may be changed to an actinolite schist in which is an abundance of magnetite. Carbonaceous shales are altered to graphitic schists; dikes of basic magnesian rocks are altered into magnesian schists; sandstone becomes mica schist, or a dense hard quartzite. There are many other forms of metamorphism, of which the above are the most commonly seen.

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A STOCKHOLDER in a mining corporation cannot relocate a mining claim owned by the company in which he is a stockholder because of the failure of the company to perform the annual assessment required by law on unpatented claims. Nor can he perform the work himself and "advertise the company out" If, through neglect to attend to the assessment, the company loses the claim, the stockholders who lose thereby may sue the company for the damages sustained. Any other person not a stockholder in the company may relocate the claims for such failure to perform the annual assessment work, and there is no law which prevents such third party from giving an interest in the relocation to a stockholder who has sustained loss through negligence of his company.

IT is seldom that the best oil wells are obtained at the place where the oil seepage occurs, for the reason that at the place where the oil oozes from the rocks is the outcrop of the oil bearing stratum, though in some instances the seepage may be due to a fissure which extends down to the oil-bearing formation beneath. The former, however, is the more common occurrence. It is the wells which penetrate the oil sand some distance below its outcrop that is the most profitable. In many oil fields there are several strata containing oil separated by a greater or less amount of rock in which the oil occurs sparingly, or not at all, and in such case a bore hole sunk at the point of seepage of an upper layer of oil-bearing formation might penetrate a lower stratum and produce a profitable well.

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THE ideal condition of bedrock in a placer mine is a soft, somewhat decayed rock having many irregularities, such as is afforded by the upturned edges of mica schists and slaty rocks. When this rock is so decomposed that it may be shoveled up from 1 inch to 6 inches deep, it usually catches and holds the gold passing over it in the stream. The condition is improved if the stream crosses the strike of the formation and the grade is light. Where the grade is steep and the channel narrow, the bedrock is usually found smooth and gold only lodges in the cracks of the jointing planes of such rock. It sometimes works its way several feet downward into such cracks. To secure this gold the bedrock must be taken up. The best pay is usually on bedrock, though there are many exceptions to this.

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WHEN an engine, air compressor or other similar machine is worked beyond its capacity, it ceases to be an economical machine, as it costs more, for the work accomplished, than it would if a machine of proper size were employed. The use of a machine much too large for the work to be done is equally bad, as it is expensive to operate and the wear and tear amount to proportionately more than where the machine is suited to the work. For this reason it is inadvisable to install a large and expensive hoisting plant to sink the first 1000 feet of a deep shaft. A smaller machine of proper size is more economical in cost, operating expense and power required, and the larger engines, to be put in place later, are not worn out before they enter upon a period of activity for which they were designed.

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WHERE ore bodies outcrop along the surface of a vein it is not always good business to run a long crosscut tunnel to reach these ore bodies in depth while still undeveloped, unless development on adjoining property proves that the ore goes down. Long tunnels run for this purpose are frequently disappointing in their results, as often no ore is found. In a case such as that stated above, it would be better judgment to develop the superficial portion of the vein first, and either mill or ship the ore for the profit that may be derived from the operation, using the proceeds in the running of the tunnel. In other words, make the mine pay for its own development. It is often said that "this ore is only on the surface, with depth it will get richer." There is no rule nor experience in mining which justifies such a conclusion, though there have been instances where such a condition has been found. Enrichment of this character is of local occurrence.

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BY using 5¼-inch piston drills on the Henderson Point rock work in Portsmouth harbor, New Hampshire, holes were drilled in hard trap to depths varying from 50 to 79 feet. The drills were operated in series, seven machines being bolted to a frame of heavy timbers, set in the bottom of a pit behind a coffer dam. Two hundred and three lifting holes were thus drilled, which were 6 inches diameter at the start, decreasing to about 2 inches diameter at the bottom of the deepest hole. Thirty-eight tons of dynamite were used in exploding the entire series of holes bored, there also being numerous down holes. The blast dislodged 35,000 cubic yards of solid trap rock. The sticks of powder used were made to order and ranged from 2½ to 4 inches diameter and 24 to 30 inches in length. About one-half the powder was 60% nitro glycerine, the remainder being 75%, or somewhat stronger than the ordinary No. 1 powder. Nine hundred exploders were required for the work.

✻✻✻✻

THE nickel and cobalt consumption of the United States and Canada is practically controlled by the International Nickel Co., which owns and operates extensive mines in Canada and also in New Caledonia. The metallurgical works at Orford, N. J., also handle nickel and cobalt ores, also American Metal Co., 52 Broadway, New York. In view of the above, it is difficult to state what percentage of nickel and cobalt in pyrrhotite or other ores would pay. The lowest percentage of copper in sulphide ores that will pay is that percentage which will yield a return in excess of the cost of production. This is variable, depending upon conditions and circumstances which must be fully known and understood. Ordinarily a copper ore to be profitable under favorable conditions, and where shipped to a custom smelter, should carry at least $10 worth of copper. This should pay for the cost of mining, transportation and reduction, together with the usual discounts. Where the same person and company owns both mine and smelter and the ore is self-fluxing, the value of the ore may under favorable conditions pay when containing only $4.

Problem in the Storage of Granular and Lump Material.*

Written by W. E. Hunter and J. S. Meyers.

It is a well-known fact that certain kinds of material, dropped from a fixed point of discharge, will—depending upon the material—assume definite angles of repose which are notably uniform in slope over the surface of the pile, rendering the computation of a close approximation to the contents of the pile or weight of the material an easy matter.

This angle of repose P (Fig. 1) is for anthracite coal 27°, for bituminous coal 40°, for dry sand 33°, etc. Often, however, the piles—whether in the open or under cover—are confined at the base by vertical retaining walls, thereby destroying the symmetry of the natural conical shape, and the amount of this confinement may vary from the single vertical wall placed at one side to complete enclosure of the base by four such retaining walls forming a rectangle. To compute the contents of the pile of material under these circumstances becomes one of some difficulty if necessary to resort to an elementary calculation, consequently it is customary to use approximation methods for the purpose, and while it may be conceded that the approximation methods are sufficiently accurate, the diagrams herewith exhibited have the merit of not only greater accuracy, but also of affording greater expedition in practice. The probability of error is likewise minimized.

In Fig. 1, which is the representation of a conical pile enclosed at the base by four retaining walls, with the apex O midway between the walls C' C and B' B, it is seen that the solid within one quadrant is made up of a parallelopiped having the base O L C D and altitude I H, and also that portion of the quarter cone within the walls having its apex at O in plan and O' in elevation and altitude J O'. It is, therefore, necessary to obtain the contents of the two portions of the quarter cone cut off by the walls C' C and C B, having the bases C L F and D C E and altitudes H G and J K, so that these volumes may be subtracted from the contents of the quarter cone.

The mathematical treatment in a condensed form is as follows, referring to Fig. 2:

Let a = altitude of cone;
r = radius of base of cone:
z = distance from axis of cone to cutting plane; given in figure as Z_1. Subscript dropped for simplicity;
V = volume of entire cone;
v = volume of portion cut off by plane.

We have

$$z^2 + y^2 = R^2, \text{ and } R : x :: r : a;$$

$$\text{therefore } y = \sqrt{\frac{r^2x^2}{a^2} - z^2} = \frac{r}{a}\sqrt{x^2 - \frac{a^2 z^2}{r^2}}$$

$$\text{and } v = \frac{2r}{a}\int_{\frac{a\,z}{r}}^{a}\int_{z}^{r}\left(x^2 - \frac{a^2 z^2}{r^2}\right)^{\frac{1}{2}} dx\, dz =$$

$$\int_z^r\left[a\,(r^2 - z^2)^{\frac{1}{2}} - \frac{a\,z^2}{r}\log_e\frac{r + \sqrt{r^2 - z^2}}{z}\right]dz =$$

$$\frac{a\,r^2\,\pi}{4} - \frac{2\,a\,z\sqrt{r^2 - z^2}}{3} - \frac{a\,r^2}{2}\text{ arc sin }\frac{z}{r} + \frac{a\,z^3}{3\,r}\log_e\frac{r + \sqrt{r^2 - z^2}}{z} - \frac{a\,r^2}{6}\text{ arc cos }\frac{z}{r}.$$

The characteristics of each of these terms of v are given in diagram A, both positive and negative terms, for economy of space, being placed above the zero line. The curve designated $\frac{v}{V}$ gives the proportion of the volume severed from the cone to the volume of the entire cone. This ratio is constant for the corresponding ratio $\frac{z}{r}$, irrespective of the dimensions a and r, consequently it is only necessary to obtain the volume of the whole cone and multiply it by this ratio as given in the table or from the curve, and the volume of the portion severed is arrived at. For instance, if it is desired to obtain the contents of that portion of a cone remaining from which has been removed a part exterior to a cutting plane situated midway between the axis and the outer extremity of the base, we first ascertain that the ratio $\frac{z}{r} = .50$, and a reference to the diagram shows that the ratio of the part cut off is, to the entire cone, .110.

Diagram A and the table accompanying it were not worked out with more accuracy than may be obtained by means of the ordinary slide rule, as the writers, desiring a diagram more suitable to rectangular bins, were agreeably surprised to find that a combination of two cutting planes, as shown in diagram B, very much simplified the formula for purposes of calculation. This formula was obtained by means of the proper substitutions, displacing z by its value as a function of the angle ¢ in the following:

$$\frac{v}{2} - v_1 - v_2 = \frac{a\,r^2}{3}$$

$$\left[2\sin 2\phi - \cos^3\phi\log_e\tan\frac{90° + \phi}{2} - \sin^3\phi\log_e\cot\frac{\phi}{2}\right]$$

Making a and r each equal to unity in the above formula gives the formula for the unit semi-cone. This unit value C_1 was used in plotting diagram B, and is shown thereon. The solution was made for the semi-cone, as it is not always practicable to have the apex at the geometrical center of the bin. The formula and curve may be as readily used in the case where the apex is not placed centrally in either direction by taking one-half the reading of the curve, which then applies to a quarter cone. Formula C_1 may also be transformed to give tons or bushels, as

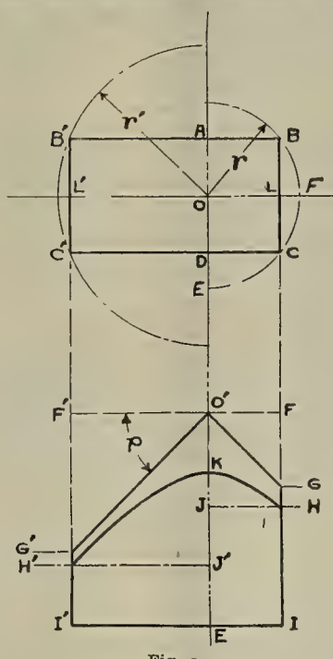


Fig. 1.

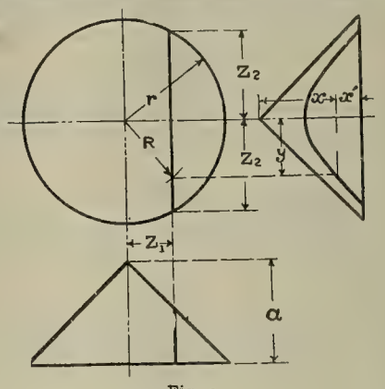


Fig. 2.

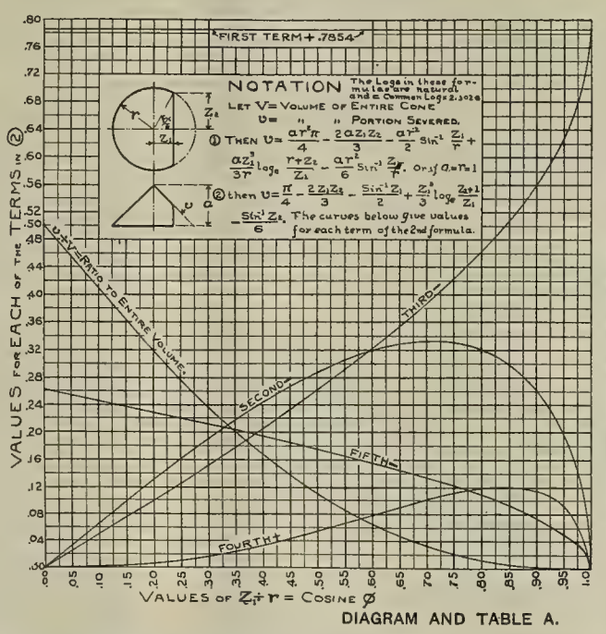


DIAGRAM AND TABLE A.

CO-ORDINATE DISTANCES

For each of the terms in the expression for the volume of the portion of a cone severed by passing a cutting plane parallel to the axis, from Formula 2. By inserting all the coefficients in formula 2 the 3rd and 5th terms summate. Let a = r = 1 as before, let ϕ = angle in degrees; formula 2 then becomes $v = .7854 - \frac{\sin 2\phi}{3} - .00582(135 - \phi) + 2.3026\frac{\cos^3\phi}{3}\log\frac{1+\sin\phi}{\cos\phi}$. ③ Logs in ② are common logs.

FIRST TERM IS CONSTANT = π/4 = .7854

VALUE $\frac{Z_1}{r}$	SECOND TERM MINUS	THIRD TERM MINUS	FOURTH TERM PLUS	FIFTH TERM MINUS	Ratio to Entire Cone = $\frac{v}{V}$
.00	.0000	.0000	.0000	.2618	.5000
.05	.0333	.0250	.00015	.2535	.4524
.10	.0664	.0504	.0010	.2451	.406
.15	.0970	.0754	.0029	.2368	.362
.20	.1297	.1007	.0061	.2286	.318
.25	.1617	.1264	.0107	.2200	.277
.30	.1909	.1524	.0166	.2116	.237
.35	.2170	.1787	.0230	.2028	.201
.40	.2445	.2056	.0335	.1930	.166
.45	.2662	.2333	.0436	.1642	.137
.50	.2887	.2618	.0548	.1745	.11007†
.55	.3064	.2910	.0668	.1648	.086
.60	.3200	.3216	.0790	.1547	.065
.65	.3291	.3539	.0814	.1442	.047
.70	.3330	.3880	.1020	.1325	.032
.707	.3333	.3927	.1059	.1309	.05088†
.75	.3306	.4246	.1118	.1204	.021
.80	.3202	.4640	.1183	.1074	.012
.85	.2982	.5080	.1200	.0924	.007
.90					*
.95					*
1.00	.0000	.7854	.0000	.0000	.0000

* Slide Rule Not Accurate Enough For These
† Solved By Six Place Logs

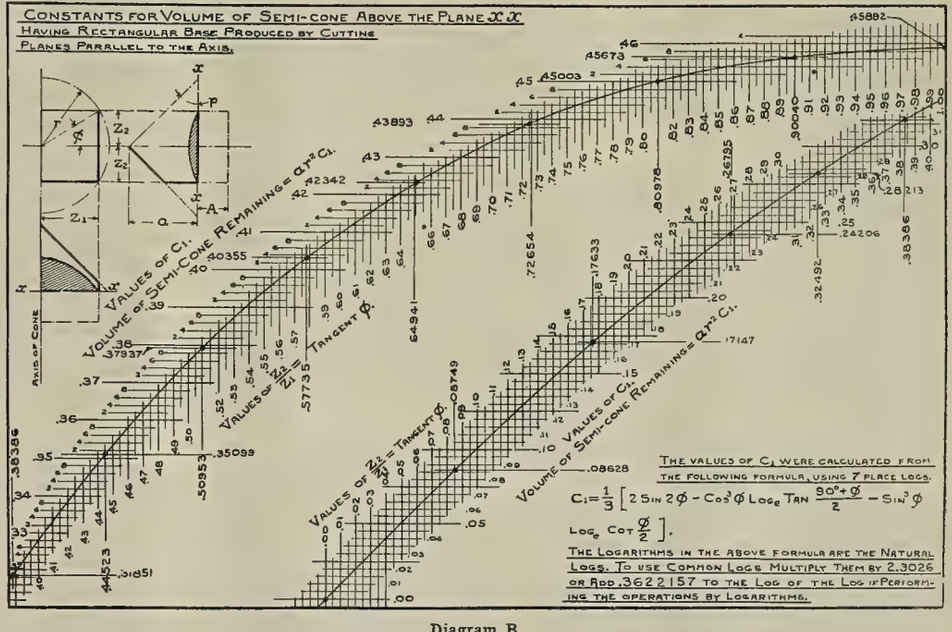

CONSTANTS FOR VOLUME OF SEMI-CONE ABOVE THE PLANE x x
HAVING RECTANGULAR BASE PRODUCED BY CUTTING PLANES PARALLEL TO THE AXIS.
VALUES OF C_1
VOLUME OF SEMI-CONE REMAINING = $a r^2 C_1$.
VALUES OF $\frac{Z_1}{r}$ = TANGENT ϕ.
AXIS OF CONE
THE VALUES OF C_1 WERE CALCULATED FROM THE FOLLOWING FORMULA, USING 7 PLACE LOGS.
$C_1 = \frac{1}{3}\left[2\sin 2\phi - \cos^3\phi\log_e\tan\frac{90°+\phi}{2} - \sin^3\phi\log_e\cot\frac{\phi}{2}\right]$.
THE LOGARITHMS IN THE ABOVE FORMULA ARE THE NATURAL LOGS. TO USE COMMON LOGS MULTIPLY THEM BY 2.3026 OR ADD .3622157 TO THE LOG OF THE LOG IF PERFORMING THE OPERATIONS BY LOGARITHMS.

Diagram B.

*Engineering News, July 27, 1905.

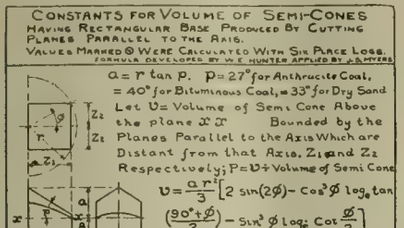
desired, by multiplying it by the proper constants for the material forming the cone. The values of C_1 given to five decimal places were calculated, intermediate values being readily interpolated from the curve.

Table B gives values of C_1 corresponding to values of $\frac{Z_2}{Z_1}$ = .36 to 1.00, advancing by .02 interpolated from the curve. The column headed P gives the proportion of the volume remaining to the volume of the semi-cone. The column headed C_2 gives the coefficient by which to multiply r_3 to obtain volume when the material stored is anthracite coal, the angle of repose of which is 27°. This table covers the range for practical purposes, as it would not be economical to construct bins under ordinary circumstances with a width less than about 0.5 to 0.6 of the length. In use the reading of diagram A should be multiplied by

CONSTANTS FOR VOLUME OF SEMI-CONES

HAVING RECTANGULAR BASE PRODUCED BY CUTTING PLANES PARALLEL TO THE AXIS.

VALUES MARKED ® WERE CALCULATED WITH SIX PLACE LOGS. FORMULA DEVELOPED BY W. E. HUNTER APPLIED BY A. MYERS


α = r tan p. P = 27° for Anthracite Coal,
= 40° for Bituminous Coal, = 33° for Dry Sand
Let V = Volume of Semi Cone Above the plane X X Bounded by the Planes Parallel to the Axis Which are Distant from that Axis, Z1 and Z2 Respectively; P = V ÷ Volume of Semi Cone
$V = \frac{\alpha r^3}{3}\left[2\sin(2\phi) - \cos^2\phi \log_e \tan\left(\frac{90°+\phi}{2}\right) - \sin^2\phi \log_e \cot\frac{\phi}{2}\right]$
or V = C1 α r³; For P = 27°, V = C2 r³ C2 = .509525 C1

ϕ	$Z_2 \div Z_1$	C_1	C_2	P	ϕ	$Z_2 \div Z_1$	C_1	C_2	P
	.36	.305	.155	.583		.72	.438	.223	.837
	.38	.317	.161	.606	36°	.7265®	.4389®	.2236®	.839
	.40	.328	.167	.627		.74	.441	.225	.843
	.42	.339	.173	.648		.76	.444	.226	.848
	.44	.349	.178	.667		.78	.447	.228	.854
24°	.4452®	.3510®	.1788®	.671		.80	.449	.229	.858
	.46	.358	.182	.686	39°	.8098®	.4500®	.2293®	.860
	.48	.367	.187	.701		.82	.451	.230	.862
	.50	.376	.192	.718		.84	.453	.231	.865
27°	.5095®	.3794®	.1933®	.725		.86	.4546	.2315	.868
	.52	.383	.195	.732		.88	.4557	.2320	.870
	.54	.391	.199	.747	42°	.9004®	.4567®	.2327®	.872
	.56	.398	.203	.760		.92	.4578	.2332	.874
30°	.5774®	.4036®	.2056®	.770		.94	.4583	.2335	.875
	.58	.404	.206	.772		.96	.4586	.2336	.876
	.60	.410	.209	.783		.98	.4588	.2337	.877
	.62	.416	.212	.795	45°	1.00®	.4589®	.2338®	.877
	.64	.421	.214	.804	The logarithms in the above formula are the Natural Logarithms. To use Common Logs multiply them by 2.3026				
33°	.6494®	.4234®	.2157®	.809					
	.66	.425	.216	.812					
	.68	.429	.218	.820					
	.70	.434	.221	.829					

VOLUME OF SEMI-CONE (WHEN α r² = 1) IS $\frac{2}{3}$ = .6666

Table B.

the contents of the complete cone and the product subtracted from the entire contents. The reading of diagram B should be multiplied by the product of the altitude and the square of the radius of the base; the result will be the contents of the semi-cone within the bin, and this result divided by two will give the contents of the quarter cone within the bin.

EXAMPLE.—A bin for anthracite coal is 230 by 160 feet and the apex of the cone is at the center of the building and 80 feet 8 inches from the floor. Required the capacity of the bin:

$z_1 = 115$, $z_2 = 80$, $r = \sqrt{z_1^2} + \sqrt{z_2^2}$, and $a = r \tan 27°$.

$(115)^2 = 13,225$
$(80)^2 = 6,400$

$r^2 = 19,625$
log r^2 ..... 4.2928079
log r 2.1464040
log tan 27° 9.7071659

$\frac{z_1}{z^2} \frac{80}{115} = .695$, hence C1

from curve = 4332 and
log C_1 ..... 9.6366884

Log V_2 ..... 5.7830680 and V_2 = 606,830 cu. ft.
and 2 V_2 = 1,213,660 cu. ft.
log r 2.1464040
log tan 27° 9.7071659

log a ..... 1.8535699 a = 71.379

80.667
71 379

9.288

log 9.288 9184479
log 160 ..... 2.2041200
log 230 ..... 2.3617278

5.4842975

therefore, contents of parallelopiped is equal to ..... 305,000 cu. ft.
contents of conical pile ..... 1,213,660 cu ft.

contents of the bin ..... 1,518,660 cu. ft.

This amount multiplied by $\frac{52}{2000}$ = 39,485 tons, the required capacity in tons of 2000 pounds, taking the weight as 52 pounds per cubic foot.

Available Supply of Platinum.

The Electrical Review says that the Croselmire & Ackor Co., 42 Walnut street, Newark, N. J., platinum, gold and silver refiners, announce that the situation in Russia is becoming so serious, and the supply of available ore so scarce, that it is possible, and not at all improbable, that before the first of the year it will be almost impossible to purchase platinum in quantities of any account. Prices are advancing almost daily, and in the next month or so the price of platinum will be very high. Platinum to-day is worth from $21 to $21.50 per troy ounce, according to the supply.

A Mine Superintendent's Difficulties in Nicaragua.

Written for the MINING AND SCIENTIFIC PRESS.

An impending sense of coming trouble forced itself on my just awakened susceptibilities one morning early in the first month of the current year.

The writer was the superintendent of a mine in Nicaragua, and that day the "Jefe Politico," or sheriff, after having attended the festivities of proclaiming a neighboring pueblo, was to pay our mine a visit.

In a moment of weakness I had consented to entertain this official with his numerous retinue; to provide them with a light "almuerzo," and show them underground. Well, we live and learn.

In the first instance, such a proposition meant, of course, the complete disorganization of the working staff, and no work being done that day.

The enthusiastic mine boss had fixed the main entry to the mine with native and home flags; and, in addition, had embowered it with a young forest of saplings, so that our ordinary business-like adit now had the appearance of being fixed for a school treat, or some such popular festivity.

On the flagpole at the office floated the blue and white emblem of native patriotism; although, I am bound to confess, I had no evidence of anyone even noticing this, our offered tribute.

The first contingent arrived during the morning, but these seemed to comprise most of the unofficial hangers on. The big man himself was reported "hors de combat" from the very strenuous undertaking of attempting an all-night "baile" copiously supported with certain well-known stimulants.

After a weary wait of most of the day, at about 4 P. M. the Jefe Politico and staff, accompanied by a heterogeneous crowd of followers, and that indispensable adjunct, the brass band, without which no government official would so demean his dignity as to preside at any function, no matter how insignificant, arrived.

As time was pressing I at once made inquiries as to whether the colonel and staff desired to go underground. On the reply being in the negative I was immensely relieved, as the very evident incapable state of all hands would make such a visit highly exciting, if not positively dangerous.

The modest luncheon that had been prepared early in the day was now called for, and with suitable apologies served. The cook had been somewhat generous in the quantities of mustard with which he had sought to impart a suitable "gusto" to the otherwise insipid sandwiches, and to the most callous palate they were, indeed, a trifle "piquante."

The first contingent, whose palate was more or less normal, after a trial had positively refused to suffer further; and so our apprehensions were great as to the favor with which our further efforts in this regard would be received. Apparently the pungent relish acted as an antidote to the jaded palate, and in many cases seemed to pass unnoticed—although to the normal innocent tears would start unbidden to the eyes. And so the lunch proved an unqualified success.

Almost at 5 o'clock, when the men, who had been in readiness all day, were preparing to leave, the big man felt sufficiently recovered to remember the object of his visit and expressed a wish to undertake the journey underground.

Numerous objections were offered, and I even brought to bear some manifest fabrications, alleging the mine to be full of powder smoke owing to the nearness of "shooting time," which would be highly dangerous to their excellencies. However, nothing would avail; in fact, they rather thought they might relish the smoke, and supremely despised any intimated danger.

So, as there was no alternative, without giving grievous offense—which in those autocratic countries would be extremely impolitic—the order was given to go below.

Although the main entry was but a stone's throw distant, it was not compatible with the honor of "caballeros" to walk, and so the whole party mounted and went clattering down the hill. The colonel, in fact, thinking possibly he was leading some desperate charge, cantered across the bridge and was half way up the opposite hill before he could be halted and ignominiously brought back.

The party were manifestly in no condition to go underground on foot, and so the accommodation provided was there. Timber trucks fitted with platforms and seats came into service very handily.

The mine boss, who had himself grown a trifle hilarious by this time, undertook a little pyrotechnic display on his own account, and also to demonstrate the efficiency of the particular brand of powder used, scattered with a free hand amidst the horses and riders whole sticks of powder with a short lighted fuse. The detonations were soon something fierce; but happily, beyond a little trouble with the horses, there was no damage done. Altogether the prospects looked a little unpropitious, with such an unruly crowd, to attempt the entry of the mine. However, in we went, the three automobiles with their mozos in the van, and the stragglers following as best they could. The mine was profusely lit with candles placed in the levels, crosscuts and rises, so that there was no lack of light. All went well until we reached the main shaft, when the mine boss would insist expatiating on the glories of the undertaking, which so interested the Jefe Politico that nothing would suffice but that he must get out and see these wonders for himself. So impressed was he that in honor of the project he called for his band and insisted on having a tune.

Great was his disgust when he found that the instruments had been left outside. After some maneuvering I managed to get the party aboard again and gave orders for full speed ahead to the end of the drift, some half a mile farther.

My sole anxiety now was to get the party through and out again without loss of limb or life. On arriving at the "breast," with little more adventure than a dump or two around the curves all hands alighted.

In two crosscuts near the breast six rounds had been drilled in each and loaded. After sundry efforts on the part of the boss to practically demonstrate how the holes were drilled, in which I had to discontinue his efforts as he was operating perilously near the charged holes, the Jefe declared his wish to see the holes fired. I can picture the scene very vividly now—the Jefe at the entrance to the crosscut within a foot or two of the spitting fuse, yelling at the top of his voice "Fire! Fire!" and waving his arms over his head, apparently in blissful ignorance that there were a half dozen shots in close proximity, and spitting for all they were worth. Seeing the state of affairs, I yelled to the other men not to spit their shots and devoted my efforts in getting the enthusiastic party into some place of safety. We had barely retreated to the switch when off went the shots, one after another; and, as a consequence, the entire party was left in darkness, as all the candles were blown out by the rush of air in the drift. The martial sound of the shots evidently awoke the latent patriotism and warlike sentiments, and "Vivas" galore were yelled by the crowd for the president, evidently with much gusto.

Now the proposition was to get the crowd out again.

The members of the band took a fancy to be trammed out in the mine cars; accordingly, they were hustled aboard into three cars and trammed out at a good lively gait, as the grade of the track is in places considerable, and the mozos did not spare their victims.

It was a matter of considerable congratulation that none of the cars were derailed and the occupants seriously injured; for as a matter of fact they must have come out of that drift seemingly like a shot out of a gun. As a matter of fact the entire party emerged in perfect safety—the members of the band a little sadder, but possibly wiser men.

By this time it was quite dark. After the inevitable delay the Jefe, followed by the cavalcade, headed for the office. On arriving there he evidently felt it encumbent on himself to deliver a speech, as it appears customary in Spanish countries on every possible occasion to speechify. Earlier in the afternoon we were given the benefit of some very lofty flights of oratory, which, boiled down, I expect, meant very little, if anything.

However, it seems inherent in the Spanish nature to express sentiment in the most ornate manner, whether called for or not; and so in this case the happy period of departure was thereby dragged out to such a length, assisted by a few supplementary drinks, that I was beginning to think if we ever should see the end of it—or whether some unfortunate occurrence might not cause some little six-shooter practice, as all the guests were, as customary, armed; when eventually the whole party, headed by the jubilant Jefe, drew off into the darkness and the night and left one individual, at least, devoutly thankful for their safe departure and vowing never again to volunteer or consent to entertain any Government official on any pretext whatever, in any part of the Spanish Americas.

Portable Trams in Mine Stopes on the Rand.

In stopes of small inclination the use of some form of conveyor has become the general practice, says the Government engineer of the Transvaal Department of Mines.

A form of conveyor has been found successful at the Lancaster G. M. Co. It is the invention of J. Faull, the manager, and takes the form of a double line of tramways on which a pair of skips are operated by gravity under the control of a brake. The two skips are joined by a wire rope which passes round the brake drum at the head of the stope. The full skip pulls up the empty one. The skips are self-dumping at the lower bin, this being effected by a door at the lower end of each skip which opens automatically when the skip lands on a buffer at the ore bin.

The claim to novelty consists in the portable nature of the apparatus, sections of parallel rails being fastened at gauge to light sleepers, in suitable lengths, which can be connected and disconnected readily,

and which also can be folded over on to one another for the purpose of removal or storage. Besides the facility of handling which the hinging affords for folding purposes, it also allows the rail track to accommodate itself to the uneven contour of a stope floor, and in practice it has been found that this flexible track is admirably adapted for the purpose for which it is designed.

It has been found desirable to construct the track in sections of different lengths, the shorter sections of 3 feet being found to follow sharp undulations of the floor more closely than the 9-foot sections, which are suitable for stretches that are less uneven.

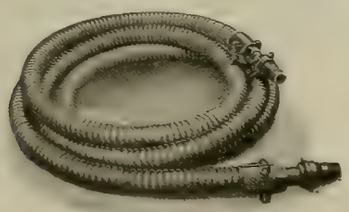
In the narrow stope between the second and third levels of the Botha mine about 70 feet of parallel double tracks are laid, made of 3-foot sections of 18-inch gauge. On these tracks are two skips of 9 cubic feet capacity each.

In another and wider stope between the sixth and seventh levels similar tram lines are being worked, only in this case the tracks are of 2-foot gauge, and the sections in lengths of 9 and 3 feet, while the skips are of 16 cubic feet capacity. The number of boys engaged in serving these two skips, which convey a ton of ore from the front face to the ore chute, a distance of some 70 to 80 feet, every two or three minutes, is eight, viz., six at the loading station, one operating the brake, and one clearing the discharge. The installation of this folding track allows ten shovelers to be dispensed with, besides more rapidly performing the work.

Regarding the portability of the tram lines, 4 feet of single track was folded up and transported in four minutes and relaid in six minutes. These times need to be doubled to obtain the rate for rigging and unrigging the double track. It has been recently definitely proposed to use belt conveyors, in 600-foot lengths, to handle the ore on the main incline (complementary to the main vertical shafts) of the deep level mines of the eastern section of the Witwatersrand. The inclination of the reef is not expected to be greater than 20°, while it may be as flat as 8°, and it is felt that some method of continuous mechanical transport will prove more economical than ordinary methods of skip winding.

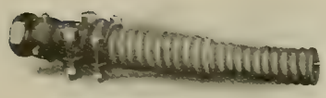
Flexible Steel-Armored Hose.

Mining superintendents and others will be interested to know of a new product in the line of armored hose, the construction of which prevents any collapse, as the armor binds the rubber lining so tightly that even after the rubber part becomes useless the loss of steam or air is so small that the machine may be continued in operation until it is convenient to replace the damaged hose. If from any cause a section of the hose is cut out, the remaining two pieces can



Coil of Flexible Steel-Armored Hose.

Splicing Clamp.



Re-enforcing Bushing.

be coupled together without interfering with its efficiency. The armor incases the hose completely so that no part of the rubber lining is exposed to external injury. The efficiency of the hose is increased, as it is practically impossible for the hose to kink or flatten, thus maintaining a uniform internal diameter which is essential to perfect circulation of steam or air. It is obvious that a hose of this character is not continually in the repair shops.

The steel-armored hose consists of a high-grade rubber hose closely covered with an exterior metal armor composed of interlocking strips of galvanized steel wound spirally in such a manner as to give extreme flexibility. Special couplings and fittings have been designed, and can be supplied for mechanically connecting the armored steam or air hose in the most reliable manner to various makes of drills.

This new product is manufactured by the Sprague Electric Co., 527 West Thirty-fourth street, New York City, who will be pleased to send a descriptive bulletin, No. 50,537, upon request.

Cyaniding Silver-Gold Ores of the Palmarejo Mine, Chihuahua, Mexico.*

NUMBER III.

Written by T. H. OXNAM.

This clayey portion, which we term "slimes," is allowed to dry as much as practicable, and is then treated by agitation in a separate plant, as will be described farther on in this paper.

Figs. 2 and 3 show the arrangement of the cyanide leaching plant in plan and in elevation.

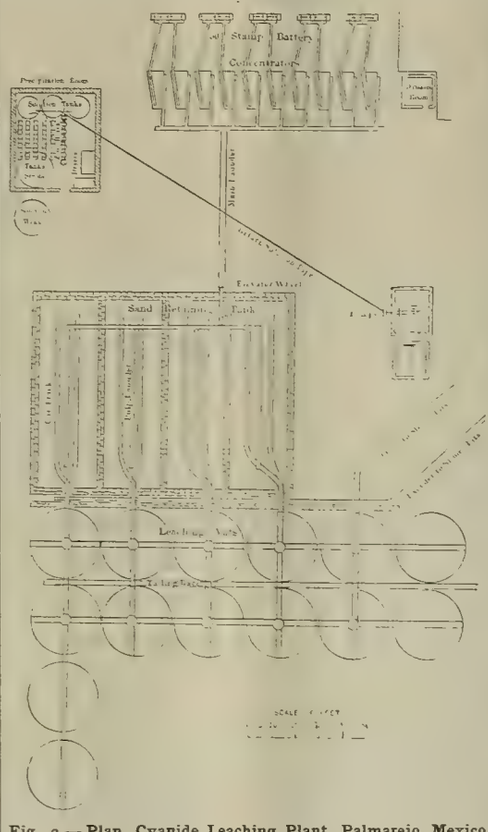


Fig 2.—Plan, Cyanide Leaching Plant, Palmarejo, Mexico.

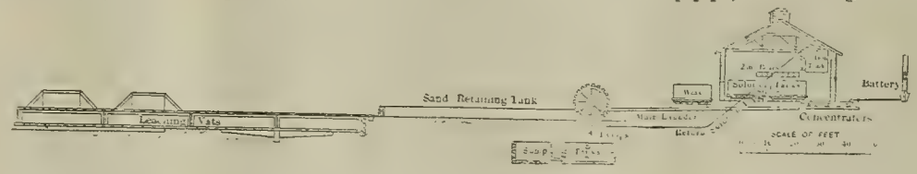


Fig. 3.—Cyanide Leaching Plant—Elevation.

CYANIDE TREATMENT OF SANDS.—The sands retained in the compartments of the large masonry sand retaining tank, after being allowed to drain as long as possible—usually from 36 to 48 hours—are trammed by half-ton cars to the cyanide leaching vats, twelve in number and each 30 feet in diameter and 4.5 feet deep. The filter bottom, which reduces the available depth to 4 feet 2 inches, consists of a wooden, lattice framework covered by a layer of cocoa matting, over which is stretched a filter cloth of 8-ounce duck. Two heavier grades of duck have been tried as filter cloths, but it was found that they tended to reduce the rate of leaching and gave less satisfactory service than the 8-ounce cloth. Ten of the leaching vats are constructed of No. 9 sheet steel; the other two were built here on the premises and are made of 3-inch native pine. Two additional vats of the same dimensions and capacity, made of 3-inch redwood throughout, are now in course of erection.

The sands, as charged into the leaching vats, carry from 14% to 16% of moisture. Each vat is charged with the equivalent of 100 tons of dry sands. While being trammed to the leaching vats, slaked lime is added to each car, usually in the proportion of from 4 to 5 pounds of lime per ton.

The vats are filled and discharged by contract for $19 a vat, which is equivalent to 19 cents per ton.

Two strengths of stock solutions are employed, the weak solutions averaging between 0.25% and 0.30% of KCN, and the strong solution averaging from 0.75% to 0.80% of KCN. The working strength of the solutions is always taken as that indicated by titration with silver nitrate in presence of a few drops of 10% solution of potassium iodide, as an indicator, 10 c.c. of the cyanide solution being taken for titration. For the sake of convenience, we still express the strength of our working solutions in terms of potassium cyanide, although for over a year we have been employing sodium cyanide exclusively. Titration with silver nitrate shows that the sodium cyanide being used is, on an average, equivalent to about 125% of potassium cyanide. Our experience at this place with sodium cyanide leads us to believe that it is fully as efficient as potassium cyanide for the dissolution of the values contained in the ore. It also appears that, since commencing the exclusive use of sodium cyanide, our solutions become rather less fouled than was previously the case. Freighting expenses are always a considerable item with us and by the adoption of sodium cyanide, equivalent, as above stated, to 125% of potassium cyanide, a saving of 20% of the freighting expenses on this article has been effected. Granted, as our experience seems to confirm, that sodium cyanide is equally as efficient as potassium cyanide, it would seem probable that it will gradually displace the latter, which, until recently, has been almost universally employed. Besides the direct saving in transportation expenses, the sodium cyanide appears to possess other advantages. From a metallurgical standpoint, other things being equal, it would seem preferable to use a salt as nearly pure as is to be obtained. Absolutely pure sodium cyanide being equivalent to about 132% of potassium cyanide, a product testing from 125% to 130% of potassium cyanide is manifestly nearly pure. It by no means follows, however, that the ordinary commercial cyanide, rated as 98% to 99% pure, and which by the usual silver nitrate titration will stand up to this strength, contains but 1% to 2% of impurities. That this commercial cyanide frequently carries a varying percentage of sodium cyanide is a well-known fact, and it of course naturally follows, on account of the relatively greater proportion of the CN radical contained in this salt as compared to potassium cyanide, that the greater this percentage of sodium cyanide contained in the ordinary 98% to 99% of potassium cyanide, the greater will be the percentage of impurities.

In view of these conflicting results, it is to be hoped that the managers of other plants, where sodium cyanide has been tried on a large scale, will follow Mr. Oxnam's example and publish the details of their experiences. From a chemical standpoint there seems to be no reason why a molecule of NaCN in dilute solution should act differently to a molecule of KCN, nor why the gold double cyanide of the one should be more or less stable than that of the other. Possibly the alkaline carbonate, present as an impurity in varying percentages, may have had some influence in the case of certain ores. Fuller information on the subject is certainly desirable.

As soon as a vat is charged, from 20 to 25 tons of weak solution, carrying as just stated from 0.25% to 0.30% of KCN, is introduced from the bottom by means of a 2-inch drop pipe, terminating in a Tunderneath the filter. This solution is introduced slowly in order to avoid channeling of the charge, and it usually makes its appearance on top of the sands about six or seven hours after being turned on. When the solution stands 2 or 3 inches above the top of the charge it is turned off and the material is allowed to soak for six hours, during which time the material will usually have settled from 3 to 4 inches. The weak solution discharge valve at the bottom of the vat is now opened and leaching is commenced. During the next two, or sometimes three, days, weak solution is added from the top as rapidly as permitted by the leaching rate of the charge until a total of from 100 to 130 tons has been applied. From 60 to 70 tons of strong solution, averaging between 0.75% and 0.80% of KCN, is now run through the charge at a somewhat slower rate, the usual time consumed for this operation being about forty-eight hours. Weak solution is now run through the charge as rapidly as possible, until within about twenty-four hours before the time it is to be discharged, when wash water to the amount of from 15 to 20 tons is added in lots of about 5 tons each. The residue is now ready for sluicing, which is accomplished by two men in about six hours, each using a 2-inch hose, equipped with a 0.5-inch nozzle and operating under a head of 72 feet. After finishing the sluicing out the canvas filter is usually swept clean with a broom, it being found that if this is not done the filter cloth frequently tends to become clogged with very fine slimes and the rate of filtration is lowered. Each vat is equipped with two 10-inch by 10-inch square bottom discharge doors.

The quantity of wash water used is regulated principally by the balance of the solutions on hand. Although a separate zinc box is provided for waste solutions, it is very seldom used excepting during the rainy season, as very rarely during other times of the year is any solution run to waste. Only two of the leaching vats are under cover, and during the rainy season it frequently becomes necessary to run a certain percentage of the solution to waste, as during

*Trans. Amer. Inst. Min. Engrs.

each heavy rain the exposed vats will collect a very appreciable quantity of water.

It has so far been my experience that as thorough oxygenation as possible of the material being treated is a very desirable feature in the cyanidation of most gold ores, and, in the case of the Palmarejo ores, it appears to be absolutely essential in order to obtain the best results. Due to the fact that the major portion of the value of the material being treated is in the silver content, the actual weight of fine metal to be acted upon is much greater than is ordinarily the case with gold ores.

In order to permit of as much air being supplied to the sands as possible, the solution during the treatment is frequently allowed to drain down several inches beneath the surface of the charge, air being thus allowed to penetrate the material to this depth. It is our custom to assay each charge every 24 hours, after the first 5 days of treatment. Before each sampling, the solution is also usually allowed to drain down several inches below the surface of the sands, thus allowing additional opportunity for the entrance of air into the upper layer of the charge.

Under the most favorable conditions, however, the air drawn into the top layer of the charge can have but little effect on the lower half. It is doubtless due, at least largely, to this difference in aeration to which the upper and lower portions of the charge are subjected, that practically without exception, when ready for discharging, the lower half of the charge will run from 1 to 2 ounces of silver higher than the upper half. Frequently this difference is even more marked, and occasionally a difference of as much as three or four ounces will be obtained between the upper foot and the bottom foot of the charge.

To overcome this difficulty to a certain extent, after many experiments, the practice was adopted some time ago of transferring as many charges as possible from one vat to another during the treatment. To transfer a vat means the loss of practically 24 hours of its available leaching time, as it is necessary to drain the charge for about 12 hours before commencing to transfer it. Also it is necessary that one of the adjoining vats be empty at the proper time to receive the transferred charge. By careful manipulation, at present, about one-third of the total number of charges treated are transferred. When the two additional vats, which are now in course of erection, are completed, a greater number of charges can be transferred and the additional capacity afforded will also permit of a longer treatment to offset the time lost in transferral. The transferring is done by contract for $16 a vat, which is equal to 16 cents per ton. While being transferred, the material is of course given a thorough exposure to the air, any existing lumps are broken up by the shoveling, and, roughly speaking, the bottom layer of the original charge becomes the top layer of the transferred charge. The period during the treatment at which the transfer is made naturally depends upon the time at which an adjoining vat can be empty and ready to receive the transferred sands, but operations are usually so timed that the transfer takes place while the strong solution is in contact with the material. During the transfer, about 100 pounds of slaked lime are evenly distributed near the bottom of the vat receiving the transferred charge.

The charge is sampled just before and just after transferral, the latter sample being nearly always about 1 ounce higher in silver than the former, a result which is doubtless due to the fact that in taking a sampling the almost unavoidable tendency is to obtain a larger percentage of the top half of the charge than of the lower half; and, as above mentioned, the lower half of the original charge, after the transferral, becomes practically the upper half of the transferred charge.

The first solution added after the transfer is introduced slowly from the bottom, after which the regular routine treatment is continued. The value of the effluent solution from a charge is invariably found to increase immediately after the charge has been transferred, such increase being usually from 2 to 3 ounces of silver per ton of solution.

In general, all heads and tailings samples of the sands treated are taken with a 1.5-inch auger at from 12 to 16 different points of the charge.

Table I gives a part quantitative analyses of two samples taken some time ago of the mill product after concentration and ready for cyaniding. The composition of the sands now being treated will doubtless vary but little from that of these samples:

TABLE I.—PART QUANTITATIVE ANALYSES OF SANDS.

Composition	Sample No. 1.	Sample No. 2.
	Per Cent.	Per Cent.
Insoluble (chiefly SiO_2)	88.40	81.90
Iron	1.20	1.05
Sulphur	Trace	0.17
Manganese	2.37	1.87
Lime	2.88	6.00
Magnesia	0.61	1.38

NOTE.—Qualitative analyses of the ore before concentration show the presence of small quantities of antimony, arsenic and bismuth, and occasionally traces of zinc and copper are found.

Tables II and III give a complete record and analysis of the results obtained on a charge which was transferred during treatment. Although dealing with but a single charge, these results represent those regularly obtained in ordinary operations.

TABLE II.—DETAILED RECORD OF SANDS TREATMENT.

Charge No. 744. Net tonnage, 100. Moisture, 15.5%. Lime added, 0.25%. Assay value per ton was $2.08 of gold and 15.40 ounces of silver.

Date.	Time.	Solution Added, Per Cent of KCN. Tons.	Weak.	Strong.	Effluent Solution. Assay Value. KCN.	Gold.	Silver.	Tailings Assays Gold.	Silver.	Percentage of Extraction as per Tailings Assays. Gold.	Silver.
					Per Cent		Ounces.		Ounces.		
September 20	4 30 P. M (a)	30	0 37								
September 21	5 00 A. M	15	0 36		0 08						
	4 00 P. M	30	0 33		0 16	$0 05	1 38				
September 22	3 00 A. M	17	0 33		0 20	0 05	1 49				
	2 30 P. M	30	0 35		0 21	0 05	1 61				
September 23	4 00 A. M	30	0 31		0 21	0 05	1 80	$1 03	13.74	$61.57	$13.60
	1 00 P. M	15	0 24		0 22	0 05	2 26				
	8 00 P. M	15		0 80	0 23	0 07	2 59	0 82	11.26	60 40	26 18
September 24	9 00 P. M	15		0 89	0 36	0 07	3 90				
	7 00 A. M	17		0 78	0 50	0 07	4 15	0 82	10.42	60 40	34 46
September 25	4 00 P. M (b)				0 60						
	6 00 A. M				0 61						
September 26	4 00 P. M	30	0 28		0 42			0 62	9 47	76 87	40 44
	3 00 A. M	18	0 29		0 31	1 51	7 59	0 62	10 04	76 87	33 08
September 27	2 00 P. M	16	0 29		0 29			0 42	9 96	84 33	37 86
	11 00 P. M	20	0 28		0 28						
	8 40 A. M	15	0 28		0 30	0 02	5 56	0 20	8 38	92 54	47 30
September 28	5 00 P. M	15	0 28		0 30	0 30	3 28				
	2 30 A. M	15	0 26		0 25			0 10	7 87	96 27	50 80
September 29	11 00 P. M	15	0 26		0 25	0 20	2 10				
	4 00 A. M	5			Wash water						
September 30	11 00 A. M	5			Wash water	0 20		0 10	7 24	96 27	54 47
	7 00 P. M (c)				Discharged.	0 18	1 10	0 10	7 44	96 27	53 21
						0 12					

(a) Turned solution on from bottom at 4.30 P. M. Solution appeared on top at 11 P. M. Let soak for six hours. Charge settled 4 inches.
(b) Let drain preparatory to transferring. At 6 30 A. M., September 26, commenced to transfer to vat No. 3. Finished transferring 4 P M One hundred pounds lime distributed near bottom of transferred charge Solution turned on from bottom appeared on top at 10 P. M.
(c) Started to discharge vat at 7 P. M. Finished discharging at 2 A. M.

NOTE.—Extraction equals 96 27% of gold and 53 21% of silver.
Total time of treatment, including charging and discharging, 11 days.
Solution added: Weak 261, strong 64, wash water 15, total 340 tons.
All tailings samples with the exception of the discharged tailings were washed before assaying.
During transferral a sample taken from upper 18 inches of charge assayed $0.50 of gold, 9.20 ounces of silver, and one from lower 18 inches of charge assayed $0.82 of gold and 11.92 ounces of silver.

TABLE III.—SIZING TEST (A).

Made on heads from Vat No. 1; charge No. 744 Sept 21, 1904. 1000 g. taken Ordinary brass wire assayers' screens were used. Assay value of material per ton was $2.08 gold and 15 40 ounces silver.

Size of Material.	Weight.	Assay Value. Gold.	Assay Value. Silver.	Percentage of Total Value Contained. Gold.	Percentage of Total Value Contained. Silver.
	Per Cent.		Ounces.	Per Cent.	Per Cent.
Retained on 60-mesh	41 2	$2 27	14 78	34 90	38 29
Retained on 100-mesh	10 9	2 16	12 86	8 78	8 82
Retained on 120-mesh	8 2	1 85	12 94	5 66	6 67
Retained on 150-mesh	11 5	1 85	12 66	7 04	9 16
Passed 150-mesh	28 7	2 68	14 90	2 70	2 53
	25.5	4 25	21 42	40 44	34 35
Totals	100.0			100 42	99 82

SIZING TEST (B).—Made on discharged tailings of Charge No. 744, Oct. 1, 1904. 1000 g. taken. Used same screens as in Test A. Assay value of material per ton was $0.10 gold and 7.44 ounces silver.

Size of Material.	Weight.	Assay Value. Gold.	Assay Value. Silver.	Percentage of Total Value Contained. Gold.	Percentage of Total Value Contained. Silver.	Percentage of Extraction on Sized Product. Gold.	Percentage of Extraction on Sized Product. Silver.	Constituent Portion of Total Extraction. Gold.	Constituent Portion of Total Extraction. Silver.
	Per Cent.		Ounces.	Per Cent.	Per Cent.		Per Cent.		Per Cent.
Retained on 60-mesh	41.8	$0 20	9 43		52 98		86 30		15.13
Retained on 90-mesh	11.0	Tr.	5 65		8 85		66 07		6.17
Retained on 100-mesh	8.8	Tr.	4 88		6 77		62 98		5 48
Retained on 120-mesh	13 4	Tr.	4 67		9 89		66 80		9 04
Retained on 150-mesh	24.9	Tr.	7 10		23 78		66 65		16 65
Passed on 150-mesh		0 10							
Totals	100.0			99 83					52.13

The effluent solution from the leaching vats is carried to the sump tanks by means of two separate lines, one for the weak, the other for the strong solution. These tanks are of masonry and are three in number. Two of them, having a combined capacity of 65 tons, are connected together and serve as a weak solution sump; the other, having a capacity of 25 tons, is used for the strong solution. All solution draining from the leaching vats is passed through the zinc boxes before being returned to the vats.

The proper tonnage of strong solution is maintained by frequently determining the strength of the effluent solution from the leaching vats, and when this strength reaches about 0.35% of KCN the solution is turned into the strong solution sump. As a working guide for maintaining the proper alkalinity of stock solutions, they are titrated every day with the addition of about 5 c.c. of strong lime water, 10 c.c. of cyanide solution being used in all titrations. If the addition of the lime water causes a difference of more than 0.5 pound in the indicated strength of the solution, the quantity of lime added to the sands charged into the leaching vats is increased.

From the sumps the solution is elevated by means of a 3-inch centrifugal pump, running 900 revolutions per minute, a vertical distance of 29 feet, through a horizontal distance of about 150 feet, to three storage tanks at the head of the zinc boxes. These tanks are each 10 feet in diameter, 8 feet deep and have a capacity of nineteen tons. Two of these tanks are used for the weak and one for the strong solution. The solution from the vats now passes through the zinc boxes, from which it is led to three storage solution tanks beneath the boxes. These storage tanks are made of No. 9 sheet steel, each one being 15 feet in diameter, 6 feet deep and of a capacity of thirty-three tons. Two of them are used as strong solution storage tanks, the other as a weak solution storage tank. The strong solution is brought up to the required strength by adding the necessary quantity of cyanide to the last compartment of the strong solution zinc box, which is reserved for this purpose. No cyanide is ever added directly to the weak solution.

(TO BE CONTINUED.)

Vulcanized Fiber for Friction Clutches.

The construction of a dredger that can stand up to the unusually severe work required in dredging river gravels for gold has been a task that has been but lately accomplished. The first dredgers built were continually breaking down, and for a time it was feared that economical running would be prohibited by the high cost of repairs. Continual experimenting has proved that manganese or other hard steel is necessary for the bucket plates. The bearings have at last been practically perfected and the manufacturer now has time to give attention to minor details.

One of the latter has been to find a suitable material for the surface of the friction gearing used in some makes, for transmitting the power. Rolling cylinders are frequently used to transmit force, and constitute what is known as friction gearing. In such cases the axes are arranged so that they can be pressed together with considerable force, and, in order to prevent slipping, the surfaces of contact are made of slightly yielding material, such as wood, leather, rubber or paper, which, by their yielding, transform the line of contact into a surface of contact, and also compensate for any slight irregularities in the rolling surfaces.

Considerable difficulty has been experienced in finding a material that would safely hold the heavy load of lowering dredger buckets from 40 to 60 feet below water level. The experience of a large San Francisco firm in this matter has finally led them to adopt either Eastern maple or a vulcanized fiber, giving preference to the latter, as the maple will burn if subjected to great frictional force.

This vulcanized fiber is produced by treating specially prepared vegetable fiber with chemicals, whereby the outside of each separate fiber becomes glutinous, and while in this condition the whole mass is consolidated and becomes homogeneous. After the chemicals have been extracted the mass is rolled, pressed and cured, so as to give the vulcanized fiber of commerce.

It is claimed that it is insoluble in all ordinary solvents, and that it is not injured by contact with alcohol, ether, ammonia, turpentine, naphtha, benzine, petroleum, or any of the animal or vegetable oils. It absorbs water, but is not injured thereby. The hard, vulcanized fiber is prepared in sheets 44x66 inches and from 0.005 to 2 inches thick. Sheets from $\frac{1}{8}$ to $\frac{3}{4}$ inch are usually used by the dredgers. It can be worked in a lathe, drilled, riveted, sawed and punched. It is not brittle nor easily broken, and possesses great strength, elasticity and durability. The Electric Railway & Manufacturers' Supply Co., 68 First street, San Francisco, Cal., carries a large stock of this material.

THE new abrasive alundum is the result of the fusion of the mineral bauxite in the electric furnace. Bauxite is a hydrated oxide of alumina, and is in some respects similar to corundum. The latter contains no water and less aluminum than bauxite. It is a new material sold in competition with carborundum, which is also made in the electric furnace from the fusion of silica and carbon.

Placer Mining in Alaska.

In consideration of the importance of the placer mining industry in Alaska, an exhaustive investigation of the mines and mining methods in vogue in the far North was undertaken by the United States Geological Survey, the results of which have been published in Bulletin No. 263 by C. W. Purington, and from which the following has been abstracted:

OPEN-CUT MINING.—Under this heading will be discussed the various methods of mining by which gravel is taken out of open cuts—either simple pick-and-shovel methods or methods involving the use of mechanical contrivances. The simplest of the open-cut methods dominated throughout the province up to within a few years, to the practical exclusion of all others except winter drifting. To-day probably 60% of the placer mining operations in Alaska are confined to open-cut methods, and this investigation has proved that, when combined with proper mechanical devices, these form often the most economical mode of exploitation.

Open-cut methods can be conveniently grouped under various headings, but the underlying principle of excavating and transporting the material to the washing apparatus, either by hand labor or by some mechanical means, remains the same.

ROCKER AND LONG TOM.—The simplest method of work which the miner adopts after he has passed the stage of panning is that of shoveling from the bank and washing the gravel in a rocker. The form of rocker employed in the Klondike, where its use has been nearly discontinued in mining, is shown in Fig. 1. Two men are necessary to use the rocker properly, while only 3 to 5 cubic yards of gravel can be washed in ten hours. At no place was the long tom seen in use in the North, although it was formerly employed to some extent in washing the Nome beach placers.

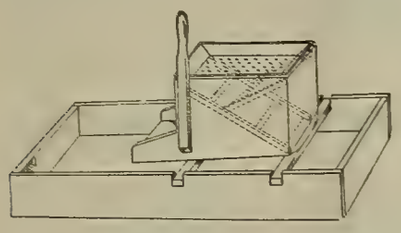


Fig. 1.—Klondike Rocker.

SHOVELING INTO SLUICE BOXES. — Conditions throughout many of the Northern placer districts favor this method of placer mining, for in many localities the pay streaks are thin, ranging from 2 to 4 feet in thickness, rarely exceeding 5 feet. It is often applicable where conditions of transportation prohibit the installation of more elaborate plants.

When the total depth to the bottom of the pay streak does not exceed 12 feet, the overlying barren material can generally be "ground sluiced" off, even where the grade does not exceed 1%, at an expense varying from 7 to 20 cents per cubic yard. The frozen muck which composes this overburden is from 50% to 75% water, and the solid residue of silt or fine clay is easily carried away at any time of slight rise in the stream.

On Anvil creek five strings of boxes with 120 shovelers give a twenty-four-hour capacity of 1080 cubic yards.

The handling of water is important. Even when the gravel has been solidly frozen previous to stripping and sun thawing, there are generally from 15 to 25 miner's inches of seepage water, which works into the pit floor. This must be disposed of either by draining or by pumping. If sufficient water (50 miner's inches) is available, a "China pump" can be rigged up. This device is not economical in its use of water, for the water is generally of more value for other purposes in Alaska mining.

DAMS.—As in all other forms of creek mining, great care must be taken to keep the creek water out of the working pits by means of dams. Dams constructed of sod walls lined with sacks have been found cheaper in the Klondike than those built of sod and brush. Pile driving is not advisable in the North, but in case timber is abundant cribbing is desirable. In a dam built across Discovery Fork of American creek the ends of the logs were set in frozen ground on both sides and the muck was allowed to refreeze around them. The dam, 40 feet long, consists of 12-inch timbers, from 9 to 18 feet long, laid up in two rows 5 feet apart, earth and rock filled, and braced with cross timbers. The dam, self-dumping gate and accessory flumes were built by two men, and are said to have cost, in labor and time, only $300.

A self-dumping gate was introduced on Discovery Fork during June, 1904, in "booming" the overburden from the area of pay ground which it was desired to uncover. Swinging on its horizontal axle, set two-thirds the distance from the top to the bottom of the gate, it releases the water when the reservoir becomes full and regains its closed position when the reservoir is nearly empty. During a period of three weeks a block of overburden consisting of muck and barren gravel, 5 feet thick by 25 feet wide by 900 feet in length, had been removed by the booming process before the shoveling operations commenced, the total cost, including the construction of the dam and gate, not exceeding 7 cents per cubic yard.

The process of booming by means of automatic water gates was formerly generally in use in California. As a rule it is inapplicable to mining or stripping in Alaska, because the stream grades are gentle and because the debris carried down by the torrential stream will damage property situated farther down the creek.

On Hunker creek, in the Klondike, a dam of moss, brush and gravel, 90 feet long and 18 feet high, built for the purpose of keeping the water from an open cut, cost $500. Dams in Seward Peninsula are successfully built of sod, the material which overlies the frozen muck to the depth of 2 feet. Sacks of sand are also successfully used.

DRAINS.—Below the proposed pit a backwater dam, generally 4 feet in height, is built across the creek, and the end of the sluice is extended beyond this dam a few feet. Assuming that the ground is to be worked upstream, the method of laying off the drain, commonly called the "bedrock drain," is as follows: In 12-foot ground take a level and sight downstream from the prospect pit to a point where 12 feet vertical distance above the water in the stream is obtained. The sight should be taken at a point 2 feet above the surface of the ground, to allow for the height of the backwater dam. The point where the drain is to be started is the distance downstream obtained by the sight plus 12 feet, allowed as a safety factor. On a 2% grade this would necessitate a drain 612 feet long. The drain is dug and left open until after the first cut is made. Its dimensions are generally 2 by 2 feet and it is lagged inside with poles horizontally, these being held by posts with 4-foot centers, into which shoulders are cut for caps. After the first cut the drain must be covered by logs and moss laid on top of the caps. For small operations a box drain made of sawed 1-inch lumber, the inside dimensions being 12 by 10 inches, is used. There should be a standpipe bored with auger holes in the drain at the lower end of every cut. The drain should have a very slight grade, as low as 1½ inches to 100 feet being used. At first the drain will handle only seepage water, but if one cut of 100 feet in length after another is successively worked upstream, sluice water may have to be run through it to prevent backing up. Some operators recommend keeping the main drain large and giving it the bedrock grade, while a smaller drain, 8 by 8 inches, is kept parallel to it on a less grade. This will handle the seepage water and will gain depth upstream, thus allowing for inequalities in the bedrock, which are very frequent.

On Mastodon creek, in Birch Creek district, a bedrock drain, 500 feet long, dug 4 feet wide, lagged inside with 4-foot cord wood, making it 2 feet in the clear, and covered with poles and moss, was dug through cemented and frozen gravel and bedrock, and cost $7000, its construction consuming all of one season. In the Fairbanks district an open drain, not lagged, 3 feet deep and 3 feet 6 inches wide, took the labor of two men six weeks, costing nearly $900.

In excavating for drains the ground should be cut in terraces, so that when it commences to thaw it will not run and clog the canal. Pumping seepage water from the pit is to be condemned in general as

Placer Miner's Cabin in Alaska.

Rocking on the Beach at Nome, Alaska.

Open Pit Mining in Alaska.

strongly as pumping water for sluicing. In Bonanza creek, Klondike, an operation involving the handling of several thousand yards was said to be more expensive by 40 cents per cubic yard when pumping of the seepage was done than when the water was handled by drain. The pumping of seepage water by any form of pump may be estimated to add at least 25 cents per cubic yard to the expenses of handling the gravel. The use of overshot wheels operating China pumps is cheap where water is plenty. A small one was using 20 inches of water to lift about one-third this amount a height of 10 feet. Such a pump in the Klondike, with 5-foot wheel, costs $100 to build.

Cost of Shoveling.—The cost of a plant, including that of constructing a seepage water drain, sod dams and a string of ten sluice boxes, with a ditch to lead the water to the sluice, varies from $500 to $2000, according to the conditions. The expense of handling gravel by this method is from $1.25 to $2.50 per cubic yard, reaching $5 to $7 in remote districts.

The duty of a man shoveling is variously estimated in different districts of the North. This form of mining having been nearly discontinued in the Klondike region, very little information concerning it was obtainable. In one case, where a platform was used, two men shoveling in two stages a total of 9 feet lift, 2 feet of pay were shoveled into the boxes at the rate of 3½ cubic yards per ten-hour man.

In Birch Creek district the duty of a man shoveling, from an average of twelve operations, is 5 cubic yards in ten hours, the depth of pay averaging 4.41 feet, and the lift never exceeding 6 feet.

In American creek, where the boulders were large and men had to stop work to get them out of the way, the duty was 2¾ cubic yards. On Discovery Fork of this creek the duty was 4 cubic yards, the depth being 5 feet.

In the Nome region 5.76 cubic yards duty is probably very near the average on a bank from 5 to 7 feet in height. In the case of the large operations of the Pioneer Mining Co., on Anvil creek, the work has been so systematized that on the 3-foot bank handled the duty is 9 cubic yards per ten-hour man.

The method of working shallow placers by shoveling into boxes has much to commend it, especially when the water is drained from the cut, either with or without a covered drain. In Alaskan gravels exceeding $3 in gold tenor to the cubic yard of material handled by shoveling, frequently from one-half to two-thirds of the gold lies in the crevices of the upper 18 inches or 2 feet of the bedrock. Men directly shoveling this material can thoroughly clean the bedrock by the shoveling-in method. On the other hand, if horse scrapers, steam scrapers or steam shovels are used the bedrock is frequently not cleaned, and a gang of men must go over the ground a second time to pick up the auriferous material which has been left. This point is of the first importance. No operator should contemplate the installation of mechanical excavators for working gravel without taking full account of it.

In considering methods of mining by water or mechanical power, the cleaning of bedrock by men may be permissible from an economic standpoint in exceptional instances, as, for example, where a thick overburden is cheaply removed by hydraulicking and a very thin rich pay streak remains. When, however, a mechanical method of removing overburden and low-grade gravels costs from 50 cents to $1 a yard, and the whole area has to be gone over again by men to wheel the rich pay to the sluice, the gravel must be extraordinarily rich to pay a profit. The lowest cost of handling gravel by the method of shoveling in was found to be $1 per cubic yard on one of the creeks of Seward Peninsula, while the cost may reach $5 on some of the isolated interior creeks of Alaska. From 10 cents to $1 per square yard of area worked must be generally added to the shoveling cost to cover the cost of stripping muck or overburden. Ground which exceeds 12 feet in depth of combined stripping and pay will rarely pay if handled by the method of shoveling into the sluice.

(To be continued.)

Gold in the Philippines.

Gold is found in the Philippine Islands in a number of localities. As recently as May 14, 1904, there were reports of a rich gold strike—128 ounces in a short time under primitive methods—by an American prospector in the provinces of the Camarines. The capital is Nueva Caceres, a city of 12,000 inhabitants, about 207 miles from Manila. Silver, iron, copper and lead are also known to exist in the same mountains. Specimens of quartz from another point—Paracale—assay 38 ounces of gold to the ton. In Benguet (the highlands of the Philippines), where the summer Government station is to be erected, the gravels of the river Agno carry gold. In another district, years ago, natives produced 150 ounces of gold per month, using only cocoanut shells as dishes. Copper also is reported from many localities. Copper ore was smelted by the natives before Magellan discovered the Philippines. Assays show over 16% of copper in the surface ores, and the ore bodies are of good size and form a valuable undeveloped resource.

The Cactus Mine, Beaver County, Utah.*

Written for the Mining and Scientific Press

On the eastern edge of Wah Wah valley, in the San Francisco range of mountains, in Beaver county, Utah, and 230 miles in a southwesterly direction from Salt Lake City, is located the new mining camp of Newhouse. This camp is reached via the San Pedro, Los Angeles & Salt Lake railroad, Newhouse being the terminus of a branch of this road from Milford. The property is better known as the Cactus mine, which has been worked in a small way for several years. Since the present management has taken control a large amount of development work has been done and many improvements made. The tunnel is in over 6000 feet and they have drifted on the second ore body. A crosscut has been run 135 feet from wall to wall, and approximately 200 feet in length, all in ore. A shaft 614 feet deep from the surface to the tunnel level has been sunk and levels made each 100 feet. The ore from the upper levels is dropped through the shaft to the tunnel level and from there brought out by means of electric motor, there being twenty-one cars handled at a trip. Each car holds approximately 3½ tons of ore. The ore is then put through crushers, situated close to the mouth of the tunnel, and from this point loaded into railroad cars and sent to the mill for treatment. The company has built a branch road from the mill to the mine, something over a mile in length. The engravings on the front page and accompanying show the mine and interior and exterior views of the mill.

The Table Floor of the Cactus Mill, Newhouse, Utah.

Three 10x20 Blake crushers at the mouth of the tunnel are used in crushing the ore, and the bins have a storage capacity at the mine of 600 tons. At the mill the ore is brought up a 4% incline to the top of the mill, where it is dumped into bins. These bins have a capacity of 1000 tons. The ore bins are made of steel. The cars which transport the ore from the mine to the mill are hauled directly over the bins and dumped. The mill is built in two sections, which are similar in every respect.

The ore is drawn off from the bins onto belt conveyors by means of the plunger feeders, and from the conveyors delivered to the elevators. There are two elevators in each section of the mill. The belt conveyors deliver the material to the dry elevator, which takes it to the top of the mill. The elevator is 70 feet high and the cups are 6x12 inches. The material from this elevator goes to a 14-millimeter mesh trommel and the oversize to 15x36-inch rolls, where it is crushed to about 14-millimeter size and returned to elevator. The undersize from the 14-millimeter goes to a double trommel consisting of a 7 and 3½-millimeter screen. The oversize from the 7-millimeter goes to the No. 1 jigs; the oversize from the 3½-millimeter to the No. 2 jigs. The product from the Nos. 1 and 2 jigs is taken out through a side discharge. All tailings and hutch products are returned to the wet elevator—16-inch belt and 6x16-inch cups. This elevator delivers the material to the 3½-millimeter trommel, and the oversize from this trommel is returned to another set of 15x36-inch rolls for recrushing, and from jigs to wet elevator, and again to a 3½-millimeter screen until all material will pass through a 3½-millimeter. The undersize from this 3½-millimeter and the other trommel mentioned above is delivered to a 10-mesh No. 20 wire trommel. The oversize from this trommel goes to the No. 3 jigs; the undersize to a 16-mesh No. 24 wire trommel and the oversize from this trommel to the No. 4 jigs. The undersize goes to a system of Calumet water sizers, which are arranged in series. The first compartment of the sizer delivers the coarse material that will pass through a 16-mesh screen to a set of jigs running 325 strokes per minute. The next compartment delivers to a set of four Wilfley tables, the next compartment to another set of four Wilfleys, and the next compartment to two tables. The overflow from these sizers goes into a system of settling tanks. The settlings from these tanks are treated by four tables and the overflow from these settling tanks passes to sump tanks in the bottom of the mill where the slimes system proper begins. The water that flows across the heads of all the tables is also returned to the slimes system in the same manner. From these sump tanks the slimes are pumped to a set of fifteen settling tanks in the upper part of the mill. These tanks are 8x8 feet and the bottoms are in the form of an inverted cone. The purpose of these tanks is to give the slimes a chance to settle and thicken, when they are drawn off through the bottom of the tanks and delivered to a set of slime tables. All the water in the slimes settling tanks is collected in one tank and used to supply the tanks with water. On the Nos. 3, 4 and 5 jigs the tailings are discharged and sent out of the mill. The product through the first and second jigs is returned through the elevator for retreating. The middlings from the tables are continually returned to the head of the same table for retreatment. The product from all the jigs and tables are delivered through a system of shaking launders into push cars, which are elevated and dumped into the concentrates bin. The railroad cars are loaded from these bins ready for shipment. The overflow from the shaking launders is also dumped back to the slime system. At present they are handling about 600 tons per day through the mill. The water for the mill and town comes from Wah Wah springs, about 10 miles to the west of the camp, and is carried across the desert or valley in 12 and 14-inch pipe.

*See illustrations front page.

Gold ore has been mined and milled in California for less than 50 cents per ton.

King Solomon Mine, Frisco, Summit County, Colo. (See Page 114.)

The Hancock Jig at Penn Wyoming Co.'s Mill.

Written for the MINING AND SCIENTIFIC PRESS by R. B. LAMB.

The new Australian jig, more generally known as the Hancock jig, installed at the mill of the Penn Wyoming Copper Co. at Encampment, Wyoming, has proved a decided success. The jig is handling feed from three different trommels, one of which is 8-mesh, one 4-mesh and one 3-mesh. The ore is crushed to pass through a $\frac{5}{8}$-inch opening. The feed varies from $\frac{1}{4}$ inch to $\frac{5}{8}$ inch. The jig is handling 380 tons of this product daily.

The jig screens are, from the head downward, 8-mesh, 4-mesh, $\frac{1}{2}$ inch punched, $\frac{5}{8}$ inch punched and $\frac{3}{4}$ inch punched respectively. The rolls are fed direct from the jig.

The three products made are concentrates, middlings and tailings. The middlings are returned to the jig to feed the bed.

A notable feature of the machine is its simplicity, and the perfect control the operator has over a feed, varying within very wide limits.

The special merits of this jig are high capacity, simplicity, light screen wear; it will treat material of varying sizes within certain limits; requires little labor to operate; makes clean concentrate, and is cleanly. It requires a constant speed and regularity of feed. It requires about the same quantity of water as other jigs per ton of ore treated.

The points to be guarded against are: (1) That all moving parts be kept entirely free from lost motion. (2) Large pieces of rock must not be allowed to enter the jig, as the bed becomes immediately disturbed. (3) The speed must not vary. (4) The moving parts must be strong and free from spring. (5) The discharge must be regular.

The machine briefly described consists of a box made of 4-inch lumber, properly braced with angles and rods, as shown in the accompanying engraving. This box is approximately 25 feet long by 4 feet 2 inches wide by 5 feet 9 inches high, and forms the hutch of the jig. It is supported by cast iron legs, in order to raise the body of the jig sufficiently for the operating mechanism. This makes the total height of the jig nearly 10 feet, which is one of its objections. However, as it is customary to put the foundation of the jig underneath the operating floor of a mill, this brings the bottom of the hutch box about at a level with the operating floor.

In this hutch box, and submerged in the water, works the screen frame, or sieve of the jig. The sieve is 20 feet long by 2 feet 8 inches wide, and is divided into a series of pockets extending across the screen. These pockets are intended to maintain and hold a "ragging," or bed, through which the concentrates are drawn into the hutch. This screen or sieve is carried on two cast iron cross bars fastened to the screen. These cross bars are supported by four upright arms, two on each side. The arms or rods are connected at the bottom to rocking arm shafts, which are connected to levers, the ends engaging a three-way cam on the main drive shaft of the jig. The main drive shaft revolves at 60 revolutions per minute and the result is a reciprocatory movement imparted to the sieve, which can best be described as an upward and forward movement and downward and backward movement. The upward and forward movement is produced by the rocking arms; the downward movement of the drive by gravity, and the "bump," or backward movement, by the radial bar, which is connected to the end of one cross arm. The up and down motion is about $\frac{3}{8}$ inch; the backward motion, or "bump," is only sufficient to advance the feed properly along the screen. Both the amount of the up-and-down motion and the "bump" are controlled by proper adjustment, so that this movement can be regulated to suit different kinds of ores. The number of reciprocations of the screen is 180 per minute. Some of the special and particular features of this machine are:

1. A large production, due to the fact that the feed is carried along the screen by what is practically a reciprocating motion, and not by a current of water, another reason being the size of the machine and sieve.
2. It handles an unsized feed.
3. The jig will handle 100 tons per day as well as 500 to 600 tons.

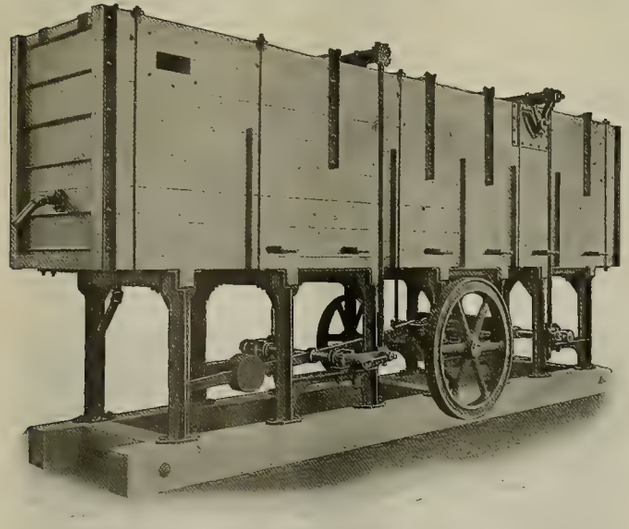
This suits the machine for a small concentrating plant, say 100 tons in twenty-four hours, as well as a large one. The Hancock jig simplifies the arrangement of launders and transmission of power.

All concentrates are made in the hutch, although it can be arranged to take off a clean concentrate from the top of the screen, if this is necessary.

In operation the fine material in the feed is taken down through the screen into the hutch at once. The finest mesh screen that the jig uses is over the first hutch compartment. The coarser part of the feed forms a ragging, or bed, for this fine concentrate. The next hutch compartment receives the medium-sized concentrates, and the third hutch compartment the coarse concentrates. In the last part of the jig, commencing where the coarse concentrates come down, the screen consists of plates punched $\frac{1}{8}$ inch larger than the largest size material the jig is handling. In this section of the jig, an artificial ragging, such as round iron punchings of proper size, is used as a bed.

In the last section of the jig, the action of hydraulic classification carries along the fine sands, while the coarse concentrates are being taken down into the hutch, an important feature of the jig. The last two hutches are usually used for middlings, all the free mineral contents of a feed being stratified and taken down into the hutch in the first three compartments. If all the middlings can be taken down in the fourth hutch, the fifth hutch is usually used for a tailings discharge. The hutch compartments can be changed as to their dimensions in order to suit different propositions by moving the cleats which hold the hutch divisions.

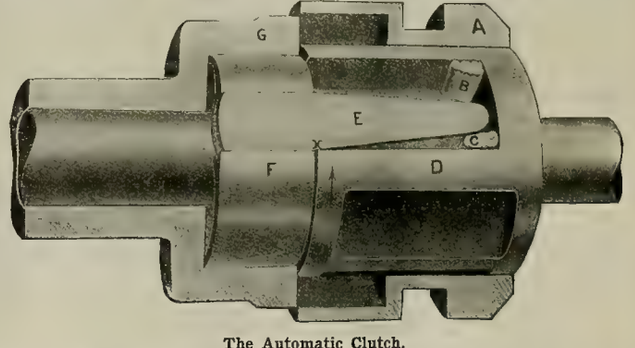
It would appear from the experience at this place that the jig would not be very successful on feed below 10 or 12 mesh, though elsewhere I am told it handles fine material with as satisfactory results as those obtained on coarse here. The jig requires a bed holder, which is made of 4-inch pieces set 4 inches apart for the entire length of the screen. These pieces must be renewed for about every 10,000 tons of ore treated. Otherwise when they become too much worn they get springy, which imparts a motion to the screen and the bed cannot be held. If the jig is solidly constructed its operation gives no trouble whatever.



The Hancock Jig.

Automatic Clutch.

Herewith is illustrated an automatic self-adjusting clutch. A is the operating sleeve which carries the pins B and C, shown in section, which fit between the faces of the cavity in the keyed member D. Loosely placed between the pins B and C is a lever E, which extends between the ends of the expansion ring F, which is surrounded by the cup or loose member G. If the keyed member D be rotating in the direction indicated by the arrow, the ring is freely revolved by the lever E, which is driven at point x, as pin C is free of the lever; and pin B operates on the lever only when the member D is revolving in the opposite direction. When the clutch is engaged the sleeve A is moved to the left, and pin C gradually relieves the bearing point x on lever, and the member D drives the ring by the lever through the pin C. This causes the lever E to expand the ring F within the cup G, with such pressure that the friction caused exceeds the force on the lever, so that "the greater the load the tighter the grip." This clutch is manufactured and furnished by the American Automatic Clutch Co., Akron, Ohio.



The Automatic Clutch.

Notes on Hydraulic Mining.*

NUMBER II.—CONCLUDED.

Written by R. L. GRIDER.

RIFFLES.—There are many different kinds of riffles in use—poles, rails, wooden blocks and angle steel riffles. The iron riffle saves gold better than the wooden and requires little or no washing, but is generally more expensive. Where sluices are not less than 200 feet in length and timber is cheap, blocks of wood are preferred. For economy in wear and increased gold saving area, place the heart side of the block up stream. Near the head of the sluices (first 120 feet) space the blocks 1 to 3 inches apart and decrease the width of space toward the dump. Never drive wedges between the sides of the flume and the blocks, because the swelling of the blocks will rip or split off the side boards from the bottom of the box, rendering it unfit for use. This is a common mistake made by miners. The blocks are prevented from floating by using a side lining of 2x6-inch or 2x8-inch scantlings which are spiked to the side of the flume. After having washed gravel four or five days, charge the sluices with mercury by pouring it into the flume from side to side in a zigzag manner up or down the flume once or twice a day. Do not strain the mercury into the flume through drilling or buckskin, as some recommend; this flours the mercury, rendering it buoyant and loss occurs. One to four pounds of mercury constitutes a charge per 50 feet of flume and alternate 50-foot sections are charged daily.

In order to obtain unamalgamated specimens, do not charge the first two or three boxes and never put mercury in the race. If the flumes are long or large and the gold fine, one to ten tanks of mercury are used per run.

DUMPS.—All dumps over 60 or 70 feet in height give little or no trouble, but lower dumps require much attention and a great amount of water to aid in spreading the materials. Spreading dumps is also facilitated by means of branch or Y sluices. When the dump at the end of one branch is full, the water is turned by means of a swinging hinged gate into another branch and a sluice box is added to the former. Consequently no time of actual mining is lost by this method.

THE CLEANUP.—The bedrock is cleaned with the pipe into the race and the race into the flume. Muddy water aids in cleaning the gold from the bedrock, and if the rock is too rough and full of seams, hand cleaning may be necessary. When the race is clean, turn the water out of the sluices, rip off and wash the slats (lining), take out the riffles or blocks, which should be thoroughly washed and laid on the side of the flume, loosen the materials adhering to the bottom of the flume with shovels or hoes, and turn on water enough (about 2 inches deep in the sluices) to wash the material down the flume. The mercury and amalgam drag along behind, and are scooped up with an iron scoop. A small auxiliary sluice leading from the side of the main sluice facilitates in cleaning up, and should be used unless there is an undercurrent or grizzly connected with the flume. The undercurrent or grizzly, however, is not economical unless the flume is short and there is plenty of water. Long flumes are always economical gold-saving contrivances. In some cases where the sluices are too short, where the grades are too high, where the sluices are poorly constructed, or where the ground contains much clayey material, the loss of gold and mercury is quite great, probably 10% to 40%. The loss of mercury depends upon the velocity of the current, the length of the sluices, the length of the run, the temperature of the water, and the character of the material, as well as the method of charging the flume. From 90% to 98% of the gold should be saved, and if the gold is coarse or heavy there is no reason why 98% to 100% should not be saved. Pipe clay and leaky flumes are the greatest sources of loss.

HYDRAULIC ELEVATING.—The action of the hydraulic elevator is like that of a steam injector. There are three kinds of these machines in general use—the Hendy, the Evans and Campbell elevators.

Place the elevator in the lowest part of the mine and deep enough in the bedrock, so that feed sluices

*Abstract of Colorado School of Mines Bulletin.

may be extended up to the workings. An hydraulic water lifter, an auxiliary to a gravel elevator, should be permanently installed by the side of the gravel elevator to keep the pit free from water when it becomes necessary to stop the elevator to make repairs, change nozzles, relieve it of obstructions, or clean up. A better method, however, is to install a double elevator, so that in case one needs repair the other can be used, and in case the volume of the water varies its capacity can be regulated to the quantity of water at command. An abundant supply of air to the upcast is necessary for good work with the hydraulic elevator, since the materials will pack and not enter the upcast if air is not admitted. Furthermore, the air, after passing the throat, is immediately compressed, so that it aids the water in raising the material. The upcast—i. e., the pipe leading up to the outer flume—discharges the material against a striking plate or grate, which deflects the material downward into the outer sluice. This plate gives much trouble when the boulders are hard, heavy and large, since they are impinged with great force against the plate or grate. A grate of steel bars, bent to the proper form, gives a better resistance than a plate, wears longer, and is more easily repaired. These bars are securely anchored in the top of the first box of the outer flume. This box must be covered, clamped, rigidly constructed, and weighted with boulders. Usually no grade is given to the first box of the outer flume, since the materials are discharged into it by the elevator with such force that they are carried from 10 to 40 feet down the flume. The grade for the second box should be 1 to 2 inches, that of the third 2 to 4 inches, and so on until the maximum grade for the outer flume is reached. The construction and equipment of the outer flume is identical with that used in hydraulic mining operations. The elevator should be fed regularly, and it works better when fed by a bedrock feed flume. To attain good results, the maximum amount of gravel should be elevated with a minimum amount of water, since the cost of lifting water is as much as or more than that of lifting gravel. The proportion of the distribution of water to the elevator is about two-thirds of the estimated volume, the remainder being used by the giants for piping.

Grizzlies are arranged in the bedrock feed flumes to prevent cumbersome boulders or other large material from entering the elevator and choking it. As soon as an opening is enlarged, cut the bedrock feed sluices upward from the elevator pit toward the bank for economy in the transportation of the material to the elevator, in the feeding of the elevator, and in the catchment of the gold. Much experience is necessary for successful mining with the hydraulic elevator. It not only requires engineering skill to install a successful elevating plant, but it requires technical engineering ingenuity to keep the machinery working to the best advantage.

Hydraulic mining, as a whole, requires scientific methods of work before success can be hoped for. No matter how favorable all the conditions may be, good business management will still be an indispensable requisite to success in such an undertaking. The ground contains large amounts of precious metal, but it is scattered through a vast amount of barren material. To collect it, immense quantities of dirt must be very quickly and very skillfully worked. Any carelessness in the technical part will result in large losses, but want of business management will result in larger. Economical management is, therefore, an essential requisite to success.

Galvanized Iron.

The first method of coating iron with zinc was electrolytic, says the American Manufacturer, that is, a solution of zinc such as zinc sulphate or chloride was employed through which an electric current was passed, the work to be zinced forming one pole and a sheet of zinc the other. The wet or electrolytic process was soon abandoned in favor of the hot or molten process, as there were no efficient low tension dynamos which are essential for the economical working of such a process, and the coating applied was found to be unreliable. The hot molten process consists of dipping the article into a molten bath of zinc (at a temperature of about 800° F.) covered with a suitable flux, such as sal ammoniac. From time to time various improvements, relating to the mechanical details, have been introduced into the working of the hot process, having for their object the reduction of the amount of zinc consumed for a given area of iron, but, unfortunately, such a reduction results in a corresponding decrease in the durability of the galvanized articles. Sheets are passed through squeezing rolls as they leave the bath; wire through asbestos rubbers or sand; nails and similar articles are placed, when the zinc is still molten, in centrifugal machines to remove as much zinc as possible. Another improvement of some moment has been the introduction of close annealing to reduce the amount of oxide formed, and the subsequent removal in acid. Sand blasting—that is, projecting sand at a few pounds pressure on the article to be freed from scale—has been substituted for the wet acid process for some classes of work.

THE PROSPECTOR.

The mineral specimens from Burnt Ranch, Cal., are: No. 1 granular quartz, with an abundance of pyrite—iron sulphide. No. 2 is massive quartz, with a little pyrite and some talc on one side; the brown and yellow color is due to iron oxide. No. 3 is an eruptive rock (diorite-aphanite) and is evidently the wall rock of a vein; the black color is due to the multitude of microscopic grains of magnetite. No. 4 is quartz containing pyrite. Nos. 1, 2 and 4 probably are gold bearing.

The rock sample from Truckee, Cal., consisting of a small sack of broken pieces, is a good grade of copper ore. Most of it is chalcopyrite in quartz gangue. The mineral is altering to bornite, which occurs as a film of oxidation, showing iridescent colors — blue, purple, green, reddish and bronze shades. It is a good concentrating ore, as it consists almost wholly of quartz and copper sulphide. A small amount of pyrite is present.

The rock samples from Tres Piedras, N. M., are determined as follows: No. 1, light brown, fine grained rock, a typical rhyolite, showing quartz blebs, a few somewhat altered hornblende crystals and an occasional crystal of feldspar, with a few scattering crystals of black mica (biotite). No. 2 is a basic rock (porphyrite), having a slightly schistose structure. No. 3 is a much decayed crystalline rock, originally syenite.

The rocks from Nogal, N. M., are: No. 1., a silicified country rock, possibly originally granite, or some similar rock. It also formerly carried a considerable amount of iron sulphide, and doubtless other sulphides of the base metals, the only ones at present remaining being finely disseminated pyrite. The pyrite has nearly all been altered to iron oxide. This ore may be gold-bearing. It has that appearance. No. 2 is similar to No. 1, but is not so much oxidized. It shows crystals of lead, iron and copper sulphide. No. 3 is an ore, apparently somewhat richer than Nos. 1 and 2. It contains the sulphides of iron, copper, lead and zinc, and has abundant quartz, also a little iron oxide as a result of decomposition of the pyrite. Gold and silver are also probably present in this ore. No. 4 is similar to No. 3, but is less oxidized, and contains a higher percentage of galena (lead sulphide), and chalcopyrite (copper sulphide). This is an ore which should concentrate readily. No. 5 is a siliceous ore, containing much iron oxide—the result of the decomposition of sulphides. No. 6 is syenite, in which occurs iron, copper and zinc sulphide. No. 7 is an altered and silicified crystalline rock, probably something like No. 6. The rock has been altered since its original silicification, by the oxidation of the sulphide minerals. All of the specimens of this lot probably contain gold and silver as well as the other metals mentioned.

The rock specimens from "R," Marysville, Mont., are: No. 1, fine-grained granite, in which there is abundant quartz, both orthoclase and plagioclase feldspar, hornblende and biotite. It would probably be more proper to call this rock grano-diorite. It contains considerable iron-sulphide, which indicates that it is near a mineral vein, as granite seldom contains pyrite at a great distance from a vein, or zone of mineralization. No. 2 is apparently a dike rock—diorite—and is somewhat decomposed. The visible minerals are quartz, feldspar and hornblende. No pyrite is seen in this rock.

The white crystallized rock sample from Randsburg, Cal., is calcium carbonate, commonly called "lime spar."

The sample of ore from Pollock, Idaho, is principally quartz, stained green with copper carbonate. The greater part of the dark mineral is an aggregate of chlorite scales. In several places are small amounts of bornite, a purple colored metallic mineral (sulphide of copper), and at one place a small amount of copper glance, also a copper sulphide. The brownish stains are due to iron oxide.

The rock from Jacksonville, Cal., is quartz with much decomposed ankerite (iron-lime-magnesia carbonate). The dark colored, bright, metallic mineral is specular iron, a variety of hematite. The smooth, greasy-feeling, scaly mineral on one side is chlorite schist.

The rock samples from Dorleska, Cal., are as follows: No. 1, chiefly quartz, carrying pyrite. The structure and general appearance of the rock suggest a zone of mineralization in a granular eruptive rock, probably quartz-diorite or grano-diorite. No. 2 is very similar to No. 1, but somewhat more mineralized. The bright sulphide is pyrite (iron sulphide); the dark mineral is zinc sulphide (zincblende). In No. 3 the sulphides are pyrite and mispickel, with a few very small crystals of galena, zinc and copper sulphide. These latter can only be detected by high magnifying power. Package No. 5 contained two pieces of rock. The float is quartz porphyry. The dark colored piece is a much altered, but more basic, rock, probably originally diorite. It contains much iron sulphide and very little quartz, whereas the float piece contains a large amount of free quartz. No. 5 is granite of rather coarse texture. In this same rock mass, doubtless, different varieties and phases of the rock may be found, but in the samples submitted the entire absence of hornblende removes it from the diorites. No. 6 is a metamorphic rock—graphitic-mica schist. Originally it was a fine sandstone, or mixture of fine sand and clay.

The rocks from Running Water, Wyoming, are: No. 1, mica schist, with a little malachite (copper carbonate). No. 2 is quartzite. It also contains copper carbonate, and in one place a small amount of native silver.

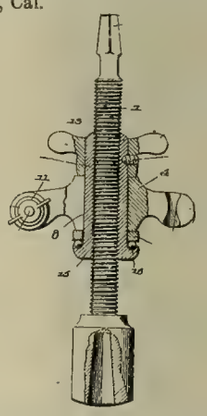
The mineral specimens from Sonora, California, are: No. 1, a dike rock with veinlets of quartz. No. 2, marble (crystallized limestone). It shows free gold. No. 3 is mica schist and calcite. This also shows gold. There are several localities, near the Tuolumne river, in the vicinity of Groveland, where similar ores are found. No. 4 is diorite, almost unaltered. No 5 is quartz, containing a small amount of telluride of gold.

Mining and Metallurgical Patents.

PATENTS ISSUED AUGUST 1, 1905.

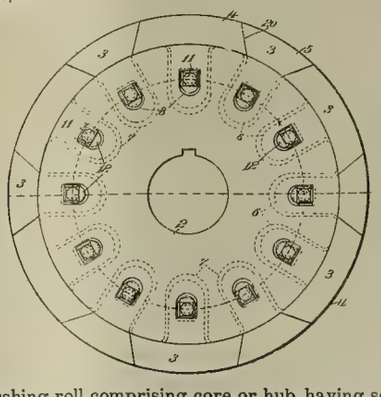
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

DRILLING APPARATUS.—No. 795,450; W. D. Rankins, Modesto, Cal.



Implement of class described comprising threaded shank, collar arranged thereon and provided at lower end with bearing, clamping head entirely encircling and mounted for rotation upon collar and resting at one end upon bearing, lateral arms carried by head, one of which is provided with one of pair of holding chain-receiving recesses, and other of which is cleft through to collar opening, members formed by cleft having opposing faces rabbeted to form second holding chain-receiving recess, and bolt and nut combined with cleft arm to clamp head upon collar, bolt serving as means for connecting holding chain with implement.

CRUSHING ROLL.—No. 795,331; W. Brinton, Highbridge, N. J.



Crushing roll comprising core or hub having series of pockets extending inwardly from periphery thereof, such periphery having concaved formation transversely thereof, plurality of segmentally formed shoes each having transverse convex inner face fitting into concaved seats of core, and inwardly extending lug, and means for securing such shoes individually to core, shoes having beveled coacting end faces, certain of shoes being formed as wedges and others as thrust members, wedges assisting to main tain thrust members in position.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Including the production of coke from by-product retort ovens, which in 1904 amounted to 2,608,229 short tons, the total output of the coke ovens of the United States during 1904, according to the report made to the United States Geological Survey by E. W. Parker, 23,621,520 short tons, against 25,274,281 short tons in 1903. The decrease in 1904, as compared with the preceding year, was 1,652,761 short tons, or 6.54%. The total value of the product declined in much greater proportion, from $66,498,664 in 1903 to $46,026,183, a decrease of $20,472,481, or 31%. At the close of 1904 there were under construction 4430 new ovens, of which 832, or 18.8%, were of the retort or by-product type.

ALASKA.

The Ketchikan Mining Journal reports that the new smelter at Coppermount is now running at full blast and is handling over 250 tons of ore daily. This smelter has been constructed by the Alaska C. Co. The power is derived from Pelton water wheels of 600 H. P. The water is taken from Lake Mellen in the hills back of Coppermount. The company has 30,000 tons of ore in the bins ready for the smelter, and a large force are getting out ore from the mines sufficient to keep the smelter going. From the time the ore leaves the mines till it reaches the hearth of the smelter it is handled by gravity. A railroad 1400 feet long transports the ore from the mine along the ridge of Copper mountain to the top of the aerial tram, which delivers it down to the ore bins above the smelter. From the bins it is conducted by chutes into the furnace. One hundred and fifty men are employed in the smelter and mines. At present the ore is taken from Indiana claim, the ore body of which has been stripped for over 250 feet. H. W. Mellen is president and manager; D. D. Stewart is foreman of the mines, and C. W. Fuller is foreman of the smelter. Besides their property at Coppermount, the company has leased the Rush & Brown property at Kasaan bay, and the ship Richard III is loading 700 tons at that place for shipment to the smelter.

Seward, Alaska, has been connected with the outer world by telegraphic communication. With the completion of the Seward-Valdez cable, the Government has 2300 miles of cable in Alaskan waters. There are hundreds of miles of overland wires, aside from the wireless system perfected by L. D. Wildran between Nome and St. Michael. Messages for Seward over the new cable have to be relayed twice. Going north from Seattle, the first break is at Sitka, where there is a relay to Valdez. At that point the message is repeated to the operator at Seward.

A. Geffeler, manager for the Helvetia and Little Basin companies at Windham Bay, will build an aerial tram to the Windham Bay Co.'s stamp mill, which has been leased to the Helvetia M. Co.

ARIZONA.

Cochise County.

At the Denn-Arizona, at Bisbee, the gallows frame has been finished. One boiler has been placed and another is on the way. The shaft is down 250 feet and progress is being made at the rate of 100 feet per month. The general formation through which the shaft is going at present is an altered sandstone, and it is not expected to get into mineralized ground until several hundred feet more depth is reached. As the diamond drill reached ore at the 900-foot level it will probably be six months before that zone is reached by the shaft. B. M. Pattison is superintendent.——The supplies for the Vantia mill, in the Yellowstone district, have been hauled to the mine, and the mill will be completed within a month. Work underground is not being pushed until the new hoist is running.

Gila County.

The Arizona Silver Belt describes the new concentrator at the Old Dominion, at Globe, as of the progressive crushing type. The first operations begin in the crushing plant at the new shaft where the concentrating ore from the mine is brought into two of the six steel bins. The ore is drawn from these bins onto a belt and from thence passes automatically through the coarse crushers over a picking belt, from which the first-class ore can be sorted, and through a fine crusher and a set of rolls and from thence it drops to another belt where it is carried to the two concentrator storage bins, each holding 210 tons of ore, and there stored. The ore is drawn mechanically from either of these two storage bins by automatic feeders which feed onto another belt regularly, and at any given rate that the mill may demand. The latter belt conveyor takes the ore up a steep incline to the top of the mill and there discharges it into a mixing box where the ore is mixed with water and from thence passes into revolving screens. The ore is classified into various sizes in the revolving screens and in classifiers below them and is distributed according to its size to the various machines on the roughing floor. The two coarsest sizes, viz., the sizes rejected by the §-inch and ⅜-inch screens, respectively, drop into two bull jigs and after the very coarse metal is extracted, the tailings pass automatically to the finishing rolls and are again elevated until they pass through the ⅜-inch screen. All sizes of material from the ⅜-inch size down, excepting the finest slimes, are sized and passed to the main roughing floor of the mill where they are concentrated in seven jigs and the six Wilfley tables. The concentrates from this main roughing floor discharge automatically and unite with the concentrates from the bull jigs and pass to the storage bins for concentrates. The tailings rejected by the machines on the roughing floor are collected and crushed finer, if necessary, in two 6-foot Chilean mills. The reground tailings are then classified and are passed to the machines on the finishing floor for final treatment. Automatic devices are used to remove the water from the coarse tailings and to thicken the slime pulps before they pass to the finishing floor and the water thus obtained is returned for use in the mill. The finishing floor is equipped with nine Wilfley tables for the coarser sands and eighteen Frue vanners for the finer sands and slimes. All concentrates from this floor pass by gravity to an elevator and are elevated and thrown into the stream of concentrates from the upper floors and pass to the storage bins from which they will be drawn into railway cars and taken to the smelter. From this description of the process it will be seen that from the time the ore is thrown onto the upper belt until the time that the tailings are turned out of the mill and the concentrates delivered into the storage bins, everything is automatic and there is no shoveling or wheeling of any kind. The mill building is of steel with steel shaft supports and steel supports for the revolving screens. The foundations are of concrete and all heavy machines are set close to the ground upon strongest foundations. The mill is designed to have a capacity of 300 tons per day. Feed was turned on the mill on the afternoon of July 30 and it ran steadily until the end of the shift. There was no time to regulate the flow of water and it has taken a few days to get the mill started to work regularly.

Mohave County.

(Special Correspondence).—The West Gold Road Co. has resumed active operations. New mine and office buildings will be put up, a new hoisting plant installed and a double-compartment shaft begun. Considerable new hoisting and sinking machinery will be bought this season. Jno. M. Wright is manager, J. D. Spargo superintendent.

Acme, Aug. 8.

At the Minnesota-Connor mines, at Chloride, seventeen men are at work. ——G. H. Hooper is working the Midnight and Pinkham mines at Chloride.——Near Pilgrim camp, at the Dempsy-O'Dea property fifteen men are at work on the mine and the shaft is down 275 feet. ——At the Azalia mine seven men are at work.——R. C. Walker, superintendent of the Cerbat Mountain M. Co., reports that sinking below the 175-foot level is under way.

Pinal County.

Development at the Buckeye mine, in Twin Butte district, is progressing rapidly, the shaft being now down 375 feet. The company is making preparations to start the smelter. —— A Pittsburg company has taken over the Midday copper claims in Saddle Mountain district. T. F. Weeden, the superintendent, has received instructions from the company to purchase ground at the river along the line of the Phœnix & Eastern Railroad for a site for a 500-ton smelter and concentrating plant.

Santa Cruz County.

R. E. Doan, of Los Angeles, has bought the Gringo mine of J. Parks, in Temporal gulch, 3 miles from Patagonia. He proposes to put up a 50-ton mill to treat the low-grade gold ores.

Yavapai County.

(Special Correspondence).—It is reported that Dr. E. B. Perrin, owner of the onyx quarries 45 miles northwest of Prescott, has made a contract with the Denver Development Co. to do $80,000 worth of work on them, and other contracts with Chicago people to take the entire output. A narrow gauge railroad is to be built from Seligman to the quarries.

Prescott, Aug. 8.

(Special Correspondence).—The Harryhousen claims, adjoining the United Verde on the north, have been taken under bond by D. N. Bartholdi and associates, who are making preparations for the development of the property.

Jerome, Aug. 7.

The 10-stamp mill at the Golden Idol at Cherry creek is said to be nearly finished. C. K. Tibbetts is superintendent.

A gasoline blower and 1000 feet of air pipe have been put on the Buffalo M. Co.'s mines on Berry creek. The tunnel, which is now in 1000 feet, will be driven 500 feet farther.

The Jeanette-Arizona Gold M. Co. is working claims on the Santa Maria, 8 miles southwest of the Sultan mine, near Hillside. Superintendent Carbaugh has two shifts drifting from the shaft, which is down 400 feet. ——At the Mineral Hill camp, near the Jeanette-Arizona Co., a steam hoist has been put in.——The Eagle Gold & Copper M. Co. is working southeast of Martinez under the direction of O. Jennings.

Yuma County.

The 20-stamp mill at the Soccorro mine, at Harrisburg, is working twelve hours per day. B. J. Quinn has temporary charge of the mine, and also has charge of the cyanide plant at the Harqua Hala, employing six men. It is reported that the water is to be taken out down to the 600-foot level and the mine developed.——J. B. Martin has leased the Desert Queen mine to the C. H. Pratt Co., and Hall Bros. are doing some work on it.—— The Winzedale M. Co., under the management of Hanna & Young, are putting up sampling works at Winzedale and are developing a water supply. Water has been found at a depth of 129 feet. Mining properties near Cunningham pass, 8 miles from their works, are being developed.

CALIFORNIA.

Calaveras County.

(Special Correspondence).—There is more interest being taken in the ancient river beds in this district than in many years heretofore. There are several channels under and near the town of Mokelumne Hill which are mostly buried by the lava caps. In early days these channels are reported to have yielded large returns and to have given employment to several thousand men. There remain remnants of old channels unworked and the upper gravel of channels worked in the 50s which was considered too poor to work at that time, but which will pay well now. These channels are mostly buried under Stockton ridge to a depth of 250 to 300 feet. The old workings are for most part inaccessible, but new shafts have recently been sunk and the gravel channels again exposed. Some new work is planned, and it is intended to explore and drain several of these old channels through the medium of a tunnel from the west side of Stockton ridge. This tunnel, known as the Hector, is already in several hundred feet. The principal channels under Stockton ridge are the Stockton ridge channel, Chile gulch blue lead, the Corral flat, or French hill channel, and further south the Duryea and Concentrator channels. In addition to these there are believed to be some other channels, of which but little is known at present.

Mokelumne Hill, Aug. 7.

El Dorado County.

At the Mt. Pleasant mine, near Grizzly Flat, the mill is running on fair ore and the mine is looking well.—— It is reported that the first payment has been made on the Zimmermann mine, Pacific district, and that work will be resumed soon.——At the Alcimento mine, Smith's Flat district, Superintendent C. Henson has opened up and repaired 700 feet of tunnel.

Kern County.

At the Butte mine at Randsburg it is reported that a 14-foot ledge has been struck at the 600 level, a part of which shows assay values of $100 a ton.

The Baltic mine, near Randsburg, has been sold to an Eastern syndicate. E. R. Abadie will have charge. They have ordered a 25 H. P. gas engine for hoisting and will sink 500 feet on the ledge. They have also ordered a 50-ton cyanide plant. The water will be developed from Cuddaback lake.

Nevada County.

Superintendent Kendall expects to have the machinery in place at the Banner mine, near Nevada City, by August 15th, when pumping will be commenced. The company has put in steam powor, being unable to get water. It is possible electricity will be put in later. The shaft is to be sunk from the 700-foot level to the 1200-foot. C. C. Weisenburger has charge of the placing of the plant.——The mill at the Grey Eagle mine, near Maybert, has been started again.

At the Empire mine at Nevada City, the crew at the 3000 level struck the main ledge, for which it has been running a crosscut for several months. Drifting will at once begin and an ore chute will be put through. It is the intention also to equip the level with a more powerful pump.

Mariposa County.

The Exchequer M. Co., which owns mines above Merced Falls, is about to put in machinery and build a dam on the Merced 7 miles above the falls and put in a power plant.——At the Houghton mine, north of Hornitos, a new 10-stamp mill is being put up.

Placer County.

(Special Correspondence).—The recently completed shaft of the Hidden Treasure gravel mine at Bullion is being timbered. A sawmill is to be put up at the collar of the shaft, and hereafter all timber will be supplied through the shaft. The tunnel is being straightened and 35-pound rails are being laid to replace the lighter ones formerly in use. A new electric locomotive to be put in will increase the output. H. T. Power is superintendent.

Bullion, Aug. 9.

A fire at the Whisky Diggings mine, northeast of Lincoln, August 4, destroyed the hoisting works. It is reported that work will be resumed soon.

Shasta County.

It is expected that the new 5-stamp mill of the Middle Creek G. M. Co. at the Dowbrowsky mine, near Shasta, will be running by September 15.——D. J. Phelps has been making arrangements to resume work on the Mt. Shasta mine on Clear creek, west of Shasta.

Sierra County.

At the Alaska mine at Pike City the company has decided not to open the old shaft, but will sink a new one close by. The old shaft is 700 feet deep, and the old company had trouble in contending with the flow of water. The present company will have pumps that will be able to handle the water. There is a new 20-stamp mill on the mine.

The Alaska mine at Pike City is being opened up under the direction of Superintendent George St. John. The company has decided not to open the old shaft, but will sink a new one close by. The machinery will be put in as quickly as it arrives. The old shaft is 700 feet deep, and the old company had trouble in contending with the water.

The Forest City M. Co. is developing Chipps Ridge, between Wolf and Kanaka creeks.

At the Rainbow mine, near Alleghany, the old flume is being replaced with a new one preparatory to starting up the mill. J. Clinton is in charge of the work.——The Marguerite mine, 2 miles west of Sierra City, is being reopened by a company headed by J. E. Westall, who is is charge of the work. The 4-mile Marguerite flume is being rebuilt and will furnish power for pumping and milling.

Siskiyou County.

Lack of water has caused a large number of Siskiyou county mines to close down until the fall rains come on. ——In the Oro Fino district D. Carter is sinking on a ledge adjoining the Gardner mine.

Trinity County.

Superintendent Charles Dobler has seventy-five men at the Fairview mine and mill at Minersville. Mill Foreman A. H. Philbrook is keeping twenty stamps dropping.——Dr. Johnson and M. W. Stover, who have a bond on the Beaudry property at Minersville, will put in a hydraulic elevator on the low ground. The ditches give a pressure of 350 feet.

Yuba County.

Four new mining dredgers at the Yuba Consolidated Gold Fields are being equipped with machinery and will be in operation this fall. The hulls have been com-

pleted and floated. The pit is ready for two more and timbers are being framed for them. The two dredgers being built for the Marysville Gold Dredging Co. are well along and all ten of the machines, including the two already operating, the four now being equipped, the two just commenced and the two being built by the Marysville company will all be working on the training walls on each side of the river for the Government by November 1.

COLORADO.

Boulder County.

The Lulu B. mine and mill, operated by the Utica Hill M. & M. Co., has been working near Ward under the management of J. McKimmery. The shaft is now down 450 feet. Levels have been run at each 75 feet, all of which show large bodies of ore. Their 10-stamp mill, 1½ mile north of Ward, is running steadily.——J. L. Lee is unwatering the Morning Star mine, near Ward.——The Old Humboldt mine at Ward is being worked under the direction of W. T. DeCamp.——The Sound Currency M. Co. has been sinking a shaft on their property north of Ward. They will put in a hoisting plant. —— The Myrtle M. & M. Co. has received word that its new Howell-White roaster will be shipped by Aug. 11.

Denver County.

The Western Association of Technical Chemists and Metallurgists hold a general meeting in Denver, Sept. 5 to 7. H. C. Parmalee is secretary.

Clear Creek County.

The new concentrating mill of the Waltham M. & M. Co., on Chicago creek, near Idaho Springs, is in operation. The plant was briefly described in the issue of Aug. 5. An illustration of this mill and its surroundings appears on the front page.

At Idaho Springs the holdings of the International Gold Mining Co., the Banner Development Co. and the Colorado Development & Investment Co., which were taken over by the Banner Consolidated mines, have been consolidated. The three companies owned forty-nine claims on the ridge, between Clear creek and Trail creek. The property will be opened up at depth by means of the Rockford tunnel. Boilers, air compressor, blower and drills are to be put in at once. The tunnel has been driven 1000 feet and will be continued to the Donaldson vein, where it will attain a depth of 1600 feet. H. A. Reidel will have charge of the operations.——The Crowfoot crosscut, of the Capital Prize group, is in 1900 feet on Griffith mountain, near Georgetown. Manager W. Cooper intends to put in two more machine drills. ——A. M. Hill, owner of the Julian property, on Lincoln mountain, near Georgetown, having arranged for the resumption of work, will drive the tunnel on the Julian claim, which is now in 100 feet.

The Newhouse tunnel has placed an order for ten new tram cars and a motor.——The Sun and Moon and Saratoga are getting ready to use a large increase of power and will push their development work through the tunnel. The Ora M. Co. has begun work with air drills, drifting on the Edgardine lode in a lateral from the Newhouse tunnel.——The Queen Francis Co. has put miners to work, cutting a station and switch off from the tunnel, preparing to drive a lateral on the Queen lode; and work will begin on the Adduddell lode early this month in the Newhouse tunnel.

The Little Richard M. Co. is running its tunnel to cut the Lexington vein, near Idaho Springs. This tunnel is now under the Lexington territory, but the vein, which has a northward pitch near the surface, has turned and pitched toward the south, making it necessary to drive the tunnel much farther than was expected at the start. Work has b en hindered by bad air, but this has been overcome by a suction fan. W. J. Morgan of Milwaukee, Wis., is manager. G. L. Bingham of Idaho Springs has charge of work. —— The Frances M. & M. Co. will work the Queen vein, near Idaho Springs, through the Newhouse tunnel. —— At the Torpedo tunnel, in Spring gulch, operated by the Idaho Springs Gold Producing Co., J. C. Hull of Idaho Springs manager, hand work has been discontinued and machiney put in. —— W. M. Kirke of Idaho Springs, who has been working the Castleton mine since the first of the year, is putting in new ore plates preparatory to a heavier output. —— Operations have been started at the King mine on Fall river, near Idaho Springs. W. H. Moore has charge.——J. G. Roberts, W. G. Arkills, J. Nelson, M. C. Potter, E. R. Lumley, J. W. Anderson and R. R. Graham, all of Idaho Springs, have leased a block of ground on the Columbia mine on Little Mattie mountain, and are preparing to sink the shaft another hundred feet.

Gilpin County.

The Hot Time Transportation, Tunnel, Drainage, Mining & Milling Co. has been formed with W. L. Bush as president; J. R. Spear, vice-president; G. K. Kimball, secretary-treasurer and manager; all of Idaho Springs. The company will work mining property lying between the line of the Newhouse tunnel and the Old Town mine, and drive the lateral connecting the Old Town workings with the Newhouse tunnel. Work has been started with machine drills. The distance to be driven is 4000 feet and will require eighteen months to complete. The driving of this lateral will benefit the Russell Gulch section, as its course will be almost directly under the lowest part of the gulch the entire distance. It is believed that it will ultimately drain every mine in the immediate section through which it traverses. The Old Town shaft is 1500 feet deep on the pitch of the vein, and the lateral will cut beneath the bottom of the shaft.—— The Dump mine, on Bobtail hill, is being operated under a lease and bond by M. Dalpez & Co. of Central City. A new shaft building and machinery has been put in. Sinking operations have been completed, the shaft being down 350 feet, at which depth drifts have been commenced on both sides of the shaft. Drifts are also being extended on both sides of the shaft at a depth of 280 feet, where there is a good sized ore body and regular shipments are being kept up.——The Never Sweat mine in Lake gulch is being operated under a lease and bond by J. B. Chatterton of Central City, the owners being H. M. Orahood of Denver and A. B. Drake of Central City. Sinking is being done, and drifts are to be run when down 100 feet. A whim is being used for present hoisting purposes, but if the indications continue a steam hoist is to be put in, as deeper operations will follow.——Doble & Co. are working the Pederson mine in Gregory district under a lease, at the 250-foot workings.——Ellmann & Co. have been timbering a new shaft east of the main shaft on the Susan Mary mine in Lake gulch, and will sink to a depth of 125 feet, when they will make connections with the main level from the deep shaft. They expect to put in a whim for hoisting.——The shaft of the Clay County mine, in Lake gulch, is down 700 feet. The 300 west level is being cleaned out.——The New National Tunnel M. Co. is sinking at the Caledonia shaft and are down 520 feet. The intention is to sink this shaft to the tunnel level for air connections as well as to take out the ores through the tunnel level. G. W. Adams is superintendent.——The Ontario-Colorado Gold M. Co. is employing fourteen men at its O'Neill mine in Gregory district. Two drifts are being run on the west side at a depth of 464 feet and stoping is also being carried on in both places. Milling and smelting ores are being taken out each drift and a winze is being sunk for ventilation and for development purposes. H. Bowden is in charge.

A. E. and W. Hampson, who have been operating the tailings plant at the Smuggler-Union mills, have surrendered their lease on the same and will hereafter operate in Black Hawk. They will get the tailings from eight mills for treatment without the payment of any royalty whatever, compensation for the privilege being only ground rental. Their plant will be equipped with sixteen Wilfley tables, six Frue vanners and 150 canvas tables.

A. B. Sanford of Denver is reopening the old Mann and North Star claims, in Vermillion district, 5 miles west of Central City. The main shaft on the North Star is 314 feet deep, whence a level is being driven to the west to get under the ore known to exist in the upper workings. A new mill is planned to treat the ore by plate amalgamation, concentration and cyanide.

The Victoria group of the Star of Gilpin Co. is being worked under the direction of W. L. Shall. The property is 2 miles from Rollinsville. The main shaft is now down 150 feet and an upraise is being made. A new shaft is being sunk 150 feet from the main shaft.

Jefferson County.

(Special Correspondence).—Ground has been broken for the Guggenheim Hall at the School of Mines. The money for this building, which amounts to $75,000, has been donated by S. Guggenheim. The corner stone of the building will be laid Sept. 30, 1905. A new power house and assay laboratory are just being completed at an expense of $50,000.

Golden, Aug. 7.

H. J. Reiling, president and general manager of the National Gold Dredging Co., operating the gravel bars on Clear creek, near Golden, states that he is handling with two dredger boats 75,000 cubic yards of dirt per month. Discovering that a considerable part of the flour gold was escaping, he has put in a Pierce amalgamator as an experiment, and is also having it tested by the jigging process at one of the testing plants in West Denver. About 1½% of the total yardage handled is black sand, which contains, in addition to flour gold, considerable quantities of monazite. The black sand is saved for separate treatment hereafter when the flour gold and rare minerals will be extracted.

Lake County.

With the increasing demand for zinc and the success attained by the new Yak tunnel it is probable that another zinc mill will be working in Leadville inside of two months. Pittsburg people are behind the enterprise and the mill will be built near the Norton sampling works, and H. H. Norton will have charge of it. At present the mills in the camp are handling only 25% zinc, but it is stated on good authority that the new mill will handle a much lower grade at a fair profit.

Stewart & Thompson of Leadville have commenced work on the Flagstaff group in Bosswell gulch.

Low-grade siliceous ore has been found in the Gold Basin, belonging to the Big Four M. Co., Jonny hill, Leadville, through the workings of the Fannie Rawlins. T. D. Kyle and associates have a lease on the ground and are shipping fifty tons daily from the 360-foot level.

La Plata County.

At the new Bonnie Girl M. & M. Co.'s 50-stamp mill on the La Plata river, near La Plata, the ore is to be carried from the mine to the mill by a 4600-foot Bleichert tramway, with a drop of 1100 feet. The longest single span is 700 feet. The ore is distributed to the ore bins, 1500 tons capacity, by a 20-inch belt, 85 feet long, fed from a hopper. The mortars, weighing 6200 pounds, placed 18 inches above the floor, are set on blocks of crushed stone and Portland cement, the top dimensions of which are 9 feet by 4 feet 9½ inches and the base 7 feet by 4 feet 9½ inches. The mortars are lined with manganese steel. Suspended feeders fitted with manganese-lined removable spouts feed the ore to the batteries, where it is crushed through 30-mesh screens. The fifty stamps each weigh 900 pounds and will drop from 6 to 8 inches at the rate of ninety-five per minute. To every five stamps there is a friction clutch. Only outside amalgamation is to be practiced, two plates being 3 feet in length and one 4 feet. The mill water supply comes from Tirbieco gulch, 1200 feet above the mill, and is delivered to the mill in a 12-inch pipe under a 48-foot head. Manager C. L. Buckingham has designed the mill and electric power plant.

The Copper Age group, 2 miles from La Plata, is being worked by F. M. Crowell and C. Roundtree. The main tunnel is in over 200 feet.——The Chief M. Co. is working five claims near La Plata, under the direction of L. L. Swift.

Mineral County.

(Special Correspondence).—The Creede United Mines Co. have not been running their big mill full capacity for some time on account of scarcity of ore, but the capacity of the mine is increasing and it will be but a short time before they will be turning out the full capacity of the mill. The camp is better than for several years and it is thought within a few months the output will be increased.

Creede, Aug. 5.

Ouray County.

W. G. Brown, of the Security M. Co. of Ridgway, is expected to start the mill by Sept. 1.——J. S. McCluskey and W. E. O'Brien, who are leasing at the Grand View, below Ouray, have struck gold-copper ore in the new tunnel which was started between the mill and shaft house levels.

Park County.

In the lower Tarryall district, near Wayman, north of Cripple Creek, J. K. Vanatta, president of the Apex Copper Co., owns prospects. Mr. Vanatta has sunk two shafts on the Apex. The main shaft was sunk to the 250-foot point. There lime was crosscut for 125 feet. The new shaft has been put down 130 feet. It is proposed to continue one of these shafts to a depth of 300 feet. Emil Erickson is superintendent.——At the Star group of the Haymen Co., Manager Frank Clancy has sunk the main shaft 270 feet.

San Juan County.

The railroad being constructed from Howardsville up Cunningham gulch will have a beneficial effect upon the development of the mines in that section. It will pass the Old Hundred group first, then the Green Mountain and the Pride of the West, the latter operated by E. Smith and associates, who are putting in a big power plant with a 400 H. P. Leffel turbine. The Green Mountain Co. will build a 3000-foot tram and put in twelve Rand Slugger drills for opening up their property to supply their 200-ton mill. The Old Hundred people have ordered a Corliss Imperial Rand compressor for their mine. —— N. R. Bagley has let a contract to drive a 5000-foot tunnel into the property which he is managing, and expects to order a compressor plant for that work. —— J. Terry has opened up the Sunnyside mine and is doing about 500 feet of development work every month with machine drills. —— The Gold Prince mill, being built at Animas Forks under the supervision of O. O. McReynolds, will probably be completed by Jan. 1, 1906.——At the Old Hundred mine Manager R. W. Davis is pushing the mill construction to get under cover before the beginning of winter. —— I. C. Boss, inventor of the Boss method of stamp milling, is erecting the mill at the Grand Mogul. —— The Pass M. Co., operating the Champion mines, Sultan mountain, are putting up a Bleichert tramway 1400 feet long, and placing Rand drills for the more rapid development of their properties.

The Animas Power Co. has its electric plant at Rockwood, between Silverton and Durango, on the Animas river, almost completed and the stringing of wires into the Silverton district has commenced. The work is under the management of W. R. Allen of Colorado Springs. To reach Animas Forks and the headwaters of the Animas river, Gladstone and the tributaries of Cement creek, together with the side lines to the Silver lake and other large properties in the county over 60 miles of primary aluminum wire will be required, and of secondary wire 150 miles will be required to accommodate the mining properties that have already signed contracts to use the Animas power. The date set for turning on the current is Oct. 1.

The Silver Ledge mill at Silverton is shipping two cars of zinc concentrates to Denver and three cars lead-iron concentrates to Durango each week.——It is reported from Animas Forks that the Dewey mine in Hurricane basin has again been started up by Ouray parties.—— Matson & Slattery have resumed work at the Queen City property in Ohio gulch.——At the Aspen mine, on Round mountain, sixteen men, under the management of J. O. Campbell, have been cleaning out the old timbers and debris in the tunnels.——The Hamlet M. Co.'s new 50-ton mill is producing several cars of concentrates a week. It is on the Animas slope of Middle mountain, alongside of the Silverton Northern Railroad track. C. Dale, the builder, is improving the jigs.——The Hercules management at Silverton are sinking a shaft on the Little Dora vein 1300 feet from the portals of the lower tunnel. The shaft will be sunk to a depth of 250 feet. The main tunnel is in 3500 feet and is still being driven ahead. Since beginning operations in the spring, Manager Thomas Kane has been developing and blocking out ore bodies, with intention of having mineral for a continuous run of the mill.——At the Champion mine on Sultan mountain, near Silverton, the Ross M. Co. are constructing an aerial tramway 1400 feet in length, from the mine down to the D. & R. G. Railroad track. A 6-drill air compressor will be put in at the foot of the hill.

San Miguel County.

A rich strike is reported in the lower workings of the Japan mines, near the Tomboy, in Savage basin, 5 miles from Telluride. The company has decided to abandon the old mill in Savage basin, near the Japan mine. A new plant will be constructed at Pandora, 2 miles from the Japan group, by the Japan-Flora M. Co. Mine and mill are to be connected by an aerial tramway.

Nelson, Kirby & Reed, all of Telluride, will operate the plant at Pandora.——In the Smuggler-Union mills at Pandora they have 110 stamps dropping. In the new 60-stamp mill thirty stamps are pounding on the ore of King & Lindsey, lessees of a large portion of the Smuggler-Union mines, and thirty on the ore of Townsend & Bancroft. In the old 80-stamp mill only fifty are falling. Of these thirty are on the ore of Wagoner Bros., lessees of the Sheridan, Smuggler and Union dumps and the 76 claim, and twenty on the ore of King & Lindsey.

Summit County.

(Special Correspondence.)—Summit county is doing more deep mining than ever before in the history of the county, especially in the Ten-mile district. This district begins at Fremont Pass, north of Leadville, and runs from the headwaters of the Ten-mile to where it empties into the Blue at Dillon. In the upper Ten-mile at Kokomo the two most active properties are known as the Wilfley and the Breene. These mines are reported as shipping about 100 tons of ore per day each. The ore carries approximately 25% lead, 30% zinc and 30% to 40% iron. At Frisco four crosscut tunnels are being driven. The King Solomon mine, illustrated on page 110, is equipped with boiler, 8-drill Rand compressor, and is putting in electric light plant, and expects to drive the tunnel 2000 feet farther, making 2500 feet in all. In going

this distance they expect to cut ten veins which are known to exist at the surface, and from which considerable ore has been shipped heretofore. The North American and Mary Vernon properties belong to parties living in Memphis, Tenn. It is understood they have made arrangements for a power plant, to be erected about half way between the Mary Vernon and North American, which will supply air for both mines. A contract has been let to run a tunnel on the North American 3000 feet and on the Mary Vernon 2000 feet, the company to furnish the power, air and light, Mr. McAllister, at Frisco, resident manager of the properties. The other tunnel that is being driven is on the Mint property of the Mint M. & M. Co., in Ophir mountain. Same is now in over 500 feet and will be continued. The company intends putting on a plant of machinery, including electric light plant, air drills, etc. F. E. Wire, Libertyville, Ill., has charge of the operations. The Chief Mountain Mining Co., in the district, own ten or twelve claims, from which several tons of ore run well in gold, silver and lead. An adit tunnel is being driven on one of the veins, which is now in several hundred feet. It is the opinion of prominent mining engineers as soon as some of these tunnels now under way are completed, it will be the means of opening up some good ore, and that mining on the Ten-mile will no longer be in the prospective stage, but will be one of the leading districts of Colorado.

Frisco, Aug. 8.

Teller County.

J. Wellington and associates have secured a lease on block 190, the Lucky Gus claim, of the Stratton Cripple Creek M. & D. Co., and are working it. A shaft on the Lucky Gus is 1000 feet deep, but the new operators will commence work on the upper levels.——Fitts & De Masters, operating the Deerhorn property on Globe hill, Cripple Creek, have a new body of ore.——Operations are being pushed through the Pinto shaft of the Free Coinage Co. property on Bull hill and in the town of Altman.——Moon and associates have a lease on the Nightingale property on Bull hill and have put in machinery, and will push operations throughout the shaft, which is now 300 feet deep.——The Golden Cycle Co. has laid off between sixty and seventy of their machine men while new compressors are being put in. The company has received two 10-drill air compressors. The company was formerly operating eighteen drills. Heretofore the Golden Cycle Co. has secured its air from the La Bella plant.——The Gilpin & Cripple Creek Co. is working in the Little Pearl shaft on Bull hill. The company has leased the Atlanta property to R. P. Russell.

Preparations are being made by lessees to put in a 100-ton cyanide plant on the Des Moines property, on a south spur of Gold hill, near Cripple Creek.——There are six or eight cyanide plants in operation in the district and all of them are recovering large amounts of gold each month.——The mill on the Los Angeles mine, on Bull hill, is completed and the company is treating between forty and fifty tons of ore a day that is averaging $5 to the ton in gold.——Next month the Little Giant Co. will commence operations in Pony gulch.——The Empire State shaft of Bull hill, Cripple Creek, is being sunk from 800 feet to the 1300-foot point.——At the Mary Nevin C. C. Jackson and associates, lessees, have arranged for a 12-drill compressor at the Nevin shaft.

IDAHO.

Boise County.

President J. J. Oberbillig of the Twentieth Century M. Co., operating in the Black Hornet and Pearl mining districts, states that during the past eight months he has been at work on a tunnel being run to cut three ledges. The tunnel is in 440 feet and has cut four of the ledges. A 20-ton cyanide plant will be put up this fall, the capacity to be increased as development requires.

Custer County.

To open up the Seafoam and Greyhound districts Gov. Gooding states that the State will furnish half of the $4000 which it is estimated the road will cost. The miners there will have to do the rest. It is proposed to make a contract with the miners to build half the road under the supervision of the State and on a survey made by the State, as it will be necessary to have a road equally good at all points. The proposed road will start at Wagontown on the Ketchum road, cross Vanity summit, run down Vanity creek to Rapid river and pass down the latter stream to Float creek. It will be 12 miles in length.

Idaho County.

The Crooked River M. & M. Co. is building a flume to their properties, near Oro Grande, to replace the ditch now in use. It is hoped to continue operations during the winter. Elevators, classifiers, distributors and pumps are to be put in the mill.——J. F. Powers, secretary of the V. & O. M. Co., at Oro Grande, expects that the new cyanide plant will be finished by the end of the year.——W. I. Sweet of Long Branch, New Jersey, says that the Idaho Consolidated Little Giant M. Co., of Warren, is preparing to put in an electric power plant for the operation of their mine. The company has a 5-stamp mill. H. Sheller, of Warren, is the president and manager.

Owyhee County.

H. M. Stevens, superintendent of the Rich Gulch Co. mines, reports that a new strike has been made on their claims near Silver City.——Electricity is to be substituted at the Cumberland mill, on War Eagle mountain, near Silver City, for the present steam power.

Shoshone County.

During the portion of last month that Richard Anderson was operating the Rex mine, formerly the 16 to 1, under lease, the royalties of the company are said to have amounted to $2000. About 200 tons of concentrates were shipped, which assayed 62% lead and 30 ounces in silver. The ore that was milled was taken from the stopes between two levels. The ore as mined is said to carry 14% zinc, but the value of this metal is not saved.——Low water has caused the Black Cloud mine and mill to close down, throwing seventy-five men out of employment. A Pittsburg corporation has been operating the property for several months. Until there is an increase of water in Nine Mile creek only a small force of men will be employed on development work. This is the second property that has been forced to suspend operations this summer on account of the lack of water. The Rex mill closed down last week for this reason.

Washington County.

The Ladd Metals Co. is pushing work on the smelter at Landore and have commenced on the brick work of the reverberatory furnace. They have fifty men at work.——C. W. Jones is working the Peacock mine, near Landore.

MICHIGAN.

Houghton County.

The Adventure mine has been closed on account of a strike. The company wished to save time and expense of hoisting the men to the surface at the noon hour, and announced that lunches would have to be eaten underground in the future, whereupon the men walked out. No extra labor will be required, the company says, to resume when the men return to work on their terms.

Keweenaw County.

Sinking at the Allouez is below the fourth level 50 feet. The management states that there has been no change in the quality of the lode as the sinking progresses. The beginning of stamping operations at the Centennial mill on Allouez rock is due to start. The shaft has three compartments, with 2-ton skips and hoists good for a depth of ½ mile. Owing to the steepness of the incline shaft, back rails of 6x10 inch timbers are set so close to the wheels of the skips that their flanges can not leave the steel rails, the wooden timbers really serving as guides. At the change of angle from 80° to 38° on reaching the lode, a single idler with wide flange cares for the cables passing at either end. In order to save pumping charges on surface water entering the mine, H. J. Stevens, in the Copper Handbook, says that a gutter has been cut around the shaft leading to an opening 36 feet long, half winze and half drift, used as a sump.

MISSOURI.

Jasper County.

The Maud L. M. Co. has completed a new 200-ton mill on its lease on the Leonard land at Chitwood. It is equipped with electricity, except the air compressor, which will be driven by an 85 H. P. gas engine.——The Three C M. Co., operating in Chitwood, is ready to build a new mill. The company is under the management of C. A. Morsman.

MONTANA.

Broadwater County.

The new concentrator at the East Pacific, near Winston, is finished. There are 20,000 tons of good concentrating ore on the East Pacific dumps which will be worked, after which second-class ore from the mines will be put through. F. A. Taylor is superintendent.

Fergus County.

The new cyanide plant for the Maginnis mine at Maiden has been completed and the mill remodeled.

Granite County.

The Granite Bi-metallic mines at Granite have been closed by President P. A. Fusz.

Jefferson County.

The Basin Reduction Co. are building a new tail race with a system of tanks which will quickly gather all the tailings which can then be dumped into the cars. A race was built with lateral sluice ways, the water being conducted by these directly into the railway cars, allowing the tailings to settle, the railway company then hauling the cars to some of their high trestles near the Wickes tunnel, where they are dumped. But this system has proven ineffectual and was only built for temporary purposes or until the tanks now under construction could be put in. The tail race will be built over a series of tanks having a dump bottom. The tanks will catch all the tailings and these will in turn be dumped into the cars direct. The plant will be inclosed in a building, which will be steam heated to avoid freezing during the cold weather. The company contemplates improvements in their settling dam system to gather the slimes.——A. B. Keith is working claims near Clancy.——H. Williams is working the Sierras mine, near Basin, and shipping ore to the East Helena smelter.

NEVADA.

Elko County.

Work has been resumed at the Wardell Iron mine, near Wells, by the owners, C. O'Neill and G. R. Vardy. It has been found that the ore is valuable for fluxes, and it is said the owners have concluded an arrangement with the United States Smelting Co. whereby a good market is furnished.

Esmeralda County.

The Gold Bar M. Co. of Goldfield is said to have secured 1000 acres of coal land near Coaldale, 47 miles northwest of Goldfield. In a 5-foot blanket vein coal that will do for steam purposes has been proven. Special fire grates will be built for the boilers for its consumption. Water has also been developed on the ground and it is estimated that it can be pumped to a mill at a cost of three cents for each 1000 gallons. An electric railway may be constructed from the mill to Goldfield. It was found that it would take about 60 miles of track, as all the heavy grades will be avoided, thereby saving a large amount in the grading expense and the power required to pull the trains. Electric power for mines and lighting purposes will also be furnished. It is reported that the company will put up a 500-ton cyanide and chlorination plant. J. M. Hower, manager of the Dorcas mill at Florence, Colo., and E. F. Browne are interested.

The Wisconsin mine at Lida has been sold by P. Kiser to the Nevada Exploration Co., J. B. Croak, manager. A double-compartment shaft is to be sunk and new machinery is to be put in.

Lincoln County.

Contracts are to be let by the Gold Coin M. Co. for sinking the Sazerac shaft to the 300 level, for drifting 100 feet south at the 200 and for drifting north and south at the 300 when reached. The mine is at Dupont camp in Searchlight district. Carl Andersen has charge. The present hoist will be replaced by a 25 H. P. hoist as soon as the 300 level is reached.——Work will be started on the Mountain View claim of the Wynopa group, belonging to the Gold Coin M. Co., 1½ miles southwest of the Sazerac.——Water struck in the bottom of the 200-foot shaft of the New Era mine, near Searchlight, has stopped work until a 6-inch pump can be put in. The shaft is to be sunk to the 350-foot level.——A special postoffice has been established at Nelson, Eldorado canyon, with P. A. Blair as postmaster.

NEW MEXICO.

Grant County.

At Silver City the Comanche M. & S. Co. will build a 200-ton concentrator and a briqueting plant. The reverberatory and blister furnaces have been finished.——The Ernestine M. & S. Co. has been unwatering the Mogul and the Pinos Altos Town shaft preparatory to working these properties. A steam hoist is being put on the Pinos Altos, and a contract has been let for mining the ore, on a tonnage basis.——As soon as the water is lowered to the 500-foot level, the Gillette will start work with a hoisting equipment and a permanent pumping plant that will drain all the properties on the Pacific vein.——Ore is being taken from the Hearst shaft. The air shaft to connect with the tunnel level will be finished by August 15, when the force in the mines will be increased.

Otero County.

The Southwest S. & R. Co. intends to begin work on its proposed smelter at Jarilla on September 1.

OREGON.

Baker County

J. Cheyne, who has charge of the work in the crosscut tunnel on the Morning mine, near Greenhorn, says the miners are contending with a large flow of water and with running ground, but are making progress.——The Humboldt mine, near Greenhorn, is replacing its small gasoline hoist with a larger steam one.——The owners of the Spero group, near Greenhorn, have resumed work.

Manager M. E. Bain of the Overland mine, near Cableville, says his deep work is entering the zone of the shoot he proved at the surface.——The Royal Winchester M. Co. has been organized by G. Kellogg and associates of Atlanta, Ga., to develop a property on the John Day side of Cable Cove, near Cableville.——M. F. Muzzy and D. Cahill of the Cracker-Oregon Co. of Bourne have resumed operations.——Superintendent Rusk of the Platts group, near Sumpter, states that the working force, both underground and on the surface, is to be increased.——Deep work at the Indiana mine, near Baker City, has been progressing since the management was authorized to put in a sinking plant.——On the Golden Gate mines at the head of Desolation creek, Greenhorn district, a 40-foot tunnel has been driven.

Douglas County.

Manager W. B. Stewart of the Continental M. Co. at Nugget has shipped a third carload of ore to the Tacoma smelter. The winze being sunk from the 500-foot level is down 75 feet. A 50-ton concentrating plant is to be put up.

Grant County.

According to the statement of Manager J. Thomsen work on the Olive lake power plant of the Red Boy mine, near Granite, will begin soon. At a recent meeting of the Red Boy Co. the water rights, ditches and flumes owned by it were sold to a new company for $50,000, to be paid in electric power.

Manager O. C. Wright has resumed work on the Sheridan, near Granite.

Josephine County.

Manager C. R. Ray of the Condor Co. intends to resume drilling with the Keystone prospecting drill on the McConough ranch, near Gold Hill, on which he took a bond last year.——Work on the High Line ditch, which is being built at Gold Hill, proceeds on an increasing scale.

F. W. Blaisdell is preparing to finish his ditch from Reuben creek to his placer mines on McNail flat, in the Grave creek district, near Grant's Pass. The ditch will be about 8 miles in length when completed, and will have one inverted siphon.——A California company has a drill prospecting the Wimer mine, at Waldo.——T. W. M. Draper has a drilling machine at work prospecting in the Waldo section, and has recently located 2000 acres of placer ground.

Lane County.

Operations at the Lucky Boy mine at Blue River, owned by L. Zimmerman of Portland, have been steady for some time. The 40-stamp mill is in commission, with an abundance of water and power for milling purposes.——The Treasure mill is expected to be finished in September

Wallowa County.

High-grade copper and silver ores are said to have been discovered in the mountain ranges south of Lostine. This district comprises an area 35 miles long and 12 miles wide, between Eagle creek and Wallowa river. Lostine may be reached by the O. R. & N. railroad to Elgin and then 40 miles by stage, or from Lewiston, Idaho, by wagon road, 90 miles in length. The first locations in the district were made by J. Dunn of Joseph, Or. The Great Northern Gold & Copper M. & M. Co. is developing thirteen claims under the management of E. T. Sluer. He has men rebuilding the trail between the Iron Dike camp and Windy Gap, in the Calumet camp, where the property of the Great Northern Co. is located.

SOUTH DAKOTA.

Lawrence County.

It is reported that the Homestake Co. is to build an immense plant at Deadwood to treat the slimes from the Lead and the Central plants. Filter presses designed by C. W. Merrill will be part of the equipment.——The Lucky Star M. Co. has started work on its properties between the Lucky Strike and the Clover Leaf mines. J. G. Reid of Minneapolis is president and C. A. Allen of Deadwood treasurer.

Pennington County.

(Special Correspondence).—At a meeting of the directors of the Clara Belle M. Co., held in Cleveland, Ohio, July 31, the following officers were elected: Frank Hebert president, N. P. Bowler vice-president, A. R. Teachout treasurer, L. Hebert secretary, Walter Lister assistant secretary. The company is now improving the property, erecting a first-class stamp mill and saw mill, building a tramway, a large boarding house and other buildings. About twenty-five men are at work and more will be put on soon. The property consists of 180 acres, 1 mile from Oreville, near Hill City, on the Burlington Railroad. The work is an important one and will help to develop this country, which is rich in minerals.

Oreville, Aug. 7.

UTAH.

Grand County.

In the La Sal mountains, near Basin, considerable work has been done since July 1. Superintendent M. I. Fowler has opened up a new vein on the Tornado on Gold Hill. J. Beasley of Provo is said to have struck gold and copper ore on the Dirigo La Sal Co.'s property in Bea er basin.——W. R. Wheat of Basin, manager Grouse Mountain Co., expects to start work on a 100-ton cyanide plant next year. Work is to be continued on the lower tunnel, now in 350 feet.

Juab County

J. Aylward has finished building a 1500-foot cable for the Bullion-Beck mine at Eureka.

The ore shipments in carloads from Tintic for the week ending August 4 were: Gemini 6, Bullion-Beck 5, Centennial-Eureka 56, Yankee Con. 3, Eagle & Blue Bell 10, South Swansea 5, Uncle Sam 3, Victoria 4, Ajax 3, Carisa 1, Mammoth 11, Lower Mammoth 1, Grand Central 3; total 111.

Manager J. C. Sullivan, of the Raymond mine at Eureka, is reopening the property by work in the south drift on the 1500-foot level.

Piute County.

Work has been started on the new 200-ton stamp mill of the Sevier Con. Co. at Gold Mountain, near Kimberly.

Salt Lake County.

The capacity of the Yampa smelter, at Bingham, is to be increased 100 tons by the construction of another reverberatory furnace and four roasters. The plant will then consist of two blast furnaces, two reverberatories and six roasters and it will be able to handle 500 to 600 tons daily.

Summit County.

The Wildflower claims, near Park City, are to be worked by a company, of which W. H. Whitehill of Park City is president.——At the Daly-Judge mine, at Park City, little is being done beyond prospecting.

Tooele County.

Settling tanks and a canvas plant are being put in the Stockton mine at Stockton. A new vein, said to be 30 feet wide, has been opened up on the 850-foot level.

Utah County.

The mill test having been completed, it is stated the Utah Ozokerite Co. mine at Colton will resume operations and a mill of fifty tons' daily capacity will be built.

WASHINGTON.

There was a decrease of $136,000 in the production of gold in the State of Washington last year, according to the estimate of F. A. Wing, assayer in charge of the Government assay office in Seattle. The same authority gives the decrease in silver production as exceeding $232,000. On the other hand there was a gain in the output of copper and lead. The gold production in 1904 was 15,009.977 fine ounces, value $310,283.76; silver (coining value) fine ounces, 1904, 125,312.18, value $162,019.78; copper 199,670 pounds, value $25,475.45; lead fine pounds, 378,588, value $16,312.06. Total values, 1904, $514,091.05.

Ferry County.

The Belcher M. Co. has purchased an 8-drill electric plant for the Belcher mine, near Republic, and a similar outfit for the Hawkeye mine, the latter being owned by the Winnipeg M. Co. They also purchased a 35-ton direct connected locomotive, suitable for traction on heavy grades, and 100 tons of relaying rails for the Belcher Mountain railway, of which E. R. Fraser is president. An electric lighting plant was purchased for use at the mines, intended at the start for sixty lights. A gasoline engine will be used to drive the dynamo for generation of electric power, to be subsequently reinforced by water power.

Douglas County.

The Waterville Coal Co. has commenced work on a coal prospect across the Columbia river from Wenatchee. W. Milburn is manager.

Stevens County.

The new ore bunkers for the Copper King ore at Chewelah are completed and the traction service is making regular trips, hauling ore from the mine. The ore is dumped from the traction cars through a shoot into the railroad cars, obviating handling the ore by hand. J. D. Blevins is superintendent.——President H. H. Baker, of the Nellie S mine, has let a contract to G. Abbott and L. Barnes to sink 100 feet on this property. The contract commences at the 160-foot level and when completed will give them a depth of 260 feet.

Okanogan County.

J. Boyd, manager of the Palmer Mountain Tunnel & Power Co. at Loomis, reports that a 750 H. P. water and electric power plant is to be put in and operated under a 365-foot head, on Touts Coulee creek. Electric power drills for the mines are to be put in. There is talk of a 300-ton stamp and cyaniding mill to be built within 1500 feet of the mouth of the tunnel. C. S. Reitze will have charge of the electrical construction and equipment.

WYOMING.

Carbon County.

F. E. Brown has started work at the Batchelder mine, near Dillon, which has been closed down for five months. ——E. M. Sanders has started work on the Wall Rock, adjoining the Pluto mine, at Dillon.

FOREIGN.

AUSTRALIA.

New South Wales.

The value of the minerals exported during the half year ending June 30 from New South Wales was as follows: Silver, £23,746; silver-lead, £1,179,981; copper, £234,148; tin, £138,387; coal, £667,615; total, £2,243,876. The amount for the corresponding period of last year was £2,038,772.

Western Australia.

In the State of West Australia the Government gives assistance to small prospectors and small mine owners who are without means and have good prospects. They can have their ore crushed cheaply, and assistance is given in supplying them water from the Gold Fields Supply Scheme. The principal way in which the State helps the miners is by crushing their ore in the State batteries, as the private facilities on the fields are not always adequate for the ore obtained and at other times are not available. By this means many of the smaller mines have been kept going and those that were closed have, in many cases, been reopened. Crushing is done only for small mines. Electricity is used on the fields, where the larger mines are lit by it and have their own motors. There is always a market for the gold at the Government mint in every State.

CANADA.

BRITISH COLUMBIA.

Atlin District.

A new placer gold strike has been made on the Nitsultin river, which flows into Teslin lake in the Atlin country, and there has been a rush to the diggings both from Atlin and Whitehorse.——D. McG. Stewart, manager of the Northern M. Co., has started a steam shovel on Spruce creek, Atlin.

Boundary District.

Boundary ore shipments for week ending Aug. 5 were Granby mines to Granby smelter, 13,325 tons; Mother Lode to British Columbia Copper Co. smelter, 3163 tons; Emma to Nelson smelter, 396 tons; Oro Denoro to Granby s nelter, 68 tons; Providence to Trail smelter, 30 tons. Total for week, 16,985 tons. Total for year, 540,022 tons. Boundary smelters this week treated: Granby smelter, 13,540 tons; British Columbia Copper Co. smelter, 3590 tons. Total for week, 17,130 tons. Total for year, 552,-872 tons.

W. A. Robertson of Chicago, acting for the Barbara Syndicate, has consolidated the Freemont, Strathmore and Barbara mines. The Strathmore and Barbara are developed properties and ready to ship.

Rossland District.

The shipments have passed the 200,000-ton mark for the year and the outlook is that they will reach a larger tonnage than last year, when the total was 340,000 tons. The shipments for the week ending Aug. 5 were: Le Roi, 1950 tons; Le Roi (milled), 210; Center Star, 2100; Le Roi No. 2, 90; Le Roi No. 2 (milled), 600; Jumbo, 400; Lily May, 30; Inland Empire, 30. Total for week, 6750, and for the year, 201,953 tons.

Slocan District.

The No. 1 mine at Ainsworth has shipped six cars of ore to the smelter and will be a continuous shipper during the summer. H. Giegerich of Kaslo is manager.—— The mill at the Jackson mine, 5 miles from Whitewater, is doing splendid work on the zinc ores of the mine. About 500 tons of zinc ore is in the concentrates pile. Some of this requires separation, but another separate pile runs above 50% zinc. —— J. Cronin will start up the Eureka group, across from the Slocan Star, near Sandon.

West Kootenay District.

An 8-foot ledge of very rich silver-lead ore has been discovered on the Sirdar, one of the claims of the Mammoth group on Goat mountain, near Camborne. E. Baillie is manager. —— A new company called the Camborne M. Co. was formed at Calumet, Mich., on July 21, to take over the affairs of the Northwestern Development Syndicate, Ltd., and the Gold Finch M. Co., Ltd., at Camborne. Last summer the mine buildings and tram of the Gold Finch were burned. —— The McMinnville group on the lower slope of Lexington mountain, near the Eva mine, in the Lardeau district, will be worked by M. U. Gortner, M. Morgan, F. Morgan, C. A. Nelson and G. B. Row. It is reported that a new mill is to be put in.

MEXICO.

Chihuahua.

(Special Correspondence).—There has been a drilling contest in the Sierra de Almaloya between the Cigarrero mine, using the Box and Adams electric drills, with gasoline engine, and the San Enrique mine, adjoining the Cigarrero on the east, using a gas producer, air compressor and the small "Rock Terrier" drills. Both are driving tunnels in the same limestone formation. The management of both companies seem satisfied with the progress made, and are about to put in 300 H. P. plants to run more drills, hoists, etc. For some time neither have shipped ore, but with the completion of the electric tramway for the Cigarrero and the aerial cable tramway for the San Enrique, there will be another interesting contest as to the amount of ore that can be shipped per month.

Almaloya, Aug. 1.

The San Cristobal shaft at Parral has been retimbered and a new steam hoist put in, and development work will be pushed by Superintendent Gerhardt.——A 50 H. P. electric hoist has been put on the Virginia shaft of the Palmilla mine at Parral, and a like hoist will be put on the San Francisco shaft.——The new stack of the Encinillas Mines, Ltd., at Santa Rosalia is nearly finished.——The shaft on the Palmira, belonging to Weisel & Kock, is down 350 feet. A new gallows frame and machinery have been put in.

Durango.

J. P. Julia of New York has bought the Sederita mine at Mapimi. The mine is a copper proposition and is connected by road with the railroad station at Desubridora. He has commenced development work.

Jalisco.

The mill and cyanide plant of the San Felipe M. Co. at Hostotipaquillo have been started. N. Z. Seitz is president and general manager.——It is reported that the work on the cinnabar deposits near Moral, in the Mascota district, and the silver-gold mines in the Navidad camp of that district will be pushed by the El Moral M. Co., in which T. W. Lawson and F. W. Page are said to be interested. A reduction plant and furnace are to be put up. These properties were formerly worked by the United Mexican M. & S. Co.

Sonora

The Monte Visto G. & S. M. Co. have taken over the Monte Visto mine, 15 miles east of Cos.——It is reported that O. L. Neer, until recently general manager of the Transvaal Copper Co. at Cumpas, Sonora, has purchased, for Cincinnati capitalists, the York mines, near Moctezuma. Extensive development is the plan of the new owners.

PHILIPPINE ISLANDS.

Copper has been mined and smelted in a crude way in the Philippines since the eighteenth century, according to H. J. Stevens. In a native reduction plant the ore after being hand mined is cobbed to medium size, then broken to smal lumps on anvils, after which it is fine crushed in rolls of iron or stone. The ore is then smelted in crude furnaces. There are no figures of output available. There are copper and gold mines at Mancayan and Suyoc, province of Lepanto, Island of Luzon. There are also deposits of copper ore in the islands of Benguet, Negros, Panay and Mindanao.

Books Received.

The progressive engineer is hunting for short cuts that facilitate accomplishing more work in shorter time, yet withal and above all of indisputable accuracy. This seems to have been accomplished for hydraulic engineers in "Hydraulic Tables," by G. S. Williams and Allen Hazen. With great detail they show the loss of head due to the friction of water flowing in pipes, aqueducts, sewers, etc., and the discharge over weirs. According to the introduction they show the flow of water in pipes and other passages, as computed by the Hazen-Williams hydraulic slide rule, based upon the formula $v = cr^{0.63}s^{0.54}0.001 - ^{0.04}$. The most commonly used formula for determining the velocity of flow of water in pipes and channels is the Chezy formula, namely, $v = c\sqrt{sr}$, where v is the velocity in feet per second, s is the hydraulic slope, and r the hydraulic radius in feet; c is a factor the value of which is an approximation to a constant, but depends upon the roughness of the pipe and upon the hydraulic radius and slope. The variations in the value of c are considerable, and make the general use of the formula difficult. Kutter's formula was devised to compute the value of c in the Chezy formula. The tables give a series of values of c according to the age of the pipe. They are published by John Wiley & Sons, New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $1.50.

As an extract from the "Mineral Resources of the United States for 1904," the United States Geological Survey has issued the "Production of Salt for 1904." This was reported to be 22,030,002 barrels (of 280 pounds), valued at $6,021,222, as compared with 18,968,-089 barrels, valued at $5,286,988, in 1903. The chief salt producing States are New York and Michigan, and the combi ed output from these two States amounts to about two-thirds of the total production of the United States. The five leading salt producing States during 1904 were: New York, 8,600,656 barrels (39.04%); Michigan, 5,425,904 barrels (24.63%); Ohio, 2,455,829 barrels (11.15%); Kansas, 2,161,819 barrels (9.81%); Louisiana, 1,095,850 barrels (4.97%).

Commercial Paragraphs.

THE United Iron Works have received a contract from J. G. White of New York City to furnish a suction dredge 22x44 feet, run by gasoline engine, to be used in removing silt preparatory to building a large dam near Yuma, Ariz. The dredge is to be working within sixty days.

THE Rapid Economy Stamp Mill Co. of San Francisco, Cal., report that they are putting in a number of their stamps upon the Fern Leaf mine in Trinity county, Cal., and that the Chuckawalla M. Co. of Los Angeles, Cal., has contracted with them for the erection of a Richards' Rapid Economy stamp mill on their property.

THE Sullivan Machinery Co. is adding to its manufacturing plant at Claremont, N. H., to keep pace with the rapid growth of business in mining and quarrying machinery. The improvements comprise six new buildings, practically doubling the present plant. The company has recently shipped to Colon, Canal Zone, Panama, twenty-five rock drills, size UH-11 (3½-inch), fitted with the new Sullivan tappet valves, for the Isthmian Canal Commission.

Obituary.

GUSTAF H. STOIBER, a prominent Colorado mining man, died at Silverton, Colo., on the 3d inst.

Personal.

G. G. HALL has charge Conger mine, at Bingham, Utah.

WM. TRELOAR is manager Hobart Ore Co., in Sparta district, Minn.

D. F. STROBECK is manager Pacific Bullion Co. at Ainsworth, B. C.

J. D. SPARGO is superintendent West Gold Road mine, Acme, Arizona.

R. H. WARD has returned to San Francisco, Cal., from an Eastern visit.

J. V. N. DORR has returned to Terry, South Dakota, from a visit to New York.

T. H. SCOTT is directing work for the Great Western M. Co. near Burke, Idaho.

RAY POOL has been appointed superintendent Tehuana M. Co., El Oro, Mexico, Mex.

G. W. MAYNARD is consulting engineer Guanacevi Tunnel Co. at Guanacevi, Durango, Mex.

G. P. ROUX has been appointed superintendent San Felipe mines at Hostotipaquillo, Jalisco, Mex.

S. J. GORMLEY has been made superintendent Bingham Copper Co.'s smelter at West Jordan, Utah.

W. W. BYRNE of Salt Lake City, Utah, is making a trip through Washington, Oregon and California.

H. G. MONETON has taken the position of mining engineer for the Vesuvius G. M. Co. of Bohemia, Or.

W. P. SWART of Fulton Iron Works has returned from Tonopah and Goldfield, Nev., to San Francisco, Cal.

MRS. M. M. GARWOOD, editor "Progressive West," is now secretary Reno, Nevada, Chamber of Commerce.

R. H. STRICKLAND of Salt Lake City, Utah, has joined the engineering staff of the American S. & R. Co.

MARK B. KERR, having completed his work of mine examination in Inyo county, Cal., is now at Silver Peak, Nev.

A. DEL MAR of San Francisco has gone to San Bernardino county, Cal., to investigate mining properties.

H. W. WALLACE has been made manager Sombreretillo M. Co. at Saria, Sonora, Mexico, succeeding C. F. Tolman.

RICHARD ROELOFS has been appointed superintendent Cresson mine of the Bull Hill M. & D. Co., Cripple Creek, Colo.

J. A. FARWELL, vice-president J. Geo. Leyner Engineering Co., has returned from San Francisco, Cal., to Denver, Colo.

C. M. FUELLER, Denver, Colo., is making examination of the Redeemer M. Co. property, 250 miles east of Winnipeg, Canada.

WM. A. HEWITT, president Compressed Air Machinery Co., has returned to San Francisco, California, from Tonopah, Nevada.

BYRON E. JANES has been selected as head of the department of mining and metallurgy of the University of Idaho at Moscow.

J. D. KENDALL of London, England, consulting engineer of the Slough Creek Gravel Gold Co., is at Slough Creek, Cariboo, B. C.

WM. LOVELAND, manager moving machinery depart ment Allis-Chalmers Co., has returned to Chicago from a business tour through the West.

C. F. TOLMAN JR. has been appointed professor o geology in the University of Arizona at Tucson, succeeding W. P. Blake, resigned.

H. V. CROLL has opened offices in the Dooly block' Salt Lake City, Utah, as representative of the Wellman-Seaver-Morgan Co. of Cleveland, Ohio.

J. E. HYSLOP, manager of the San Francisco del Oro mines, near Parral, Chihuahua, Mexico, has left for England. W. S. Harrison has charge during his absence.

F. G. WILLIS of the firm of Hills & Willis, mining engineers, Cripple Creek, Colo., is examining mines in Boise county, Idaho. His address till Sept. 10 will be Pioneerville, Idaho.

J. D. STEWART of Gold Run, Cal., is manager and superintendent Klamath River M. Co., with mines at O'Neals creek, Calaveras county, and Klamath river, Humboldt county, Cal.

B. N. NIEDING has resigned as superintendent Tip Top Copper Co. at Helvetia, Ariz., to become superintendent Niblack copper mines, near Ketchikan, Prince of Wales Island, Alaska.

A. H. CARPENTER has resigned as manager smelter at Takilma, Or., and is in Denver, Colo. George Cresar and R. S. Stetson are managing and W. S. Keith superintending the smelter operation.

JOHN INGERSOLL has resigned his position as superintendent of the Hidden Fortune mill, near Deadwood, South Dakota, to return to his old position of superintendent of the Dakota mill, near Deadwood.

W. LINDGREN, geologist, is in San Francisco, Cal., from Washington, D. C. He has lately been given charge of the gold and silver statisties of the United States for the Geological Survey, and is now investigating the work of the special agents for California, Nevada, Oregon and Washington. His headquarters will be San Francisco for several weeks.

Trade Treatises.

The special jubilee number of the "Valve World" portrays fifty years of progress of the Crane Co. of Chicago, Ill.

The Colorado Iron Works of Denver, Colo., has issued as catalogue No. 12 "Some Details as to Smelting Practice and Equipments." This is the fifth edition of what has proved to be a practical treatise on blast furnace smelting.

Latest Market Reports.

SAN FRANCISCO, August 11, 1905.

METALS.

SILVER. — Per oz., Troy: London, 27⅛d (standard ounce, 925 fine); New York, bar silver, 59⅜c, refined (1000 fine); San Francisco, 59⅜c; Mexican dollars, 46c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, $15.50; Lake, 1 to 3 casks, $15.37½@15.62½; Electrolytic, 1 to 3 casks, $15.50; Casting, 1 to 3 casks, $15.00 @ 15.25. San Francisco: $16.00. Mill copper plates, $17.00; bars, 18@24c. London: £69 spot per ton.

An electrical engineering paper of current issue calls attention to the industrial risk the United States takes in shipping abroad such large quantities of copper as have been sent to Europe and the Far East the past two years. The demand of home industries are nearly sufficient to absorb the domestic output of the metal, and the shipment of such great amounts to foreign countries has about absorbed all the reserve stock on hand. The fact is pointed out that copper, aluminum and iron are the only metals practically available for electrical uses, and of these copper is the most important. Iron and aluminum can be employed as conductors of electricity, but the wire winding of dynamos, etc., is almost wholly done with copper wire, and this is a use which requires an enormous quantity of the metal. Electric light and railway uses consume annually a very large part of the output of this country, beside which another large amount is absorbed by the brass founding industry. The development of new mines does not nearly keep pace with the rapid exhausting of the producing mines. In view of these considerations the copper outlook for the future is promising.

LEAD.—New York, $4.75; Salt Lake City, $3.50; St. Louis, $4.52½; San Francisco, $3.70, carload lots; 4¼c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £14 ℔ long ton.

SPELTER.—New York, $5.70; St. Louis, $5.18; London, £24 ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $32.25@32.75; San Francisco, ton lots, 33½c; 500 lbs., 34c; 200 lbs., 34½c; less, 35½c; bar tin, ℔ lb., 35@37½c. London, £148 10s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $41.00@$41.50, large lots; London, £7 7s 6d; San Francisco, local, $38.50@39.00 ℔ flask of 75 lbs.; Denver, $42.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 18.50c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 33@37c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.85; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$21.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 12½c; Hallett's, 13c; San Francisco, 1000-lb. lots, 11c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12⅝c ℔ set; 14 oz. stearic, 40s, 11⅛; 12 oz. stearic, 40s, 10⅛c; 10 oz. stearic, 40s, 9⅛c. 100-case lots and over, ⅛c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ¼c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¾c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

OILS.—Linseed, boiled, bbl., 64c; cs., 69c; raw, bbl., 62c; cs., 67c; Lucol oil, boiled, bbl., 56c: cs., 61c; raw-bbl., 54c; cs., 59c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11⅞c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¾c; less than 500 lbs., 8c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.25.

URANIUM.—Oxide, ℔ lb., $3.50.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

LUBRICATOR.—No. 796,125. Aug. 1, 1905. H. P. Josewski, San Francisco, Cal. The object of this invention is to provide a device by which a stated amount of lubricant will be supplied to the bearing or part and without danger to the operator by reason of getting into the way of running belts or moving machinery. The device comprises a container, including a cylinder and upper and lower heads, the lower head having an aperture through it with walls diverging toward the outer face of the head. A plate fits directly against the lower head, the face presented toward the outer face of the head, and provided with an opening whose walls converge oppositely to the corresponding walls of the opening in the head whereby a chamber of double conical shape is formed between the meeting faces of the head and plate. There are other parts of construction designed and arranged to bring about the desired result.

LINE GRIP HOLDER.—No. 796,143. Aug. 1, 1905. Alexander Nord, San Francisco, Cal. This invention relates to a device for holding clothes lines and generally lines of any kind which it is desired to secure so as to be easily drawn taut or readily released. It consists of a body portion having a projection from one side, and an arm projecting rigidly therefrom, a means for attaching the device at one end and guides for the line in the opposite end. A second portion is pivoted to the outer end of the projection of the first portion having an arm projecting from one side, and a lever arm from the opposite side, said arms and lever arm serving to grip turns of the line which are made between the movable and fixed portions.

DRILL HOLE ENLARGING DEVICE.—No. 796,165. Aug. 1, 1905. T. M. Topp, Raymond, Cal. The object of this invention is to provide a means by which after drill holes have been made in rock or other material the bottom of such holes may be enlarged and a chamber formed for the reception of the explosive with which the drill hole is to be subsequently charged. It may also be employed for enlarging similar holes for other purposes. The device may be used in connection with hand or machine drills and turned in the usual manner for drilling ordinary holes. All the parts are loosely fitted together They may be easily assembled or dismounted without the use of screws or bolts or implements of any kind.

FRUIT PACKING MACHINE.—No. 796,156. Aug. 1, 1905. S. H. Shelley, San Jose, Cal. The object of this invention is to do away with the expense and time of manually "facing" the box and by a simple method mechanically packing the prunes into the box in cubes or bricks of uniform weight and size similar to cartons without in any way injuring the fruit or detracting from the appearance of the box when opened. It consists in an apparatus for packing prunes, a cellular open-ended mold adapted to be inserted into a box and having a portion extending above the box, means interposed between the box and the mold, and telescoping with the box and mold to p e-vent the escape of material therebetween, said interposed means carried by the mold, means for compressing the contents of the cells of the mold, and means for withdrawing the mold during the compression period.

MINING AND SCIENTIFIC PRESS.

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California's New Inland Sea.

For several months past the Colorado river has been pouring a vast flood of fresh water into the depression in San Diego county, Cal., known as the Salton Basin. This basin or sink is below the level of the sea, being about 260 feet below datum at the lowest place — the salt marsh near Salton station. There are in the world only half a dozen places where the surface is below the level of the sea. These are the Salton Basin in San Diego county and Death Valley in Inyo county, Cal., the Valley of the Jordan in Palestine, where the noted Dead Sea is nearly 1300 feet below sea level; two small areas in the Sahara desert of Northern Africa, and the largest, by far, of all, and exceeding them in the aggregate area — the valley of the Caspian sea in Western Asia — which is 86 feet lower than the Black sea.

At one time, in recent geological age, the Salton Basin in California was connected directly with the Gulf of California. The Colorado river, flowing with a sinuous but generally southerly course, emptied into this broad, shallow sea. Its great volume of sediment, upon reaching deeper water, settled to the bottom, gradually filling up the channel, and spreading out over a large area. In time a spit was built at the west side of the stream, which gradually extended out into the Gulf of California, eventually forming a complete barrier and cutting the Salton Basin off from the Gulf. This required many years in its accomplishment.

In periods of low water the river fell below the level of the sand spit and in time of flood cut crevasses through it, newer additions being made to the natural embankment until it became a broad levee, completely shutting off the basin from both the river and the gulf, and only at times of unusually high water did the river breach its banks and overflow into the basin. This has occurred repeatedly in past years, though at long intervals, the last time being in 1891–92, when the river flowed through a cut in the bank made by high water, and the water reached the salt works at Salton; but, the river receding, the supply of fresh water was cut off and the newly formed lake rapidly disappeared by evaporation, and no great damage was done.

In the spring of 1905, however, an irrigation canal was cut for the purpose of irrigating lands about Imperial, a town which had grown up in the heart of this desert wilderness, where the soil is wonderfully fertile when it can be properly irrigated.

In this work a breach was made through the levee, but the mistake was made of not providing the necessary head gates. Soon after connection was made between the canal and the river, the summer flood of the river occurred, due to the melting of the snows in the Rocky mountains where the Colorado river takes its rise, and the unusually heavy rainfall increased the volume of the river until an irresistible flood poured into the basin. Many square miles of the basin are now under water, and if it is not checked, without doubt the basin will fill in time, to the level of the inflowing river, when a spit will again be built by nature across the crevasse and the stream continue on its way to the Gulf as before.

Water Recovery Plant at a Mill in a Mountainous Desert. (See Page 123.)

Congress Mill, Congress, Arizona. (See Page 123.)

Water Settling Plant, Congress Mill, Congress, Arizona. (See Page 123.)

Water Recovery Plant at Congress Mine, Congress, Arizona. (See Page 123.)

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The Monuments Control.

The United States Land Department has recently rendered a decision to the effect that in the event of any error in the description of mineral claim surveys or of the line tying the claim survey to a government land survey corner, the monuments must control, which is quite at variance with the position taken by that department nearly two years ago, when there was much controversy over this subject. On April 28, 1904, Congress amended Section 2327 of the Statutes in such a manner that this principle is clearly enunciated, and the recent decision of the United States General Land Office referred to is in direct line with the amendment, and was no doubt influenced by it to a great extent, so that hereafter there need be no apprehension when an error is detected in the survey of a mineral claim for patent, as, regardless of all errors, the monuments must control. This was the position taken by the MINING AND SCIENTIFIC PRESS in the latter part of 1903, when the Land Office at Washington caused consternation throughout the mining States of the West by announcing that the surveys must stand, and that the "calls" of the United States deputy mineral surveyors must take precedence over monuments and everything else. The decision was manifestly so unjust, and so contrary to the purpose and intent of the law, that there was no hesitancy in declaring even at that time that the monuments must control, and any case wherein this question was the issue the United States Supreme Court would decide in favor of the claim owner and against the decision of the Land Office. So earnestly did the miners of the West take up and combat the proposition that Congress quickly recognized the necessity of settling the point for all time, and amended the section bearing upon this matter, as above stated, and the Land Office now falls in line and announces a decision in exact conformity with the amended law.

The Premium System.

It is always the desire of the mine superintendent or manager to have the work under his direction done at as low a cost as consistent with a proper regard for the men, and the conditions under which the labor is performed. Experienced managers know that it is not economy to require men to work in poorly ventilated workings, nor to demand that the men work in a constant shower of water, where it can be avoided. There are places where these difficulties are met and are most difficult to overcome, and the wise manager makes it his business to see that the unpleasant and disadvantageous situations in which the men labor are made as comfortable as circumstances will admit. The additional work the men are enabled to perform by reason of the improved condition more than pays for the expense of making the necessary change. Men will not, and cannot, work in a vitiated atmosphere, nor in a heavy downpour of water. Good ventilating plants improve the one condition, and temporary protection of some sort, in the way of an improvised roof of corrugated iron, shingles, or heavy prepared paper, alleviate the other. One of the most difficult tasks falling to the lot of the mine superintendent is to get a proper return in the form of labor performed from the men employed in exchange for the wages paid. One of the first things to be considered in this regard is the fact that good wages attract good men, while if wages are low and working conditions bad the best men will learn of it and stay away from a mine or camp where these unfavorable conditions obtain.

After good pay, the next most important matter is the proper judgment of what constitutes a day's labor. How often the miner who has been sent to the office with his time check sneeringly complains that "the shift boss or foreman doesn't know when a man is doing an honest day's work." In some instances this remark may have some foundation of truth in it, but, even so, it is quite as probable that the discharged miner was not only not doing what a competent judge would consider a proper day's work, but that he was performing far less than he could, and that his leisurely or careless way of doing things was likely to affect the other men on the shift adversely to the interest of the employer. When the laggard is permitted to set the pace, things soon go badly, indeed.

As a stimulus to greater endeavor, the premium system is sometimes introduced in the workshop and in the mine, and in many instances this works satisfactorily, but here experienced judgment is required in setting the minimum task. If this be too low the result can more easily be imagined than described. If the limitation be too high the men will be unable to reach it, and knowing it, will fail to make the desired effort. One good way to adjust this difficulty, if the conditions are unfamiliar to the manager, who may be new to the country, is to let a series of contracts to determine what the men are capable of performing under favorable wage rates. Then, basing the judgment on the results obtained, the premium system may be safely and satisfactorily introduced.

FOR some time past the copper situation has been set forth in these columns, and the conditions seemed to warrant a steady market and higher prices. The price of the metal has slowly risen in fractional figures until 16-cent copper is again all but assured. Some metal is reported to have been sold at 16 cents and the latest reports state that fine Lake and electrolytic copper can scarcely be obtained under that price. Should the present favorable conditions continue, there is no doubt that the market price of copper will slowly advance, and it seems not overhazardous to now predict the probability of 17-cent copper.

WITHIN the week Humboldt county, Nev., has attracted unusual attention by bringing forth an active mud volcano. The rent is several miles northerly from Lovelocks, in the Black Rock Desert region. As yet there is little apprehension of serious damage. The former existence of mud springs similar to the one now active is evidenced at many points in the Great Basin region. They are of the non-explosive type and usually altogether local in effect.

Railroad Lands in Nevada.

Near Olinghouse, in Washoe county, Nev., much consternation has recently been created by the claims of the Southern Pacific Railroad to land containing mining locations in Olinghouse canyon, White Horse district. These claims are on the odd-numbered sections which fall within the zone of lands granted to the Central Pacific Railroad by the government. The law makes express provisions as to what class of lands shall be deeded to the railroad. All lands known to be more valuable for mineral than for other purposes, at the time the final lists filed by the railroad are accepted by the land department, are reserved from the railroad grant, except those containing coal and iron.

Wherever conflicts of this character arise between the mineral locator and the railroad, it becomes a question of facts, in which that of the greatest importance is, when was the land first recognized as, and known to be mineral, as related to the date of the railroad patent? A discovery of mineral, after patent has issued (and possibly after the final listing of lands by the railroad, has been accepted by the land office), by the miner, will not avail him as against the railroad. There seems promise of a hard-fought legal battle over the title to these lands. If the miners can establish the fact that the lands in question were known to be mineral prior to acceptance of the railroad company's list of lands for which they desired patent, then the miners will undoubtedly win their case, for upon this question the entire proposition rests.

When the railroad company decides to take out a patent on certain of the lands within the grant zone, they make a list of such sections, or parts of sections, as they wish to patent, and file the same in the general land office. This is very much in the nature of the application of a private citizen for patent to a mining or agricultural claim. The land office then reviews the land and attempts to determine whether the land embraced in the application of the railroad comes within the definition of mineral or not. The lists of those lands determined not to be mineral are accepted, and thereafter the land is closed to occupation by any except the railroad. It would seem that in a contention of this kind there should be no difficulty in arriving at the facts in the case.

The Best Policy.

For generations past we have been taught the familiar old saying, "honesty is the best policy." For years this old saying carried much weight and was generally accepted as an axiom, but in the light of modern business standards and that which goes to make success, is honesty still the best policy? In considering this sentiment we must first inquire what is expected to be attained by honesty. If it be a reputation for integrity, high-minded purpose and earnest effort to live up to the Golden Rule, then honesty is not only an essential, but is practiced because it is right. To be "honest" merely because it is "policy" to be so is a species of honesty that will not bear much pressure. When applied to the flotation of certain mining and smelting propositions in these modern days, it is clearly evident that "honesty is not the best policy," for in ninety-nine cases out of one hundred, if the exact truth be told, the proposition would present so little attractiveness that the promoter would find it difficult to give his stock away. The investing public wants something that looks alluring — they want an investment which will place them in an easy financial position on what is apparently a comparatively small risk. Should the mine promoter point out the difficulties in the way of development and operation of the enterprise he is endeavoring to float, and enlarge upon the uncertainties of undeveloped mines, or the unanticipated fluctuations of the market, he would find few purchasers for his wares. Knowing this, he pursues the directly opposite tack, and puts the best of everything forward—points out the great successes of famous mines, and without hesitation draws an analogy, and easily shows that his property possesses every element found in the successful one, with a slight difference in favor of his proposition, and in his enthusiasm forgets the old adage and schools himself to believe otherwise.

CONCENTRATES.

A 36-INCH CIRCULAR SAW may be safely run at 1000 revolutions per minute. It is permissible to run saws at a higher speed than flywheels of the same diameter.

A GREAT deal has been written on the genesis of the diamond, but up to the present time none of the theories advanced satisfactorily account for its occurrence.

IF pending patent proceedings the owner of an unpatented mining claim fails to perform the necessary assessment work, the claim becomes subject to relocation.

EARTH and fine rock, when excavated and placed in a bank, alway settle and shrink. The amount of shrinkage is variable, depending on the class of material.

THE reactions given by bismuth when heated on charcoal are very similar to those of lead. Bismuth will form a brilliant orange-red coloring on the coal and lead a yellow color.

THE pressure on the pipe line leading to Virginia City, Nev., is at one point 1700 feet. The water used in unwatering the Comstock mines is used under a pressure of over 2700 feet.

TO ELEVATE pulp or tailings in mills, belts, endless bucket lines, platform elevators, sand wheels, pumps of several types, including the spiral, and the hydraulic jet are employed. Each of these devices have a greater or less application to varied conditions.

THE presence of magnesium may be detected in a mineral by making an acid solution strongly alkaline with ammonia, when the addition of sodium phosphate will precipitate any magnesium present, forming white crystalline precipitate of ammonium-magnesium phosphate.

BELT CONVEYORS can be used to good advantage in many situations about a mine. They can be applied to the handling of ore in surface cuts, in underground stopes, in the mill and in many other places where ore or waste must be moved from one point to another at small cost.

THE deepest anthracite coal mine in the United States is at Brookside Colliery, near Tremont, Pa. It is down 1850 feet. Although the head frame, winding plant and other surface equipment of coal mines is usually more elaborate than that at the shaft of metal mines, the latter average a greater depth than those of the coal mines.

THE tanks of the cyanide or chlorination plant should not be placed on the ground, nor on beams laid upon the ground, but upon aframework of timbers which is so constructed that a workman may get under the tank to make any necessary repairs or changes. The foundations for tanks must be firmly built so that there shall be no subsidence.

THE proper function of a factor for safety is not to cover up mistakes in engineering, but to make the necessary allowance for defects in materials employed in construction. It does not necessarily assume that the material and workmanship will be poor, but it provides a margin for safety in the event that such should prove to be the case.

TIN smelted in reverberatory furnaces by the Mount Bischoff Company of Tasmania is refined by skimming off the slag after partial cooling, and forcing pieces of green wood beneath the surface of the still molten metal, the steam formed releasing the dross, which is skimmed off. The refined metal assays 99.8% tin, and is shipped to England in ingots of 75 pounds weight.

A "JUMPER," in mining parlance, is the term used in the English colonies to indicate a drill of some length, which is used to drill holes without the use of a hammer, the bar being raised by hand and allowed to drop, the cutting being done by the force developed by the weight of the falling drill. The jumper is known in the United States as the "churn drill."

IT is stated that the dissolution of gold in cyanide solutions is accelerated by bright sunlight. This is said to apply to both potassium thiocyanate and to potassium aurocyanide. This acceleration in the dissolution of the gold is supposed to be due to the liberation of more nascent cyanogen in proportion to the additional oxygen absorbed, with a consequent increased formation of aurous cyanide.

A FEW YEARS ago canvas plants for the concentration of slimes were much in favor and are still in use in many places; but the introduction of various hydraulic classifying devices, for the purpose of properly classifying pulverized material and the subsequent concentration of the several sizes on machines adapted to the various grades of material, has demonstrated that where the classification is properly performed and the concentrating machines are adapted to the work, there is little use for the canvas slimes tables below the mill, as the values are nearly all recovered before the canvas slimes tables are reached, if the material has been crushed fine enough to release the values.

BY the use of a timber-framing machine the cost of framing mine timbers can be considerably reduced. With a properly equipped machine, a timber for the square-set system—a post, for instance—can be framed at both ends in from two to three minutes. Ties and caps also can be as quickly framed, ready for use. The machines are as accurate as hand work and more economical of time.

THE fact that a company owns all the iron in the neighborhood of its smelter, and that it is situated 60 miles nearer the coke ovens of the region in which the property is situated, neither prevents other smelters from operating, nor does it insure coke at less cost than that paid by other competitors who are at a greater distance. This has been demonstrated many times and is one of the peculiarities of railway economy.

IN working an ore deposit or vein by the open-cut or glory hole method, where the face becomes so far removed from the mill hole that the rock no longer runs to it by gravity, or where the rock is shoveled into cars, horse scrapers may be used to advantage if the rocks do not break too big to be conveniently handled. A 2 horse scraper should handle about seventy-five to eighty tons of ore per shift, or as much as five men will shovel.

WHERE ores are so soft as to require no blasting, the greatest care is necessary in their extraction under all conditions, excepting in open-cut work. If stoping underground is attempted in rock of this character, the stopes must be carried up in small vertical sections and should not spread over a broad superficial area. Timber must be promptly placed and filling run in as soon as possible and kept well up with the progress of excavation.

UNDOUBTEDLY in most cases drill holes may be so pointed as to throw rock in any desired direction when blasting. Ordinarily the rock is projected away from the hole in the direction in which the drill is pointed. This is more particularly the case in blasting boulders and outcropping rocks on the surface. In drifting and shaft sinking this theory is exemplified in the V-shaped cut holes which are first thrown out from the center of the face.

SOME gold quartz mills have no concentrating devices whatever, the values being saved on amalgamating plates alone. This works well where the gold is wholly free—not infrequently the case in the oxidized zone of many mines, but with depth sulphides usually appear, and more or less gold is associated with them. While it is generally admitted the gold in sulphurets may be recovered by amalgamation, it rarely pays to undertake this method of recovery in competition with other less expensive treatment.

ROADS, ditches, flumes, dams, buildings, machinery and other improvements on and for the benefit of unpatented mining claims may properly be charged to assessment work, and any legitimate labor performed or improvements made which is properly chargeable to annual assessment is properly a portion of the $500 worth of work necessary to be performed prior to application for patent. This $500 worth of work may be continued at the rate of $100 annually for five years, or it may all be completed within a week if desired, and application made for patent at once.

WHERE rock is to be broken down in open cuts, if a mill hole is not available through which the ore can pass down to a loading chute at a level below the bottom of the cut, inexpensive chutes may be built at the side of the cut which will permit the inexpensive delivery of the broken ore to cars run under the chute. It does not pay to build substantial or permanent structures of this kind. In some instances where ore is being mined in open cuts and the ore shoveled from the floor of the cut into cars, it will pay to run a tunnel at a lower level and put a raise through to the bottom of the cut, so that the ore mined on the stopes of the cut will run by gravity to the chute built in the tunnel below, thus reducing the cost of handling.

A TUBE mill is mainly a cylinder nearly horizontal in position, having an inlet for the material to be crushed at one end, and an outlet for the finely pulverized material, either through screens in the sides or at the lower end of the mill. The cylinder is usually lined with some sort of hard material, such as chrome or manganese steel plates, and with the ore or other material to be crushed is introduced either balls of steel or cobbles of flint—generally the latter where the iron particles would be detrimental to metallurgical treatment. The cylinder is rotated by power. This type of mill is extensively employed in some districts to produce extremely fine pulp or slimes, and is largely in use in Western Australia for this purpose.

OIL is reported in successful operation in smelting copper sulphides at the smelting works of Kedabey & Kalaxent, 40 miles southwest of Elisabetpol, Russia. The petroleum used has specific gravity 0.882; it contains 87.4% carbon, 12.5% hydrogen, 0.1% oxygen. The 5% copper ores are smelted; the leaner are worked by lixiviation. The furnaces are fired by spraying crude petroleum under a pressure head of 30 feet, at each side of the waste-gas flue, the spray being approximately injected tangential to the furnace walls into the melting chamber, where it is at once gasified, the two flames sweeping around the circumference of the furnace, meeting at the opposite side and returning across the middle in a straight line to the flue where the waste gases escape into the roasting furnace and thence into the chimney.

THERE is nothing less certain in their accuracy than the readings from the dial of an aneroid barometer. It is a very delicate instrument, and its adjustments are easily disturbed. When carrying a barometer about from place to place, climbing mountains, etc., it is impossible for the instrument to be kept in accurate adjustment. Temperature also affects the barometer, and corrections must be made for changes in temperature and slight corrections for humidity. To measure the difference of altitude between two places with a barometer, first measure the air pressure (P) at the lower station, and then the air pressure (p) at the upper station. Calling T the indicated temperature in degrees Fahrenheit, the vertical distance between the two stations = $(60{,}360 + [T - 32°]\ 122.68) \log \frac{P}{p}$.

WHERE it is the intention of a claimant to adverse the holder of a conflicting mining claim, the adverse notice must set forth the nature and extent of the interference or conflict; whether the adverse party claims as a purchaser for valuable consideration or as a locator; if the former, a certified copy of the original location, the original conveyance, a duly certified copy thereof, or an abstract of title from the office of the proper recorder, should be furnished; or if the transaction was merely a verbal one, he will narrate the circumstances attending the purchase, the date thereof, and the amount paid, which facts should be supported by the affidavit of one or more witnesses, if any were present at the time, and if he claims as a locator he must file a duly certified copy of the location from the office of the proper recorder.

ALUMINUM and magnesium are readily attacked by a solution of potassium cyanide in the cold; but of the other metals only copper and zinc cause an appreciable evolution of hydrogen, a double cyanide being formed. In the case of zinc, the action soon stops owing to the formation of the insoluble double cyanide $Zn(CN)_2 2KCN$ which protects the metal. At the boiling point the reaction is much accelerated. Certain metals e. g., cadmium and silver, will dissolve only in presence of air or oxygen; while mercury remains unattacked. Quantitative experiments show that when a strip of platinum is boiled with potassium cyanide solution, the surface gradually becomes pitted, and there is a decrease in weight. If the metal is then placed in a fresh solution and the boiling repeated, the loss of weight is greater and approximates to 0.030 gram per square decimeter per hour.

IT is a principle of the mining law that the owner by grant of mineral in a vein beneath the surface must have the use of some portion of the surface, in order that he may reach the minerals beneath. To do this he has a right of way of necessity. (Wardell v. Watson, 93 Mo. 107, 5 S. W. 605.) This way of necessity should not be of larger dimensions than is reasonably requisite. (Monmouth Canal Co. v. Harford, 1 Cr. M. & R. 614-637.) This right or privilege cannot be extended, however, to the use of other lands belonging to the grantee, for the purpose of transporting ore; nor can it be asserted for any purpose not legitimately associated with the search for and extraction of the minerals. It is also in accordance with court decisions that the right to the use of necessary surface is not restricted by reason of the fact that the surface owner had granted a right of way for a tunnel by means of which ore could be removed from the mine.

MUCH depends upon the conditions in blasting gravel banks. A blast was laid several years ago in Trinity county, Cal., in which a tunnel was run into the bank a distance of 100 feet. At the face of the tunnel the gravel bank was 86 feet high. At the mouth of the tunnel the bank was 10 feet high. In the tunnel, 30 feet from the mouth, a crosscut was run 30 feet each way, and at 60 feet crosscuts were driven 40 feet right and left, and again at the face 40-foot crosscuts were run in similar manner. Four tons of low nitro powder were placed in the first and second crosscuts on both sides of the main drift, but owing to a shortage of powder, none was placed in the crosscut at the face. It was the intention or expectation to blast the bank as far as the second crosscut, and when this was hydraulicked away, to extend the excavation and lay the second charge. In each wing of the two crosscuts was placed 50 pounds of No. 2 powder to act as a "primer." The wires were connected and several holes drilled into the roof of the main drift several feet from the entrance. This was blasted down, the debris forming a substantial tamping for the entire mine. When the blast was fired the ground broke an area considerably in excess of the outlines of the tunneling operations. Not only was the ground broken over the blast, but to the face and far beyond. The total amount of gravel dislodged and broken up was 94,000 cubic yards.

The Transvaal Gold Mines.

Written for the MINING AND SCIENTIFIC PRESS by THEO. F. VAN WAGENEN, E. M.

The object of the present paper is to review the industry in the Transvaal, which is that part of the South African upland plateau lying between the Vaal river on the south, and the Limpopo on the north. The first mentioned is an affluent of the Orange river, which flows into the Atlantic, while the other empties into the Indian ocean. The continental divide of the country therefore lies between the two streams, and when it is carefully traced out it appears that the Witwatersrand (White Water range), or the Rand, as it is popularly known, is a section of this divide. Now the gold mining region, and the town of Johannesburg, are situated directly on the crest of this range, but when there, one has no suspicion of the fact, for there is no outlook in any direction, and no appearance of hills or of a summit. In fact, the country seems quite level and the several lines of railroad coming up from Cape Town and Durban, on the south, and going out to Pretoria on the north, have their terminals right in the heart of the city, while a suburban road runs along the invisible summit, connecting the principal city, Johannesburg, with the numerous smaller towns that are strung along it for 30 miles or more.

In a broad way the mineral formation may be said to outcrop along the southern slope of this divide for an equal distance at least, and, dipping to the north at an angle of 25° to 55°, disappears in the bosom of the plateau.

Without going too much into geological details, which as yet are not settled and are not likely to be for many years, it may be said that this outcrop has been fairly well traced out for about 20 miles, and with less certainty for perhaps 20 more. It is crossed by numerous faults, which cause the line of strike to assume a most irregular course, and there are great variations in the angle of the dip. Away to the east and west it is the popular fancy (for which there is much warrant) that it curves around to the north, and in the opinion of those optimists, who are always found in a gold mining locality, and, for that matter, in almost every locality that has any good points at all, it will ultimately be chased around until a complete circuit is proved up, that will measure from 100 to 150 miles in circumference, and will include a basin of a roughly oval shape, with diameters ranging from 30 to 50 miles, within the limits of which the most sanguine of the Johannesburgers have calculated that there are several billion tons of payable quartz carrying on an average not less than half an ounce of gold per ton, and unlimited billions more of lower grade. And when the boomers get down to details, it is not at all easy to disprove the position they take, which is, concisely stated, that the Rand goldfield contains, and will yield, as much of the yellow metal as has been produced by all the other mining districts of the world, heretofore, since the dawn of history.

It is easy to comprehend what a field of operation this cheerful view of things opens to the speculator as well as the miner, and it must be admitted that full advantage has been taken of it.

The process of exploitation, development and flotation has been as follows: Originally the entire region was owned by Boer farmers and was used mainly for pasturage. The Transvaal mining law permits mineral exploration on farm lands, and so outcroppings were discovered here and there, and the history of the region as a gold field began. It does not appear that there were any evidences of work by Ancients in the vicinity, as is the case in most other parts of the African continent. When taking up land, the prospector, or his assign, the promoter, generally got a bond on the tract from the farmer, so as to quiet forever all matters of title, and then took the proposition to London, where a company was formed under the English corporation law, and a working and developing fund provided by selling a portion of the capital stock to the public. Thus originated what are known as the "outcrop mines," including most of the properties that have so far become productive and profitable. With a traceable outcrop 20 to 30 miles long, a very good beginning was made by the promoters and speculators, as may be imagined, but at last the time came when all the known outcrop was capitalized and floated off, and then began the era of the "Deeps."

The Transvaal mining law does not recognize any extralateral rights. Consequently all the outcrop mines must in due time become exhausted, but, wherever one of these had become a success, it was an easy matter to organize and float off, on the strength of its history and record, another company in its rear, on the dip of the reef. Accordingly, more acreage was blocked out, and drilling operations were started to cut the reef in depth and prove the value of the ground by demonstrating the continuity and value per ton of the ore-bearing stratum. The funds for conducting these preliminary operations were provided by the organization of a small local syndicate, or the deal was financed by one of the outcrop companies. But as soon as sufficiently favorable evidence in the way of drill core and assays was secured, the new area was floated off in London in the same way as the outcrop areas had been, the general public being called upon to provide the means to sink the deep shafts required to reach the ledge at depth, as well as all the costs already incurred, and also their share of the capitalized value of the land. A good deal more capital was required for these "Deeps" than for the outcrop propositions, as may be easily understood, for shafts ranging in depth from 1500 to 2500 feet had to be sunk to reach the ore-bearing zone, before the process of its development could even begin, besides which, each property had ultimately to be equipped with the regulation hoisting and milling plant. But the public of England went merrily into the game, and, by proper and entirely warrantable manipulation of the market, a great deal of support was obtained from investors that could be reached through the bourses of Paris, Berlin and other continental cities. At one time efforts were made to attract American capital into "Kaffirs," as these shares were called, but it did not succeed.

These "Deep" mines generally covered from 200 to 300 acres, and, of course, in due time, all the available ground immediately behind the apex mines was floated off and the promoting fraternity were threatened with a termination of their activities, unless the public could be interested in a new series. These were duly brought out under the name of "Deep-Deeps." Necessarily each had to be provided with even a larger capitalization than an ordinary plain "Deep," but it proved easy at the time to raise money for these enterprises, or rather to float off the companies, for, as the task of reaching the ore zone with shafts had now become a matter of five to seven years, only a small part of the cash for the entire operation was called up at the time, and the large financial houses in London and elsewhere carried the bulk of the shares for the first line of investors, all of whom expected to be able gradually to pass on a part of their liability at a handsome profit to the general public in time to meet the deferred payments. It was a grand scheme, quite worthy of the magnificent resources of the mineral field upon which it was based, and quite liable, or even certain, to succeed, but for the usual chapter of accidents that always occurs sooner or later, but which you and I and every one else hopes to be able to dodge, though we fully expect to see the other fellows caught.

In this case the "Chapter" consisted of the Boer war, which was expected to be all over in six months, but which lasted more than three years. Its effect on "Kaffirs" is well known, and need not be enlarged upon here. But, while the Rand shares were magnificently sustained by the London financiers during that long struggle, and while the field has been thoroughly rehabilitated and brought back to its ante bellum condition in the three years that have succeeded, the general public, upon whose broad shoulders the real burden of the task was to be placed, have not as yet come into the game as freely as was expected. This, of course, has been due to the costs of the war, which for a time has absorbed the bulk of the savings of the investing public. However, the job of the mastication and digestion of the remaining "Kaffirs" that are hanging over the market will be accomplished in due time, for the Transvaal goldfield has wonderful merit and possibilities, and so long as the gross output continues to grow, and gold remains the sole standard of value, a steady absorption will proceed until the manipulators of the London mining market have got the mass of the shares placed as they wish. But, so serious has been the check in the progress of the game, and so heavy has been the burden upon a number of the investors, that it is not likely another series of "Deeps" will ever again be attempted.

The general mining situation in the field may now be summarized as follows: First, quite a number of the outcrop mines are rapidly approaching exhaustion, but they have paid so well, and will continue to do so up to the last minute, that their closing down, when it occurs, will not injure the market or injuriously affect the reputation of the district. Second, fifteen of the "Deeps" have been brought to the productive stage, and while it is now fairly well recognized in inside circles, and quite extensively among general investors, that the net profit per ton on the "Deep" ores is not going to equal that obtained from "Outcrop" quartz, yet the series will pay well in the majority of cases. Third, while no "Deep-Deeps" have yet been carried anywhere near the producing stage, and will not begin to come in for another three to five years, there is good hope for the shareholders in that series, and in any event it is certain that as a whole they will pay expenses and hence will be operated, in which case the world at least will get the benefit of the gold recovered.

(TO BE CONTINUED.)

Mining Coal from a River.

J. Hague, of Plymouth, Pa., has a large dredge completed and has begun to dredge the river for coal, says Fuel. He has been working for some time on his "coal breaker," getting it in readiness, but was detained on account of being unable to secure the proper machinery. He has placed a boiler and engine on the flat, which will generate power for working the dredge and operating the machinery. The coal will be "picked" from the river by a steam shovel and will then be carried to the rollers by elevators, where the coal of the larger sizes will be broken and run through a screen and separated according to sizes. After the coal is separated there will be chutes to receive each size and to run the assorted coal to flats lying along both sides of the dredge. Mr. Hague has been to considerable expense in fitting up the dredge, but he contends that there are thousands of tons of fuel in the river that can be taken out with a good profit.

Some Primitive Mining Engineering.

Written for the MINING AND SCIENTIFIC PRESS.

Several years ago when in Tuolumne county, California, I came across three pocket miners who had on hand a piece of mining engineering which caused them considerable anxiety, but which they worked out in a primitive way to their own satisfaction, in a manner which must have delighted the old German author, Agricola, could he but have been a witness to this operation. The methods of these three miners were remarkably similar to those pictured in the famous old work of that writer, "De re Metallica."

The problem confronting the miners, as I now remember it, was about as follows: They were developing a pocket mine on Bald mountain, near Sonora. The vein coursed along the side of the mountain and dipped steeply toward the canyon. They wished to run a tunnel to strike the vein, but did not know how far this tunnel would have to run to reach it. The only instruments I saw them use were a small pocket compass, secured to a strip of lath about 2 feet long, and which was provided at each end with a rude sight—a tape line 50 feet long, and a piece of string, to one end of which was attached a rock weighing about four ounces—this to serve as a plumb bob. They had already made an open cut, the beginning of which was in soft ground, but the back end where the tunnel was to go under cover had become hard and tough, and it was this fact apparently that caused the desire to know about how long the proposed tunnel must necessarily be to reach the vein.

It was my good fortune to arrive just as the engineering difficulties began, and I was so much interested in the operation that I offered neither assistance nor suggestion, preferring to watch how the thing was done, thinking it might be useful knowledge to me some time when I had no better means at hand than they had.

The first thing they did was to set the compass on a piece of timber set on end, on the dump. This was really a needless operation, as it only gave them approximately the direction of the proposed tunnel as related to the meridian. I have forgotten the exact direction now, but it was easterly. The next operation was the driving of a peg or small stake into one side of the dump at the place where its floor joined the slope of the hillside—the place where they first began to dig away the earth to start the cut. Into this stake they drove a nail, after the manner of surveyors, but which seemed to me an unnecessary refinement in the process. From this nail they carefully measured up the hillside in the direction of a small shaft they had started down on the vein, a post on the outcrop being plainly visible from the dump at the tunnel site. Two men did the measuring, the third standing at the peg to keep the others in alignment. They made no attempt at leveling, but took the measurement on the slope of the hill. When this had been accomplished we all climbed up to the shaft. The distance reported on the slope was, I think, 285 feet.

At the shaft one of the men fastened his plumb bob to a nail and let it drop down the shaft until it nearly touched the foot wall. When the rock at the end of the string came to a state of rest, they carefully measured the distance from the collar of the shaft on the foot wall side to the plumb bob by means of the tape, being careful not to touch the string. This distance was 10 feet. They then as carefully measured across the shaft on the level and this distance was found to be very close to 5 feet. The vertical distance along the string was 8 feet 8 inches. This, they said, showed the vein to gain toward the mouth of the tunnel 1 foot in each 2 of inclined depth (a 60° slope, though they knew nothing of degrees).

We all returned to the lower dump. I was much interested in ascertaining how they expected to work out the problem with so limited information. Arrived at the tunnelsite, a careful measurement was made along the edge of the cut, this measurement being on the slope angle of the hill, which, fortunately for their purpose, was quite uniform throughout. They measured on this slope a distance of 10 feet from the peg. At this point they drove a second peg at the side of the cut, and then tacked a narrow strip across the top of it horizontally, so that one end of it would project over the edge of the cut. From this the plumb bob was swung and when it was quiet the spot beneath it was marked, and both the vertical height of the cut at that place and the distance from the peg No. 1 were measured. The former distance was found to be about 5 feet. The

horizontal distance was found to be about 8 feet 8 inches.

From this data they now figured that if in measuring on the slope of the hill a distance of 10 feet they gained a vertical height of 5 feet they would be when vertically under the shaft 142 feet 6 inches below the surface, or just one-half of the distance as measured on the slope, which fact had been clearly demonstrated by the measurements made in the cut. The horizontal distance gained on a 10-foot slope being 8 feet 8 inches, the distance gained in going 100 feet they argued would be "nearly 90 feet, or say about 87 feet, and in going 200 feet twice that, or 174 feet, and in 85 feet more about 72 feet, or a whole distance of 246 feet." (The actual distance based on the measurements was 246 feet, so it will be observed these miners were good guessers.)

"Now," they said, "the vein dips toward us 5 feet in 8 feet 8 inches of vertical depth. As the distance from the level of the tunnel floor to the collar of the shaft is 142 feet 6 inches, this offset of 5 feet will be repeated about sixteen or seventeen times." To arrive at this latter conclusion required considerable figuring, discussion and dispute, but it was finally agreed that sixteen and one-half times was about right. This multiplied by 5 gave 82½ feet to be deducted from the whole distance of 246 feet, which was 163.5 feet. As the cut had already advanced about 22 feet, this also was deducted, leaving a total distance of 143.5 feet to run to reach the vein.

The tunnel was run and it cut the vein in 140 feet from the point of going under cover, or 3½ feet less than they had calculated, owing to the vein taking a slightly flatter dip than that in the upper part of the shaft. These miners were Italians, and good workmen. Although their education was limited, they possessed an amount of ingenuity and practical sense which carried them over many difficulties in their work.

Cyaniding Silver-Gold Ores of the Palmarejo Mine, Chihuahua, Mexico.*

NUMBER IV.

Written by T. H. Oxnam.

Precipitation of Silver and Gold.—There are six zinc boxes, five being used for the weak solution and one for the strong solution. The five weak solution boxes, constructed of No. 10 sheet steel, are 2 feet wide and 18 feet long over all. Each box contains eight compartments, each compartment having an available zinc capacity of 24x24x18 inches, equivalent to 5 cubic feet. Six compartments only are filled with zinc shavings, and each box, when freshly dressed, therefore contains 36 cubic feet of shavings, making a total of 180 cubic feet of zinc shavings in the five weak solution boxes.

The strong solution zinc box consists of seven individual round boxes or compartments, placed in series, each compartment being 28 inches in diameter and 24 inches in depth, and having an available zinc capacity of approximately 5 cubic feet. Only six of the compartments are filled with shavings, the last compartment being reserved, as above stated, for the addition of the quantity of cyanide required to bring the strong solution up to standard strength. The strong solution zinc box has, therefore, a total of 30 cubic feet of zinc shavings.

Records are kept of the quantity of weak and strong solution daily passing through the boxes, together with their assay values before and after precipitation. These records for the year (1904) show that 91,793 tons of weak and 22,251 tons of strong solution passed through the boxes, which is equivalent to an average of 251 tons of weak and 61 tons of strong solution every twenty-four hours. During this period, the flow of solution through the boxes was naturally interrupted on various occasions for a short time. due to the ordinary cleanups, dressing of the boxes, etc., as well as various minor, unavoidable delays. Without taking such stoppages into account, however, the average rate of flow of the solution through the boxes equaled 1.4 tons of weak solution per twenty-four hours per cubic foot of shavings, and 2.03 tons of strong solution per twenty-four hours per cubic foot of shavings.

The actual rate of flow, however, exceeds these figures, as it is here assumed that the boxes were at all times kept dressed with the maximum amount of shavings, which, strictly speaking, was seldom the case.

The shavings used are cut on an ordinary zinc lathe, from No. 9 sheet zinc—the size of the sheets being 18x84 inches. Ordinarily, six sheets are wound on the mandrel of the lathe for one cutting. One boy working twelve hours cuts a sufficient quantity of shavings to supply both the leaching and agitation plants, which together require an average of about 120 pounds of shavings per twenty-four hours.

It is found best to keep only a few days' shavings on hand—freshly cut shavings giving better results than those which have been cut for some time. The customary practice of moving the zinc from the lower to the upper compartments, when dressing the boxes, is not followed, fresh zinc being added as required to the top of each compartment.

The strength of the solution running through the weak boxes will average between 0.25% and 0.30% of KCN, while that of the solution going to the strong zinc box will average between 0.35% and 0.45% of KCN.

The average assay values per ton of the solutions entering the zinc boxes are approximately as follows:

Weak Solution.	Strong Solution.
$1 of gold and 2.25 oz. of silver.	$1.24 of gold and 3.5 oz. of silver.

It is very seldom that any trouble is experienced with the precipitation of the contained values. As a rule the precipitation of gold is practically perfect, while that of the silver will average about 95%. When the percentage of precipitation falls off, it is usually due to the presence of an accumulated excess of lime in the solution.

Table IV gives the results of assays taken from each compartment of both the weak solution and the strong solution boxes, and shows the progress of precipitation in the successive compartments. These results may be taken as an average of those regularly obtained.

Cleanup of Zinc Boxes.—On account of structural difficulties the cleanup facilities are not as convenient as could be desired and it is necessary to handle the precipitates more than would otherwise be the case.

TABLE IV.—Precipitation of Gold and Silver in Zinc Boxes.

A.—Weak solution zinc box.

Compartment.	Assay Value of Solution. Gold	Assay Value of Solution. Silver	Extraction. Gold	Extraction. Silver	Constituent Portion of Total Extraction. Gold	Constituent Portion of Total Extraction. Silver	Strength of Solution. Quantity of KCN per Ton. Without Lime.	Strength of Solution. Quantity of KCN per Ton. Addition of 5 c.c. Strong Lime Water.
		Oz.	%	%	%	%	Lbs.	Lbs.
Entering No. 1	$1 03	2 46	.....	.....	.....	.....	6 3	6.6
Leaving No. 1	0 82	1.89	20 39	23.17	20.39	23.17	6.3	6.6
Leaving No 2	0 56	1.02	45.63	58 54	25.24	35.37	6.4	6.7
Leaving No. 3	0.41	0.74	60.19	69.92	14.56	11.38	6.4	6.7
Leaving No. 4	0 30	0.36	80.58	85.37	20.39	15.45	6 3	6 7
Leaving No. 5	0.10	0.28	90.30	88.06	9.72	3.29	6 4	6.6
Leaving No. 6	trace	0 16	100.00	93.50	9 70	4.84	6.4	6.7
					100.00	93.50		

B.—Strong solution zinc boxes.

		Oz.	%	%	%	%	Lbs.	Lbs.
Entering No. 1	$1 24	3.64	.....	.....	.....	.....	8.4	9.0
Leaving No. 1	1.03	3.18	16 94	12.64	16.94	12 64	8.4	9.1
Leaving No. 2	0.51	1 74	58.87	52.20	41.93	39 56	8 5	9.1
Leaving No. 3	0.41	1.03	66.94	71.70	8.07	19.50	8.5	9.2
Leaving No. 4	0.20	0.71	83.87	80.49	16.93	8.79	8 6	9.3
Leaving No. 5	0.10	0.42	91.94	88.46	8.07	7 97	8.6	9.4
Leaving No. 6	trace	0 18	100.00	95.05	8 06	6 59	8.6	9.4
					100.00	95 05		

All the boxes are cleaned up twice a month. Before commencing on any one box, clear water is passed through it a sufficient length of time to displace most of the cyanide solution, which usually requires ten or fifteen minutes. The shavings in the first compartment are thoroughly washed, after which they are removed and the water bailed out into the next compartment. The precipitates are now conveyed by means of buckets to the cleanup box, where they are passed through a 20 mesh screen. A small percentage of "short" zinc passes through this screen, but the greater part of such product is here separated from the finer precipitates and is returned to the boxes. The first compartment is now filled with water and the zinc contained in the other compartments is gradually transferred to it and thoroughly washed, the precipitates from each compartment being carried to the cleanup box, as before mentioned. In order to reduce to a minimum the rapid oxidizing effect resulting from exposure of the wet zinc to the atmosphere, the washed shavings are at once placed in the highest vacant compartment of the zinc box and covered with solution.

The precipitates accumulating in the first compartment from the washing of the shavings, after being allowed to settle for a short time, are also removed to the cleanup box. This latter is provided with three smaller settling boxes, placed in series, which take the overflow from it. The bottom of the cleanup box is tapped by a 4-inch drop pipe, which discharges directly into two large drying pans beneath.

The product is now dried as much as is practicable and then mixed, carefully sampled, assayed and sold on the premises to one of the large ore buying companies.

The moisture contained in the dried precipitates has averaged 0.27% during the past year.

The cleanups, as would naturally be supposed, are quite bulky. The net, dry weight of precipitates in each cleanup averaged between 1100 and 1200 pounds avoirdupois during the past year.

Considering the fact that the precipitates receive no treatment whatever beyond being passed through a 20 mesh screen and the simple drying as above mentioned, it is rather surprising that they carry such a comparatively high percentage of fine metal. During 1904 the assay returns on which the sale of the precipitates is based have averaged slightly over 20,000 ounces of silver and approximately $8000 of gold per short ton. By actual weight, therefore, the percentage of fine metal contained in the dried product recovered throughout this period was approximately 68.57% of silver and 1.33% of gold, making a total of 69.90% of both metals.

To the best of my knowledge this is the highest percentage of precious metal contained in any cyanide precipitates regularly obtained in ordinary zinc precipitation.

Two cleanups during 1904, of a combined net weight slightly exceeding 2300 pounds, gave an average assay value of 22,200 ounces of silver per ton, making the fine silver content equal to 76.12% by weight of the precipitates.

Having noticed in recent papers of the Institute the discussion of the number of ounces of fine metal handled per man hour while removing the precipitates from the zinc boxes or filter presses, the following data are offered.

A record kept for some time of the labor employed in cleanups shows that on an average four men (one American and three native helpers) would readily remove 1200 pounds (net dry weight) of precipitates from the boxes and have the product in the drying pans in eight hours. Based on the average assays of the precipitates for the year, this means that in thirty-two man hours approximately 12,200 ounces of fine metal would be handled, being equivalent to a duty of 381 ounces per man hour. This rather high duty is, of course, due entirely to the fact that the precipitates contain such an exceptionally high percentage of precious metals.

Table V gives the result of a sizing test made on one lot of precipitates, which ran somewhat lower than the average in silver:

TABLE V.—Sizing Test of Cyanide Precipitates.

Assay value of precipitates per ton was $8622.90 of gold and 19,488.65 ounces of silver

Size of Material.	Weight.	Assay Value. Gold.	Assay Value. Silver.
	Per Cent.		Ounces.
Retained on 80-mesh	11.13	$1,914.04	2,805.40
Retained on 100-mesh	2.41	3,369.21	5,565 2›
Retained on 150-mesh	3.90	5,465.00	11,128 80
Retained on 200-mesh	1.39	5,702.25	12 274.24
Passed 200-mesh	81.17	9,683.00	22,726.80
	100.00	.....	.....

Tonnage and Extraction Percentages.—During 1904 a total of 34,500 tons of sands were treated in the leaching plant. This tonnage would have been considerably greater had it not been that during this period, aside from the ordinary stoppages in the mill due to general necessary repairs, the mill was closed down at different times for intervals aggregating a total of fifty-seven days for the entire fifty stamps, from causes beyond our control, such as shortage of water power during the dry season, washouts along the railroad and power ditch during the heavy rains, etc.

The extraction for 1904, indicated by the assay differences between the sands charged into the leaching vats and being discharged, was 95.5% of the gold and 52.5% of the silver values. The combined total value of the precipitates recovered during the year checks closely with that called for by the sand assays.

The assay value of the sands treated during this period has averaged approximately $2 85 of gold and slightly more than 16 ounces of silver per ton.

The total returns called for by the zinc box precipitation records correspond very closely to the actual returns from the precipitates recovered. During 1904 the returns from the precipitates were practically 1% less in gold and 0.5% more in silver than those called for by the precipitation records.

This difference in the gold is accounted for by the fact that the precipitated solutions are only occasionally assayed for gold, it being ordinarily assumed in the daily precipitation records that the precipitation of the gold is perfect, while, as a matter of fact, the solution leaving the zinc boxes will very probably carry an average of a few cents of gold per ton.

Consumption of Cyanide, Zinc and Lime.—The office records show that for 1904 the consumption per ton of sands cyanided was as follows: Cyanide, 2.95; zinc, 0.96; lime, 4.33 pounds.

It will be remembered in this connection that during this period sodium cyanide of a strength equivalent to 125% of potassium cyanide was exclusively employed. Expressed in terms of potassium cyanide, this consumption would, therefore, equal 3.69 pounds of potassium cyanide per ton of ore treated.

(To be continued.)

*Trans. Amer. Inst. Min. Engrs.

The Black Hills of South Dakota were described as auriferous as early as 1867, but no note was taken of the fact until 1875, when the first movement of miners into that country occurred. The Hills were included in the Sioux reservation,

An Experience in Water Recovery.*

Written for the MINING AND SCIENTIFIC PRESS by GEO. S. BINCKLEY, E. M.

To call attention to the importance of water recovery in milling operations in the southwest is superfluous, if the reader happens to be familiar with the conditions in the arid region. It is, however, not always fully realized by others that very frequently the output from a given property is limited absolutely, by the water available, and not by the mechanical equipment and labor employed. A mere trickle of water, carefully husbanded, may be sufficient for five or ten stamps, but when the limit of hydral economy is reached, the production has also touched its limit.

When the mine operator is so fortunate as to have a clean, hard quartz to deal with, little difficulty is to be found in saving practically all the water circulated, except that lost through evaporation, and even this loss may be minimized by keeping down the surface of the water exposed to the atmosphere to the lowest possible limit, and preventing, so far as possible, the circulation of air over the exposed surfaces.

An instance of easy recovery is seen at Congress, Ariz., where separation of clear water is effected continuously by passing the slimes through a series of V-shaped tanks over wide, shallow wiers, serving to separate the tank into a number of divisions. The thick slimes drawn from the bottom of these tanks carry, naturally, a very considerable percentage of water, which, under the system in use at the time of the writer's last visit, seemed to be for the most part lost through evaporation. Observation indicated, however, that the proportion of slimes to the total of the ore was low, which, as mentioned before, simplifies the problem. The accompanying engravings illustrate the situation at the Congress mine, Arizona.

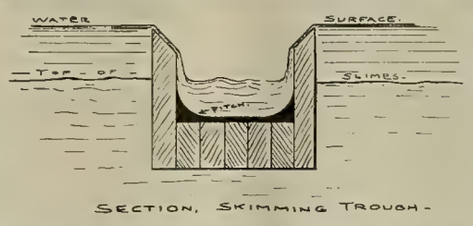
Quite another condition obtains, however, where the ore treatment produces a large proportion of impalpable slimes. The writer has seen tailings pass away from a certain well-known mill on the Mother Lode, that would not have deposited 10% of the slimes carried if passed through the recovery plant of the Congress mill. Where, in addition to the lightness and impalpable fineness of the slimes, the water is strongly or even moderately acid, the difficulties of recovery are very greatly increased, and ordinary methods entirely fail to produce clear water from the slimes.

Dr. Pierre de Peyster Ricketts of New York described to the writer, some years ago, a device he was then using at Nacozari, Mex., for thickening pulp in a concentration mill. This was merely a tank, about 8 feet diameter and 16 feet high, provided with a circular trough outside and near the top, and having the upper edge planed down to an exact level all around. Pulp was led through a launder to a wooden box, about a foot square, placed in a vertical position in the tank and reaching from the surface to something more than half way to the bottom, so that the descending column of pulp deposited its heavier constituents in the lower part of the tank, while only the lightest slimes were carried by the slow and uniform current to the top of the tank, overflowing here into the circular trough before mentioned, while a constant stream of thick pulp was discharged through a suitable opening below. This scheme worked very satisfactorily on the Nacozari ores, and would probably produce a continuous and practically clear flow of water from the pulp of the harder, more siliceous class of ores.

Some little time ago, the writer was confronted with the necessity of making a series of tests to determine the susceptibility to milling treatment of some ores which, although treated by this process previously, were known to have yielded but a low proportion of their assay value. Absolutely no reliable data existed on the actual extraction secured. A seeming paradox existed in the apparently higher extraction from base sulphide ores by amalgamation than from soft and thoroughly oxidized ores from near the surface. The first obstacle to the proposed tests was lack of water at the mill, which was formerly supplied through a pipe line 2½ miles long, from a source over 1000 feet lower than the mill. The salt water formerly used, however, had entirely destroyed the usefulness of this pipe line, so the mill was left stranded high and exceedingly dry.

After the expenditure of some time and labor, a limited flow of water was secured from the bottom of a small and shallow shaft sunk for this purpose, and another trickle of saline water was secured from a wet spot in the canyon above the mill, so, making a careful measurement of the flow from these sources, the writer decided, at last, to proceed with the tests.

In the design of the recovery plant, the system was so laid out that the tailings, once raised by a bucket elevator from the sluice to the upper part of the mill, would run by gravity to the sand-settling tanks, and



the slimes would flow thence through the slime tanks, delivering the clear water to the mill tank, which in turn gave a gravity supply to the mill. The arrangement of the tanks is shown in the accompanying diagram, and the engraving from a photo shows the relation of this part of the system to the mill.

The size of the sand tank was 5 feet deep, 10 feet wide and 20 feet long, divided into eight equal compartments, so arranged that a continuous flow could be maintained through the whole or part of the compartments. The discharge of sand could then be accomplished without interference with the flow of slimes. Each compartment had a discharge door in the bottom, and the bottom of each was provided with a regular filter rack, the same as that used in the percolation vats for cyanide work, the object being to draw off as much clear water as possible by direct filtration.

The slimes passing from the sand tanks were delivered through a launder to the slime separator. This was practically Dr. Ricketts' device, before referred to, except that it was not as deep, and was provided with a pyramidal down-take box (see sketch), so that the velocity of the descending column of heavy slimes should be gradually decreased, and that of the ascending column outside the box also uniformly decreased as it approached the lip of the tank. This part of the system was carefully worked out, and by careful attention to the blowing off of thick slimes in the bottom of the tank, it was expected that a flow of clear water would be secured over the lip and into the overflow trough.

Unfortunately, difficulties developed. In the first place, after but about a half hour of operation, the filters in the bottom of the first sand tanks clogged completely, and no further percolation was obtained, blasting all hope of help from this source. In the second place, a persistent tendency to indefinite suspension was exhibited by the slimes, as, to all appearances, as heavy slimes were passing over the lip of the separator tank as flowed in from the sand boxes. It didn't take long to come to the conclusion that not only was something wrong, but that an immediate remedy was demanded. As a makeshift, the largest of the mill tanks was cut off and converted into a slime tank, and a down-take box was so placed as to lead the fine slimes discharged from the separator tank toward the bottom of the big slime tank. This tank being a large one, the scheme saved us for a while, but the overflow pipe to the mill tank being on one side, caused a local current which began to carry slimes over.

About this time, things looked bad for a water supply for five 1080-pound stamps, two 6-foot belt concentrators, an arrastra and a gasoline engine. The available supply of fresh clear water was about the size of one's little finger, dripping out of the end of a 2-inch pipe, and we were rapidly accumulating about 30,000 gallons of slimes. Also, when water troubles were seeming pretty hopeless, it developed that our beautiful, oxidized "free-milling" ore carried a lot of finely divided copper sulphate, which made a sight of the plates to weep over—considerable galena began to turn up with this same ore and a fair amount of bornite developed. Then, the water became so acid that the slimes would hardly go down at all, and a temporary shut down became imperative.

Owing to the remoteness of the mines, no supplies were immediately available, so a couple of barrels of soda ash (sent out by mistake long previously) were brought to the mill and used to neutralize the water.

Together with the minor improvements made in the mechanical part of the system, we were able to make another start, this time on a harder sulphide ore, not highly siliceous and very slimy. In justice to the original arrangement as a whole, it must be said that although the light and impalpable slimes gave us so much trouble, an amazing amount of mud was deposited wherever the current was allowed to come to rest, and an actual determination of the proportion of slimes to sands in the original ore would doubtless be surprisingly high.

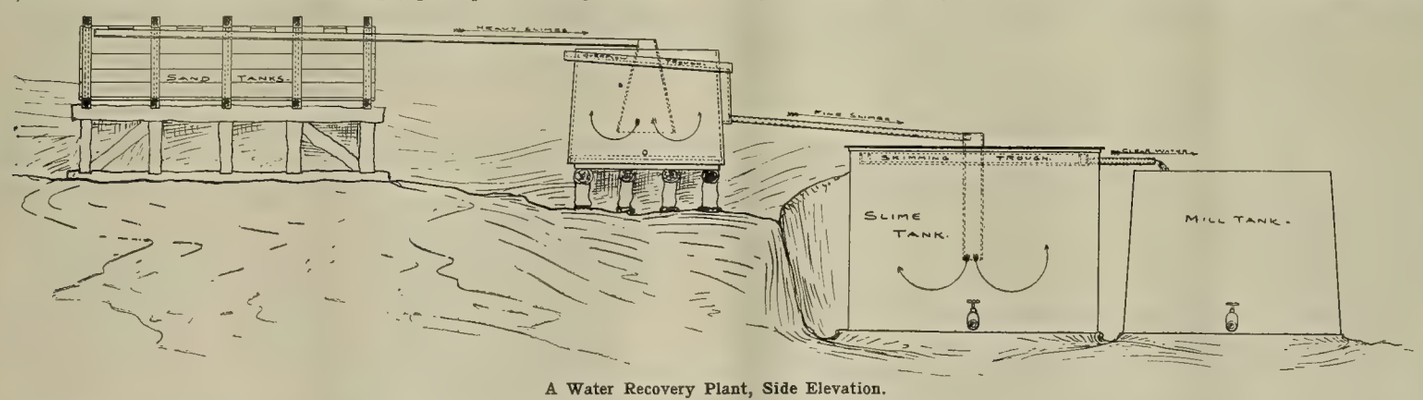
Before serious trouble could again develop, an arrangement was constructed and placed in position in the big slime tank, which the writer calls, for lack of a better name, a "skimming trough." This was a circular trough about 6 inches deep, 6 inches wide and in the form of a ring 16 feet 6 inches diameter. It was built up of 1-inch lumber and bevelled, as shown in the section on the upper lip, to about 45°, and the bottom rendered water-tight by a coating and fillet of pitch inside. This circular trough was then placed and held in position in the large slime tank in such a manner that the lips of the trough were exactly level, and a pipe connection provided from the interior of the trough through the side of the slime tank to the mill tank (see diagram). It must be understood that after being secured in position, made approximately level and connected up with the pipe to the mill tank, water was allowed to rise in the slime tank to the lip of the trough, which was then planed off to an absolute level, both sides.

When the arrangement was tried, it was found to work well, for so long as a thin skim of clear water lay on the surface of the slimes, clear water only would flow over the lip of the trough, even when over thirty gallons of water per minute was passing. The length of wier (over 100 feet taking both lips of the trough) was so great that the depth of flow over the lip probably did not average as much as $\frac{1}{32}$ inch, and localization of current was entirely avoided. When the first trial of this part of the system was made, it appeared that the problem was solved, but its limitations were soon developed.

In few words, it became clear, that with a certain slime, a definite and fixed relation exists between the amount of clear water that may be continuously taken off and the total volume of slimes that is undergoing precipitation. This fact was beautifully illustrated by observation of the working of the system through one shift.

The mill was not run at night, so for half the time the contents of the big slime tank were quiet and had a chance to settle. In the morning the water would be clear for several feet down, then, as distinct as the line separating oil from water, the slimes would begin. As the hours passed by with the mill in operation and the clear water flowing through the skimming trough from the slime tank, the plane of the slimes would rise, and if there was no wind to disturb the surface of the water, the rise of the slimes would be so even and uniform that clear water would be discharged up to the last moment, when the slime plane would actually reach the lip of the skimming trough. But once this point was reached, the slimes would flow over. Every scheme that ingenuity could suggest was tried at this point, but the fact remained that the uniform upward flow of the mass of slimes and water was more rapid than the rate of precipitation of the suspended particles.

In an attempt to conquer this difficulty, recourse was even had to the capillary siphon, strips of burlap being laid over the lips of the skimming trough, raising the water from a fraction of an inch outside of the trough over the lip and letting it flow down inside. But if the texture was sufficiently fine to act as a



A Water Recovery Plant, Side Elevation.

*See illustrations on front page.

filter, clogging would soon result, and, if open, the slimes would pass the siphon.

As mentioned before, some effect was obtained in the neutralization of the water with soda ash. When the supply of this was exhausted, lime was produced by the calcination of sea shells, and some little was obtained from small amounts of superficial secondary calcareous deposit, a kind of "caliche." Finally, a kind of mess, made by cooking a variety of cactus called "petaya" in water, was added to the slimes. It had a decided effect on the slimes, as it is a powerful astringent, but after a day of its use, the mill looked like the interior of a steam laundry in bad order, as the petaya piled up great billows of foam at every point that the pulp or water was agitated—the discharge from the elevator looked like a cream puff; the boot oozed suds from every seam; the battery frothed at the mouth, and so did the choleric old millman.

However, care and patient study of every favorable condition soon made it possible to operate the mill without interruption, and some interesting results were observed in the treatment of these ores. It may be of interest to know that when the sulphide ores would assay, for instance, $35, the concentrates would go from $8 to $12. Also, higher results were obtained from the amalgamation of the base sulphide ores than from the soft, friable, oxidized ores, owing to the presence in these latter of free sulphur—sometimes as high as 17%. This, together with the fact that most of these ores contained copper sulphate and ferric salts, induced in the contained gold a repugnance to quicksilver that amounted to a hobby, and that nothing but a nitric acid bath seemed to cure.

With all these difficulties to contend with, further operations were abandoned, as the purpose of the tests was accomplished. The reasons why a 20-stamp mill was ever built on this property are interesting, but "that's another story."

A summing up of the results, as far as water recovery is concerned, shows that, even with a very slimy ore, it is possible to recover over 88% of the water circulated in the mill, neglecting evaporation, which in the case described was very low, owing to the high humidity of the atmosphere.

Furthermore, although every effort was made to intercept the slimes before reaching the last slime tank, there was deposited here an amount of slimes equal to about 12% of the total of the ores worked. It is also of interest that an examination of the tailings showed but 7.5% of the total loss in the slimes, 10.5% of the total loss in the sulphides in the tailings, while 82% of the total loss was in that part of the tailings composed of coarse sands.

An analysis of the clear water in the mill tank, made at the conclusion of the operations (the water having been derived originally from saline springs), showed the following results: Solids, 1.48%, containing:

	Per Cent.
Lead	Trace
Aluminum salts	Trace
Ferrous salts	.19
Cupric salts	.35
Magnesium salts	.16
Calcium salts	.21
Potassium salts	Trace
Sodium salts	.41
Undetermined	.16
Total	1.48

Also, gold, per ton of water, $0.20; silver, per ton of water, .05 ounce.

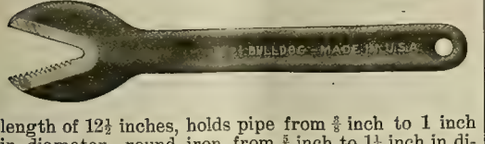
This is rather a discouraging mess for metallurgical purposes, but is interesting as demonstrating the solubility of gold in a solution of cupric and ferric salts.

In conclusion, the writer ventures the opinion that with ores of a normal character such a system as that used would probably secure a continuous flow of clear water for a 5-stamp mill, running twenty-four hours per day.

The rate of precipitation of the slimes in this case was very low, being only about .594 cubic foot of water per day per cubic foot of slimes undergoing precipitation. With a hard siliceous ore, it is likely that this rate would be at least doubled. With such a plant, however, it will be perfectly safe to base calculations on a flow of .206 gallon per hour per cubic foot of slimes in the last tank, even with very slimy ore, as the case described was probably extreme.

"Bull Dog" Wrench.

The Whitman & Barnes Manufacturing Co., having factories at Chicago, Ill., Akron, Ohio, and St. Catharines, Ontario, have recently added to their line and are placing on the market their No. 2½ "Bull Dog" wrench. This wrench, illustrated herewith, has a



length of 12½ inches, holds pipe from ⅝ inch to 1 inch in diameter, round iron from ⅝ inch to 1¼ inch in diameter. It is drop forged from special steel which the manufacturers have made to their own analysis, and is nicely finished in black with polished jaws.

The Ventilation of Mines.

Mine ventilation and sanitation is a subject of great importance to miners the world over. Coal mines become so dangerous, usually, where the ventilation is poor, from the accumulation of explosive gases, that much attention has been given this subject in that class of mines. Metal mines, being to a great extent free from firedamp, the subject of ventilation is one often given less attention than it should have, owing partly to the lack of appreciation of the existing conditions, and partly to the desire to entail no unnecessary expense—the matter of providing better ventilating facilities being too often considered as "unnecessary expense"—so long as men can be persuaded or hired to work in the vitiated atmosphere. In Western Australia the condition in some of the mines was considered sufficiently bad to warrant official investigation. In accordance with this idea a Royal Commission, consisting of trained mining men, physicians, chemists and others, whose experience and business interests fitted them for such duty, was appointed. The result of their exhaustive investigation has been published in a good sized volume entitled "Report of the Royal Commission on the Ventilation and Sanitation of Mines," issued by the Department of Mines at Perth, W. A., and from which the following has been abstracted:

Methods of Ventilation in Use.—With very few exceptions, the ventilation of the mines of this State is entirely "natural," that is, due to differences of temperature and height of the air columns in different parts of the workings. Whether this method is satisfactory or not depends on a great variety of circumstances, giving excellent results in many cases, while others are very indifferent. When there are two separate shafts to a mine, or two main airways by which a circulation of the air may be maintained from the surface into the deepest parts of the mine and thence back by a different route to the surface, the ventilation is generally pretty good, but if the airways are small and much obstructed it may be very poor. We are sorry to find this condition anything but an uncommon one in our mines. The airways ought at all times to be of such size as to easily carry the necessary quantity of air. Where there is only one opening into the workings, the shaft serving both as upcast and downcast, it is almost impossible to preserve good ventilation, as the air short-circuits from one compartment into the others at every possible opportunity, and very little of it goes through the workings. A very notable instance of this was quoted in the Victorian Mines Ventilation Bonus Board's final report, who found that of 31,348 cubic feet of air entering the shaft per minute, only 2377 feet per minute went through the workings. This phase of the question presents itself in most of the deeper mines at their lower levels, before the levels have been connected with those above them by rises and winzes, and in such workings the ventilation was often found by us to be far from satisfactory. Such places require that some mechanical means of ventilation should be employed, but outside of these there appears to be, as yet, no very great difficulty experienced in practice in ventilating all portions of even our deepest metalliferous mines by natural ventilation, so long as the levels are connected with one another right through to surface by winzes and other openings. The ventilation is, however, subject to the great drawback to all natural ventilation, viz., that the direction of the air currents is often very variable, depending on the balance of the air columns in different parts of the mine, which is much affected by the wetness of the places and by the heat generated by working and by oxidation of minerals, as well as by differences of temperature on the surface. It frequently happens, therefore, that the air currents flow one way one day and in the opposite direction on another day. Even main shafts are found at times to be upcasts and at other times downcasts. In this State this variation is all the more likely to be common because, as a rule, owing to the flatness of the country, there is little difference in the relative altitude of the tops of the upcast and downcast shafts. It necessarily follows that there must be periods of longer or shorter duration between the reversals of the air current, during which there is no circulation, and in certain parts of the mines this condition may continue long enough to be serious. There may also be local air currents circulating through certain parts of mines, the same air passing round and round without being renewed. Dr. Haldane and Messrs. Martin and Thomas, in their "Report on the Health of Cornish Miners," describe a striking instance of this in the Levant mine, the warm air from the deeper levels rising upwards through passes and worked out ground into cool wet parts of the mine and there becoming so cooled as to pass down the main shaft again instead of rising to the surface. The same air was therefore traveling round and round without leaving the mine, and necessarily became very impure. We met with a very similar case in Bayley's mine at Coolgardie in the three lowest levels.

In mines ventilated solely by natural ventilation, it is evident that the variations of the conditions causing movement of the air must be attended with corresponding variations in the velocity of the current, and, consequently, in the quantity of air passing through and the degree of purity which can be maintained. Measurements of the quantities of air entering or leaving or passing any given point in a mine, or tests of purity, therefore becomes of little use in determining the adequacy of the ventilation unless they are repeated at very frequent intervals and the results are averaged.

The want of constancy in direction and volume of the currents of air in a mine ventilated solely by natural ventilation is therefore a grave difficulty in the way of practically establishing whether or not it is adequately ventilated. Great attention should accordingly be given to regulating the air currents, so as to keep them as much as possible always moving in the same direction, and to avoid vitiated air being carried back into the workings. The methods of "splitting" the air, which have proved so advantageous in colliery ventilation, are unfortunately but little used in our metalliferous mines, but could be adopted with a great deal of benefit. Among our witnesses there were several who were well acquainted with both coal and gold mines, and their testimony was almost unanimous that collieries are, as a rule, far better ventilated than metalliferous mines, both in this State and elsewhere, although really much more difficult to deal with on account of the greater extent of their workings, their usually flat dip, and the noxious gases which emanate from the coal and the strata enclosing it, and which demand a strong and continuous current of air to sweep them away and render them harmless. They mostly agreed, also, that there was little practical difficulty in adapting the methods used in colliery ventilation to metalliferous mines, the principles being the same in both cases, and that it was the disregard of elementary principles in the latter that rendered their ventilation on the whole so much inferior to that found in good colliery practice.

The coal mines at Collie were the only mines in the State examined by us in which any serious attempt was made to replace natural ventilation by more efficient and controllable means. The Collie Proprietary Co. use a large exhaust fan, and have a ventilating furnace as a stand-by, while the Cardiff mine relied on a furnace. The fan employed gives a very poor efficiency, and could be substituted by one of the better modern types with great advantage. The furnace does fair work, but has all the drawbacks incidental to this method of ventilation, and would be preferably replaced by a good modern fan. The question of the mechanical ventilation of collieries has been so thoroughly discussed in standard text books and in numberless papers in technical journals that we have not thought it necessary to devote more than this passing reference to it, especially as the collieries are at present only small in this State, and their ventilation is a very simple problem from the colliery engineer's point of view. The main question to be decided in each case would be the choice of a suitable fan, and so many considerations of finance, business reasons and adaptation of existing plant come into this that it would be out of place for us to say what type ought to be selected.

In only a very few of the metalliferous mines examined by us has there been any serious attempt at producing ventilation by mechanical means or furnace draught. The largest installation was that at the Associated Northern mine at Kalgoorlie, where an iron pipe 12 inches in diameter leads from the foot of the roasting furnace chimney down the main shaft to the bottom level, 1050 feet, where branch pipes, 8 inches in diameter, are taken from it into the various crosscuts and drives. The chimney draught causes a fairly strong exhaust of air from the deep levels, drawing out the smoke after firing with considerable success. The draught, however, is not strong enough to clear the ends of smoke so quickly as is required, and a certain proportion of it hangs back in the level. The device caused very considerable improvement in the ventilation of the 1050-foot level, and the manager, Mr. Roberts, in his evidence, expressed himself well satisfied that its introduction had resulted in economy of working, the men losing far less time in waiting for the smoke to clear than previously. Considerable difficulty was, however, experienced with the pipes collapsing after heavy blasting, and being broken down if brought too near to the face. Stouter tubing was evidently required. In the Murchison Associated mine at Day Dawn, since the commission's visit, a small Sturtevant fan has been installed. In the other mines the mechanical appliances seen were confined to a few small water jets and compressed air injectors used for ventilating rises and dead ends. In Bayley's mine a small fan was used, driven by a compressed air engine made from an old rock drill, a device more noticeable for ingenuity than for economical use of the compressed air. Very little care had been taken with any of these appliances to secure the maximum useful effect. In the great majority of the mines the use of compressed air from the mains supplying the rock drills is looked to as the only means of blowing out the smoke from explosions, and the exhaust air from the working of the drills is relied on to keep the atmosphere fit for men to breathe. This method, therefore, calls for more extended consideration.

(To be continued.)

Gold Dredging in California.

The importance of the gold dredging industry in California is increasing with each year. From a very small beginning made nearly forty years ago, it has grown and expanded, particularly within the past decade, until it has become one of the most notable factors in the gold production of that State. This industry has been made the subject of official inquiry by the State Mining Bureau of California, and the latest bulletin issued by that institution is devoted to the subject of gold dredging as practiced in all its phases in California and from which the following is taken:

HISTORY.—It is popularly supposed that mining for gold with dredgers is an industry which has grown up within the past decade and that it was a success almost from the beginning. This is not true There are bleaching skeletons of dredgers scattered over California and New Zealand, some of which were built nearly half a century ago. There was a dredger near Oroville, on the Feather river, in the '50s. It is over forty years since dredging was first tried in New Zealand. Spasmodic attempts were made in this direction on the Pacific coast and in New Zealand from that time on. These efforts, futile as they were, so far as giving dividends to shareholders go, were of great value to the miner and mining engineer of to-day. These failures were their warnings.

As a result, this class of mining, if properly directed, is now as safe as any, provided that skilled investigators direct the investment and use of capital, and see that it is only invested where conditions permit of successful work.

Any one investigating the processes at Oroville or Folsom, or in New Zealand, where conditions are known by actual practice, will find that the difficulties have been largely overcome, because the conditions have been studied by skilled men at large expense and met with appliances fitted for the local needs, not only as to the digging of the ground, but also as to the saving of the gold.

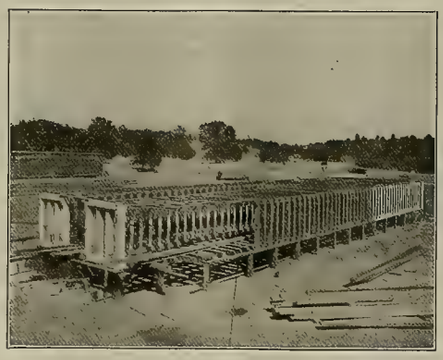
But under other conditions, in other districts, the dredgers so successful at Oroville or Folsom or in New Zealand would be failures as to some of their parts. To explain: At Oroville the gravel is loose, free from clay. There are no large boulders, the bedrock is soft, the gold is fine and it easily amalgamates. Along the streams in the mountains of California the boulders are larger, the bedrock harder, and in places in Idaho and Colorado the gold will not amalgamate owing to the presence of arsenic. Then there are many other conditions that differ in other places. Some of these difficulties may be overcome by slight changes, either in the digging part of the dredger or in the gold-saving appliances; but some of them, such as hard bedrock, in cases are fatal to successful dredging.

The conditions bearing on the cost of operation are such that each tract of ground becomes a problem in itself, and any attempt to use the costs obtained under one set of conditions, on which to predicate those which would hold under another, without a thorough knowledge of the various elements which enter into the problem, will lead to large discrepancies between the results predicted and those actually obtained, with a consequent possible failure of the enterprise.

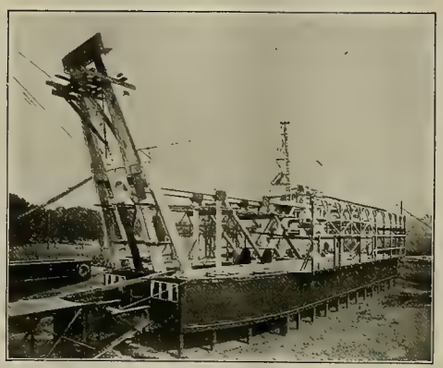
There have been built in California many dredgers that have failed and become total losses. Yet to-day, with all the data at hand for any careful investigator, there should be little excuse for failure. The varying conditions that exist where dredging is being done at Oroville, Folsom, in Trinity county, in Idaho, Montana, Colorado, British Columbia, the Klondike, Alaska and New Zealand, both as to the digging of the gravel and the saving of the gold, give the miner the actual experience necessary for him to come to conclusions under most circumstances.

The single-bucket or spoon dredger was evolved in New Zealand in the early '60s and was worked entirely by hand. A steam single-bucket dredger was built in 1870. About 1880 bucket-and ladder dredgers were introduced. These were nearly all worked with power furnished by current wheels. The first steam chain bucket dredgers of the present type were introduced about 1882. One dredger of this class, built about that time, was successfully worked for sixteen years. On account of the success of a dredger in 1889 on a branch of the Molyneux river, some twenty were built at an average cost of $17,500, but were failures, owing mainly to the fact that the ground was not suitable for dredging and the management bad. Many of these dredgers were floated down to the Molyneux river and under new ownership were made successful. Then a number of suction dredgers were built, but proved complete failures. Since then the endless-chain bucket dredger, similar to those used in California, has held the field. In New Zealand at the end of 1902 there were 201 dredgers working, 52 standing, 23 building, 14 under removal and 2 wrecked—a total of 292.

The first successful endless-chain bucket dredger in the United States was built in 1894 at Grasshopper creek, in Montana. Many attempts to dredge had been made on the Pacific coast, but it was not until 1897 that a dredger of the present type was built in California. In the summer of 1895 W. P. Hammon and Warren Treat, who were interested in horticulture near Oroville, were working some gravels for gold on property now owned by the Feather River Exploration Co. Mr. Treat had made a pit about 100 feet square down to bedrock, using a centrifugal pump to keep the water out, and hauling the gravel in wagons out to small sluice boxes, where it was washed. The gravel was handled several times by manual labor, and in spite of the heavy cost for labor and pumping water, there was a profit. Mr. Hammon had another pit, but on approaching bedrock found that the great amount of water coming in would make mining at a profit difficult.



Framework of a New Dredger in the Pit.



Hull Completed and the Gantries Up.

Ladder Frame and Rollers.

Placing Close-Connected Buckets in Position.

The attention of the writer was called to these cases and he visited the property, and, after consulting with Mr. Hammon as to the best process for working, suggested hydraulic elevators; but it was found on investigation that the distance necessary to convey water, and the large amount of water in the ground itself to be handled, would make this impracticable. At that time little was known of dredging in California. However, some of the land had been purchased through Mr. Hammon and A. F. Jones. A few months later Thomas Couch and F. T. Sutherland, from Montana, were in San Francisco, Cal., looking for mining properties. To them was suggested the Feather river gravels, and there they went, and, with Mr. Hammon, after prospecting for about a year, purchased 1000 acres, which are now being worked by five dredgers.

While they were prospecting this ground, R. H. Postlethwaite, a New Zealand engineer, who had come to California to look over the dredging field, had constructed by the Risdon Iron Works a 3¼-cubic foot bucket dredger to be used near Smartsville, on the Yuba river. While the dredger itself was satisfactory, the conditions did not permit of final success in working.

The first dredger at Oroville, built for the Feather River Exploration Co., began work March 1, 1898. It was designed by Mr. Postlethwaite and built by the Risdon Iron Works. This dredger is still being successfully operated; it has been strengthened, however, in parts.

Steam was used at first, but now all the dredgers in the Sacramento valley districts are worked by electric power. During the first two years of successful dredging at Oroville with endless-chain bucket dredgers, a number of attempts were made to dredge with suction and other styles of dredgers; but all these, with the exception of one steam shovel dredger, were failures.

AREA OF DREDGE GRAVEL.—The following table will show in a general way the acreage of gravel under consideration for dredging. It is probable that these figures will in many cases be increased and other districts opened:

District	Acreage.	Average Value per Cubic Yard, in Cents.
Oroville	7,500	17
Yuba River	5,000	25 to 30
Bear River	1,000	18 to 30
Folsom	5,000	15 to 25
Calaveras	350	16 to 22
Stanislaus	1,200	15 to 30
Trinity	1,000	... .
Shasta	1,500	.....
Siskiyou	1,000	.....
Plumas	1,500	.....
Total	25,050	

In Stanislaus county considerable prospecting has been done and about 1200 acres have been proved to contain values sufficient to warrant dredging.

In Shasta county drilling is being done on Cottonwood creek and on land opposite Redding, on the Sacramento river, and on Clear creek.

In El Dorado county some land on the South Fork of the American river, near Coloma, is being considered, but not yet reported proved.

In all these districts, and at other points in the Sacramento watershed especially, there are considerable areas of dredge gravel, most of which have been more or less examined, but not proved to be of sufficient value to work at the present cost.

The best dredge authorities claim that by proving good grade of pay in some of this outlying ground and reducing working costs, at least 25,000 acres will in time be added to the fields which it is already decided to dredge in the Sacramento valley.

In this connection experiments are being made with a view to working by a process similar to the present dredging system, but at a much lower cost. Those interested do not care to give out any data at present.

It may seem a simple thing to those who know to say that there is a great diversity in methods of gravel mining caused by varying conditions of the deposits, and that the method in vogue in one case may mean failure in another. Yet the want of this knowledge has been the cause of immense waste of capital. There have been large sums of money lost in trying to hydraulic drifting ground. Attempts have been made to use hydraulic elevators to work dredging ground where there was an excess of water to be handled. Dredgers have been built to work ground that could be worked only by means of hydraulic elevators. There are many thousands of acres of gravel, mostly lacustrine deposits, in California and other States and Territories on the Pacific coast and in Alaska that is free from water and should be worked with steam shovels, which people are now exploiting with a view to working with dredgers. In other words, they are proposing to make a condition—by flooding the ground with water—that means an unnecessary cost. A study of the conditions existing will lead to conclusions as to the methods to be adopted, and in this way only can economic success be made.

The different kinds of gravel mining, it may be said, are:

First.—Ordinary hydraulic mining, requiring water

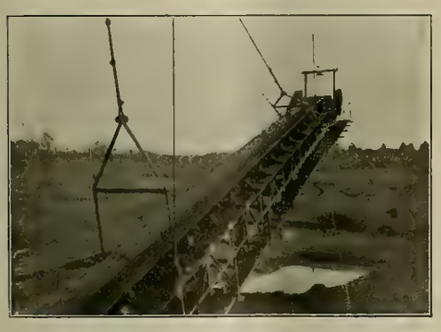
under pressure and a good dump, with gravel easily removable.

Second.—There are the drift mines in layers of gravel deposits overcapped with lava or other material of such great depth that only underground or drift mining is possible.

Third.—There are the bars along the rivers, based on hard bedrock, that must be worked with hydraulic elevators for want of dumping facilities, and which

The Tailings Stacker Drive.

The Stacker Without the Belt.



A Tailings Stacker With Belt Conveyor.

can not be worked with dredgers because the bedrock is hard. Yet in these cases it must be understood that even hydraulic elevators are of no use if there is an excess of water.

Fourth.—There is the gravel with an excess of water, with soft bedrock, that can only be worked with dredgers.

It would be futile to hydraulic the lava-capped divides in Placer and other counties in California; yet this has been attempted. They must be drifted.

It would be impossible to make an economic success of the use of hydraulic elevators at Oroville or Folsom on account of the excess of water in the gravel; yet this has been attempted.

In some mountainous districts of California dredgers have been tried and proved failures, because the bedrock was too hard to dig and the gold could not be lifted.

Then there are cases where the excess of water prevents the use of hydraulic elevators, and the hardness of the bedrock and the consequent conditions that usually follow prevent the use of dredgers. Yet inventions not now known may be made to work these gravels at a profit.

Then, again, there are large tracts of gravel, usually of lacustrine deposit, in the Sierras, not deep and not overcapped with lava, that afford good opportunity for the use of steam shovels.

Geology.—While dredge mining is being conducted under conditions apparently satisfactory to those engaged in the industry in the Sacramento valley districts of Oroville, Yuba, Folsom and Calaveras and on the Bear river, there is an interesting geological feature worthy of more than a passing thought, and that is that all this dredging is being done on what may be considered a superficial layer of gravel, underlaid by a stratum of volcanic mud and sand, the deposition of which, of course, antedated the deposition of this gravel.

The gold-bearing veins existed and were eroded for a great period of time, antedating the volcanic activity which is such a prominent feature of the Sierra Nevadas, and the ancient rivers deposited their gold-bearing debris upon the original bedrock, both within the limits of their rims and upon the floor of the great interior valley—the present valley of the Sacramento river—which at that time was a vast fresh water lake.

Subsequently the volcanic activity resulted in many instances in filling the old gold-bearing rivers to the brim with a vast quantity of volcanic material, now recognized in the mud, tufa and breccia overlying the ancient river channels, and, as a matter of course, this volcanic material was carried out into the estuaries, extending even into the lake itself to a considerable distance, and covering the previously deposited gold-bearing gravel. The subsequent uplift of the whole Sierra Nevada system has resulted in the exposure of these lake beds along the eastern edge of the Sacramento valley.

The subsequent erosion of modern streams, cutting through the original ancient river channels and often into the underlying bedrock, with its complex system of gold-bearing veins, resulted in the formation of a later bed of gravel, which rests upon the volcanic sands and mud of the lake.

Doubtless this process has been repeated a number of times, and this point could be determined by drilling or by sinking shafts. But it is clearly evident that the present dredging is not in deposits of gravel resting on the true bedrock—the slates and schists which form the adjacent foothills—but in later and, quite likely, less valuable gravel.

In many ancient river channels there are sometimes two or three gold-bearing strata, called by the miners "leads," and the stratum of gravel on the bedrock is usually the richest, while the upper strata are relatively of less value in gold per cubic yard. There are, however, instances contrary to this, where one of the upper strata is of more value; but this is due to local conditions, probably generally to the erosion of other pre-existing beds of gravel. Why this principle should not be proved true in this lake is well worth considering.

Similar conditions have been found to exist in the Cariboo country in British Columbia and in some of the mountain districts of California outside of the Sacramento valley region.

The discovery, however, of good value in these lower strata might not lead to satisfactory economic results, because the expense of handling large bodies of water that might be encountered would handicap any venture in that direction.

In connection with the question of reclaiming these dredging grounds, it may be mentioned that James H. Leggett, owner of dredgers at Oroville, has begun some experiments by planting eucalyptus and olive trees on the rock piles, with a few spadefuls of earth at the root of each tree, and they are thriving.

(To be continued.)

Iron Mistaken for Copper.

T. Lane Carter, who has lately returned to Johannesburg from a long trip north of the Zambesi, says Page's London Weekly, has been giving his fellow members of the Chemical, Metallurgical, and Mining Society of South Africa some useful hints on the subject of copper prospecting. He remarks that in the first place the prospector should know copper when he sees it, and not mistake something else for copper. A case is mentioned where a number of claims were staked out along a bold outcrop, beacons, placed, etc., but when the prospect was sampled and assayed the colored material turned out to be a silicate of iron, without a trace of copper. As to the amount of chemicals and appliances to be taken on an expedition, everything depends on circumstances. If one is to leave assay office and laboratories entirely behind and wishes to assay the copper samples at each prospect then it is necessary to have a complete outfit. This outfit must indeed be complete, for a whole expedition might be hampered by leaving behind an important chemical.

Mistakes similar to those above referred to were made in the early days in California along the Mother Lode. From El Dorado county on the north, to Mariposa county on the south, numerous copper claims were taken up and considerable work done on what was supposed to be copper ores, the bright green micaceous mineral, afterward named mariposite, being mistaken by the early prospectors for malachite, the green carbonate of copper. Glauconite and a number of other iron silicates have a green color and may be mistaken for copper ores, though containing no trace of that metal. Most copper ores are readily soluble in nitric acid, making a green solution, which the addition of an excess of ammonia will cause to turn blue. Often it at first causes a brown precipitate—iron—but by adding more ammonia (which must be done with care, to avoid spurting due to violent chemical reactions), the solution if containing copper will turn blue, the intensity of the color being greater or less according to the amount of copper present.

Electric Drill Tests.

Under date of August 8 A. W. Sayles, N. Y. representative The Mine & Smelter Supply Co. of Denver, Colo., furnishes some data, showing results of a recent test made in that city by the New York Edison Co. of the Durkee electric drill. The data are embodied in the following letter:

The Mine & Smelter Supply Co., 42 Broadway, New York City.—Gentlemen: We beg to advise you that we have made two thorough tests of the Durkee electric rock drill supplied by you to this company, and have found it most satisfactory. Both tests were made on excavation work and have shown the drill to be most efficient and economical. The first was conducted at our 121st Street station and resulted as follows:

Date.	Number of Holes Drilled.	Depth in Inches.	Number Working Hours Per Day.	Time Lost Blasting and Muck.	Number Feet Drilled Per Day.	K.W. Hours Consumed.	Cost Per Day.
				H. M.			
April 21	12	58	6¼	0 30	58	8.7	$0 87
April 22	15	58	8	1 00	73	10 5	1 09
April 23	13	58	8	1 20	63	9 4	0 94
April 25	12	58	8	1 15	58	8.7	0 87
April 26	13	58	8	1 15	63	9 4	0 94
April 27	2	58	1	0 5	10	1.5	0.15
April 28	12	58	8	1 10	58	8.7	0 87
April 29	13	58	8	1 50	63	9.4	0 94
March 1	3	58	2½	0 40	15	3.2	0.32
March 2	10	58	7	0 35	48	8.2	0 72
March 3	8	58	6	0 50	39	5.8	0 58
March 4	2	58	1	0 00	9	1 3	0.13
March 5	9	58	6	0 40	44	6 6	0.66
March 6	11	58	8	0 45	53	7.9	0.79
March 8	12	58	8	0 25	58	8 7	0 87
March 9	13	56	8	0 30	63	9 4	0 94
March 10	11	58	8	0 30	53	7 9	0 79
March 11	(5) (58)		0	0 00	00	0 0	0 00
	(6) (74)		8	0 35	61	9 0	0 90
March 12	(5) (74)		0	0 00	00	0.0	0.00
	(6) (36)		8	1 5	49	7.4	0 74
March 13	16	36	8	0 45	48	6.3	0.63

On April 21st and 27th and May 1st, 2nd, 4th and 5th the heavy rain prevented a full day's work. The average number of feet drilled per day was over 60 feet at an average cost of 1.5 cent per foot.

The second test was made at the northeast corner of 12th Street and 4th Avenue, and confirmed the figures contained in the previous test.

The following will show the work done from day to day:

Date.	Number of Holes Drilled.	Depth in Inches.	Number Working Hours Per Day.	Number Feet Drilled Per Day.	K.W. Hours Consumed.	K.W. Hours Per Foot.	Cost Per Foot.	Cost Per Day.
							Cts.	
July 5	17	48	8	68	8 09	131	1.31	$ .89
July 6	17	48	8	68	8.35	.123	1.23	835
July 7	18	48	8	72	8 06	.120	1.20	86
July 8	3	48	1 5	12	.05	.04	.40	.05
July 10	11	48	6	44	4.05	.92	.92	.405
July 11	20	36	8	60	6 45	.107	1.07	.645

On July 8th and 10th the work was stopped on account of rain. At both 121st and 12th Streets, the rock is of mica schist and muds easily, but your drill, on account of its stroke, escaped this entirely.

Thanking you for your kindness in supplying us with the drill, and congratulating you on its most satisfactory showing. Yours very truly,

(Signed) Arthur Williams,
General Inspector.

THE PROSPECTOR.

The rock samples from Goldfield, Nev., are determined as follows: No. 9, a bleached rhyolite. No. 10, gray, compact limestone No. 11 is a coarse aplite, or micaless granite. No. 12 is crystalline limestone. No. 13 is also aplite, similar to 11, but containing pink orthoclase. No. 14 is apparently a silicified rhyolite. The quartz blebs are plainly seen in this rock. No. 15, not yet determined. No. 16 is an altered and silicified eruptive rock, the original character of which it is difficult to determine in the small hand specimen. An examination of the mass from which it came might give further information on that point. No. 17 is a white, bleached rhyolite, very similar to No. 9. No. 18 is a fragmental rhyolitic rock composed of an agglomerate of pumice, quartz blebs, shattered feldspar crystals and grains of hard, firm, reddish brown rhyolite. The "sedimentary deposit beneath" may also be of volcanic material. No. 19 is a dense siliceous rock, probably an altered sedimentary. No. 20 is a flint-like rhyolite, in which a few crystals of pyrite appear. No. 21 is trachyte, in which there is considerable sanadine (glassy feldspar). No. 22 is rhyolite, similar to Nos. 9 and 17, but is stained with mineral oxides. No. 23 is not petrified wood, but a stringy, pumice-like lava, containing still numerous crystals of quartz. This stringy structure and the generally wavy appearance of the rock is due to some movement of the magma during the process of cooling, much the same as molasses candy is stretched out in the stage intermediate between the liquid and solid condition. No. 24 is a granular eruptive rock, somewhat altered. It is also apparently rhyolite.

Placer Mining in Alaska.

NUMBER II.

Horse Scraping into Sluice Boxes. — Ground which can be worked by men shoveling into sluices can, under certain conditions, be worked by horse scraping, and at one-third the expense. The most important governing condition is the degree of looseness in the gravel and in the underlying auriferous bedrock. Two horses or mules hauling a scraper, with driver, will cost from $17 to $23 a day, and in the ordinary small gravel of the Alaska placers, with soft schist bedrock, the team will scrape into the boxes from 30 to 40 cubic yards of gravel a day over a distance of 75 feet. On Penelope creek, in Seward Peninsula, it was said that the team would handle as much as ten men could shovel, the cost per cubic yard being 30 cents.

One common breaking plow with a team of horses suffices to break up enough ground for four scrapers. The method requires an inclined platform built up to a height of 10 to 15 feet above the bedrock, over the head box of the sluice. A rectangular opening in this platform serves as a chute to the dump box. Generally the horses travel in an elliptical track, passing the end of the tail box and scraping the tailings from it, then entering the pit, scraping up the pay, and afterwards delivering it to the sluice. In Seward Peninsula the cost of this method can be brought as low as 25 cents per cubic yard, and in no part of the interior will it exceed 50 cents, exclusive of top stripping.

Steam Scrapers.—The ordinary scrapers used in steam scraping operations on tailings in the Klondike have a capacity of from ⅓ to ½ cubic yard, operated by double drum, two-cylinder hoist; 16-inch drums, 25 to 30 H. P. capacity, handling on an average 250 cubic yards of loose material in twenty-four hours, at an average expense of 49 cents per cubic yard. The manipulations of the scraper, considered as a unit of the plant, take three or four men on shift—a fireman, a hoistman, and either one or two men to fill, guide and dump the scraper. The form and rigging up of the scraper, with the system of sheaves, pulling and drawback cables, is shown in Figs. 2 and 3. In practice the scrapers drag the material from the pit to the dump, a distance measured horizontally from 100 to 300 feet and vertically from 20 to 50 feet. The scrapers are not always provided with teeth like the one shown in the figure, but this is advisable. A rigid bale should never be used, as flat stones catch between it and the body of the scraper. The plants average $3500 in cost.

On Walker Fork, Forty-Mile district, Alaska, a body of gravel 60 feet in width and 5 feet in depth, with little or no stripping, was mined. According to information, the gravel was only partially free, and little or no stripping was required. As a rule the scraper was found to clean the schist bedrock satisfactorily. The scraper used had a capacity of one-fifth cubic yard, being an ordinary horse scraper rigged for steam with pulling and drawback cables. A 6 H. P. hoist operated the scraper, giving a capacity of 100 cubic yards in twenty-four hours. The 10 H. P. boiler also furnished steam to operate the bucket elevator which lifted the gravel to the sluice from the hopper, to which it was dumped by the scraper. A conservative estimate places the cost of handling gravel with rig, three men being employed and one-half cord of wood burned in ten hours, at 40 cents per cubic yard.

The plant contains the elements of a device which, it is not unlikely, may be applied to the working of the wide, shallow creek deposits of Seward Peninsula, or of such creeks of the interior as Mammoth, in the Birch Creek district, or lower Pedro, in the Fairbanks district. If circumstances warranted, the sheave anchor (a rock-filled crib) could be made more easily movable by mounting it on a truck running on track, it being made fast by cable and deadman when occasion might require. The bucket elevator employed is not recommended, as the use of such contrivances for handling gravel, unless they are specially and expensively constructed — as on large dredges — is condemned by experience. In place of this, the scraper should be dragged entirely to the point of final discharge to the sluice on an inclined platform. The operation will necessitate the building of a more elevated sluice or washing plant, surmounted by a hopper, the gravel being fed from this in order that the feed may be as nearly continuous as possible. Assuming that the elevation of the head box of the sluice shown in the illustration is 12 feet above the surface of the ground, the scraper could be dragged to double this elevation at a cost not exceeding 10% above that necessary to haul it up to the 12-foot elevation.

In general, it may be said that this method is applicable to operations on schist bedrock, but is entirely impracticable on limestone or other hard bedrock. This is also true of the steam shovel and dredging methods. Grant that bedrock conditions are suitable, and consider a solidly frozen deposit of characteristic small gravel with muck and moss overburden, 150 feet width of pay and 7 feet in total depth from grass roots to bottom of pay. After the moss is plowed up, the 3 feet depth of muck can be ground-sluiced off in the ordinary manner at an expense of, say, 15 cents per cubic yard. The ground sluicing should be done at the earliest possible moment in the open season, or preferably late in the fall. The operator now has to deal with a stripped block of frozen gravel and auriferous bedrock 4 feet in depth, carrying pay, or the material which it is desired to sluice. A vertical bank of this material cannot be attacked by any mechanical appliance yet devised, but if left uncovered for six weeks it will thaw to bedrock. The operator, however, wishes to take advantage of the continual thawing of the surface by the sun, and to do this he must attack not a

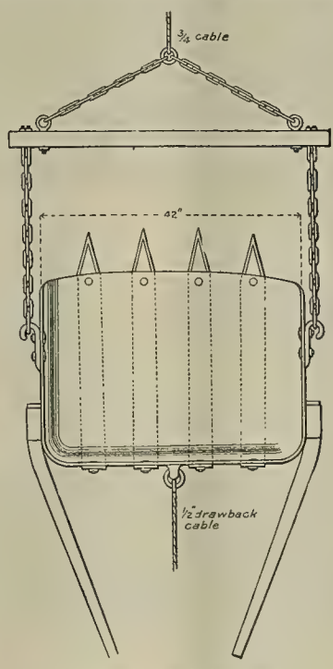


Fig. 2—Toothed Scraper.

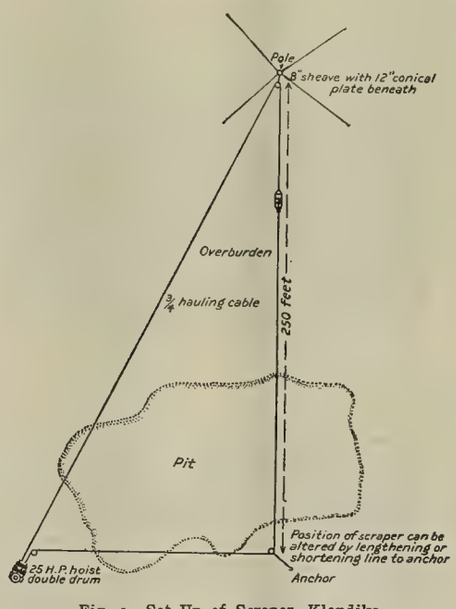


Fig. 3—Set Up of Scraper, Klondike.

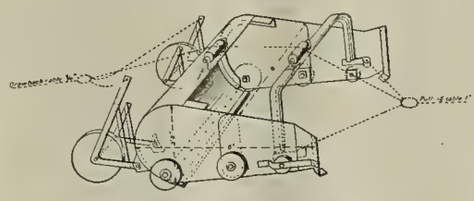


Fig. 4—Bottomless Steam Scraper.

vertical but a horizontal surface. The rate of natural thawing varies from 6 inches to 1 foot a week. The scraper, armed with teeth rigged so as to make a series of transverse cuts, say for 300 feet lengthwise of the channel, will attack the ground, scraping off the thawed material better than any other mechanical appliance.

The sluice boxes or washing plant, built to a height of 25 feet above the surface of the ground, can now be approached by a broad incline platform, or if desired the scraper may dump to cars, which convey the material by gravity to an isolated and conveniently situated washing plant. The system adopted will depend on the magnitude of the operations. In only very exceptional cases should the expense of handling, after the material is once dumped from the scraper, be allowed to exceed 5 cents to the cubic yard.

The plant above suggested implies the use of a scraper of large capacity and should handle the gravel at a total cost, including depreciation charge and added cost of stripping, not to exceed 40 cents per cubic yard in Alaska, provided that 700 cubic yards of gravel a day are sent to the sluice. In order to accomplish this a scraper, preferably of the bottomless, self-dumping type, of 6 yards theoretical capacity, should be used. It will be found that actually 3½ yards will be delivered each time by such a scraper. The operations will require a 60 H. P. boiler and double-drum hoist, and the services of seven men on a shift. The total running expense of the plant should not exceed $150 a day of twenty-four hours.

The double-drum hoist operating the scraper will have a position on the side of the sluice opposite that of the cut, and can be mounted on skids so that it can be easily moved by means of a sheave and deadman if necessary. The sheave through which the drawback cable runs may be anchored to a weighted car running on 200 feet of track laid parallel with the cut on the side opposite that occupied by the sluice and hoist. If it is desired to keep the drawback cable out of the way it may pass through two sheaves, one anchored to traveling anchor and one to deadman, the cables thus forming a triangular arrangement, two of whose angles will vary as the car is moved to cover various parts of the ground. The car may be moved as often as desired, and thus one furrow after another may be made by the scraper over a triangular area as the ground thaws. By means of a rearrangement of the sheaves it is found that nearly all of the ground can be covered. A plant erected for the Klamath River G. M. Co.* is provided with two 1½-yard scrapers, which travel back and forth alternately, both cables acting as pulley and drawback cables. Two sheaves are used on the side of the excavation opposite to the washing plant. "These sheaves are attached to a spreader which keeps them spaced a given distance apart, and to each end of the spreader is attached a tackle which runs back at an angle to deadmen, to which they are securely anchored."

The type of bottomless scraper shown in Fig. 4 was seen in successful operation stripping loam at a reservoir excavation near Portland, Oregon. It has a theoretical capacity of 6 yards, and actually handles over half this amount. Measurements of a spoil bank showed that in seven ten-hour days, stripping to 4 feet in depth, 400 cubic yards per shift had been handled. The scraper was making furrows over 300 feet in length. A 60 H. P. boiler was used, but only one cord of wood at $2 per cord was burned. The double-drum hoist was provided with 10x12-inch cylinders and was gearded 6 to 1. Four men, a winchman, fireman, and two scraper men were employed, at $2.50 a day. It was said that under these conditions the operations cost 5 cents per cubic yard. It was estimated that in a haul of from 150 to 200 feet the scraper would deliver loam to the spoil heap at the rate of 2 cubic yards per minute.

The above suggestions regarding the use of self-dumping scrapers in northern placer mining will doubtless be looked on with considerable skepticism. No direct application of the method has, so far as known, been made in Alaska. The form of plant outlined is inexpensive as compared with many already installed in Alaska, having a capacity not exceeding 700 cubic yards. The sum of $10,000 should be ample to install an entire scraper and washing plant in Seward Peninsula. Even should some form of steam scraping be found applicable to the wider shallow deposits, the installation of elaborate cableways, traveling towers, and the like, is not advisable, as in most cases their cost would be prohibitory.

*Yeatman, J. A., Automatic excavator for placer mining: Min. and Sci. Press, Dec. 17, 1904.

(TO BE CONTINUED.)

Potassium Cyanide in the Blast Furnace.

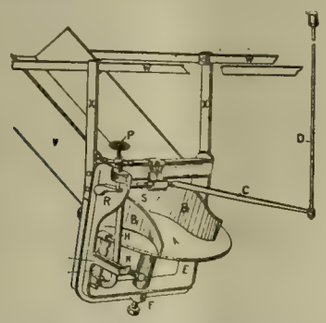
The production of an inferior material in the puddling furnace when the best pig iron is used has been attributed to the action of nitrogen in the blast furnace. H. Braune, in Oest. Zeit., 1905 LIII, p. 153, considers that it is mainly due to the formation of potassium cyanide and similar products which owe their origin to the use of basic charges, together with high pressure and temperature of the air blast. Iron and free nitrogen do not combine directly at any temperature, but if the nitrogen is combined, as in potassium cyanide, combination with the iron can take place very easily, the reaction being accelerated by rising temperature. Iron oxide is also not attacked by free nitrogen, but it readily reacts with potassium cyanide as follows: $KCN + FeO = Fe + KCNO$. The potassium cyanate takes up oxygen, forming carbonate, which rises to the furnace mouth and is found in the flues and downcomers. If bisilicate charges be used, and the iron be blown with the blast heated to 150° to 200° C., only traces of nitrogen are found in the resulting product. To remove nitrogen from steel attempts have been made to use titanium thermite.

Mining and Metallurgical Patents.

PATENTS ISSUED AUGUST 1, 1905.

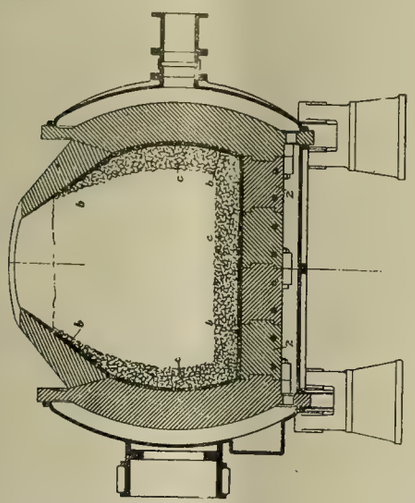
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE FEEDER.—No. 795,923; M. Nelson, Kalgoorlie, Western Australia, Australia.



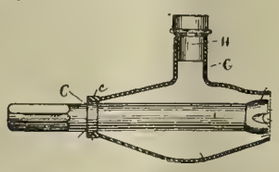
Ore feeder comprising ore chute, rotatively mounted receiving table located at discharge end of chute, guide wings for table secured to discharge end of chute and projecting outwardly therefrom abreast of table, means for intermittently rotating table, and means for adjusting table toward and away from wings.

CONVERTER LINING.—No 796,170; C. M. Allen, Lolo, Mont.



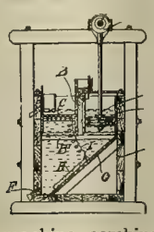
Copper converter having air tuyeres, and distributed unpacked adherent interior lining of material containing silica.

ATTACHMENT FOR ROCK DRILLS. — No. 796,327; M. Hardsocg, Ottumwa, Iowa.



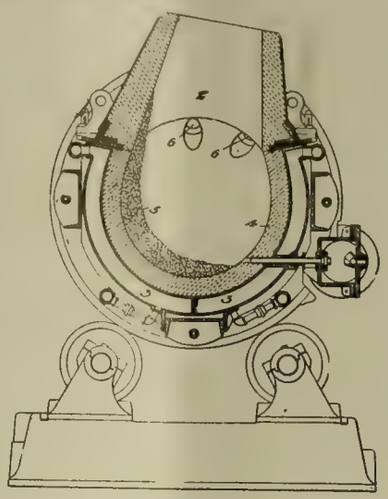
In combination with bit, protective sheath having walls of flexible material and having enlarged body portion terminating at one end in mouth having edges adapted to abut against substance being acted upon, body terminating at opposite end in opening surrounded by elastic flange adapted to impinge against shank of bit for holding sheath in fixed contact with bit and allowing body to be laterally expanded with the forward movement of the bit, and an exhaust pipe for exhausting air from interior of sheath.

ORE DRESSING MACHINE.—No. 796,172; H. S. Anderson and J. W. Bennie, Clifton, Ariz.



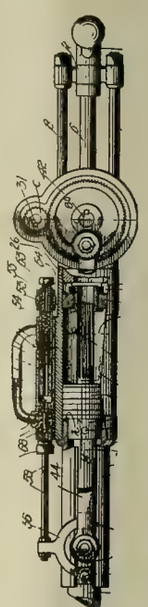
In ore dressing machine, combination of containing vessel, metallic screen therein forming electrode, electrolytic liquid containing metallic salt derived from ore treated and submerging screen, means for causing liquid to pass and repass through screen, second electrode in vessel submerged in liquid and subject to current thereof, and means for maintaining screen in electronegative condition relatively to second electrode.

METHOD OF CONVERTING MATTE.—No. 796,282; R Baggaley, Pittsburg, Pa.



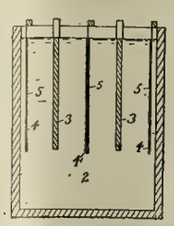
Method of converting matte, which consists in distributing lining of unpacked siliceous material over working area of interior of converter, cintering same in place, introducing matte into converter, and blowing air therethrough.

ROCK DRILL.—No. 796,228; E. R Langford, Los Angeles, Cal.



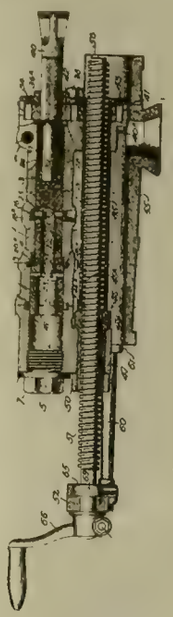
Cylinder, piston therein, piston rod connected thereto, slotted extension from forward end of cylinder, sleeve on piston rod having wing which plays in slot of extension, head on rear of cylinder, head having cupped portion and plurality of journals, shaft in one journal, gear on shaft and within cupped portion, driving shaft in other journal, pinion on driving shaft within cupped portion meshing with gear, pitman, crank pin through one end of pitman screwed to gear, and pin through other end of pitman screwed to wing of sleeve.

ELECTROLYTICALLY REFINING SILVER.—No. 795,887; A. G. Betts, Troy, N. Y.



Process of electrolytically refining silver which consists in subjecting silver alloy anode to electric current in electrolyte containing free, non-oxidizing, strong acid forming readily soluble silver salt, and silver salt of acid, and electrolytically depositing silver on suitable cathode.

DRILL BIT ROTATING MECHANISM FOR ROCK DRILLING ENGINES.—No. 796,081; J. G. Leyner, Denver, Colo.

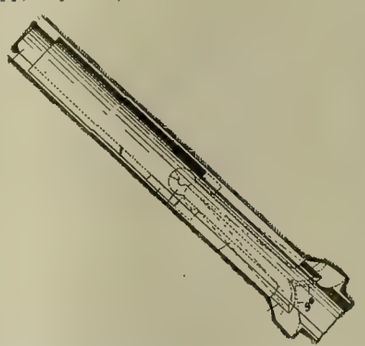


A rock drill, comprising cylinder having piston hammer and revoluble drill chuck, support on which cylinder is slidably mounted, feed screw in engagement with cylinder and support, and means whereby rotation of screw effects rotation of chuck.

CRUSHING ROLLS.—No. 796,244; R. Pick, Buffalo, N. Y.

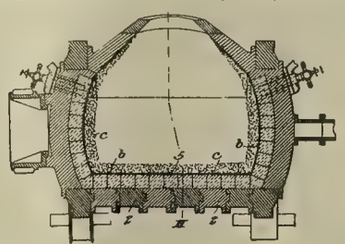
Crushing roll having peripheral ribs arranged at angle with relation to roll axis, each of ribs having plurality of transverse V-shaped grooves.

DRILL HOLE ENLARGING DEVICE.—No. 796,165; T. M. Topp, Raymond, Cal.



Device for enlarging and chambering drill holes, including shanks having outwardly turned bits at one end, segmental heads at opposite end about which they are turnable, heads having divergent adjacent faces and interlocking point and socket central of curvature of heads, shank having transversely disposed segmental channel within which heads fit and are turnable, and fixed wedge shaped block whereby bits are forcibly separated at each stroke or impulse.

COPPER CONVERTER.—No. 796,174; R. Baggaley, Pittsburg, Pa , and C. M. Allen, Lolo, Mont.



Copper converter having compacted silica lining and interior lining of unpacked material containing ore.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

Dredging operations are in progress on the upper Yukon. Moncrieff Segber's dredger has been put on Bonanza creek. Another big dredger at the mouth of Bear creek is handling thousands of tons of gravel. With favorable conditions it handles 2000 cubic yards of dirt daily, though much of the ground is frozen. This dredger digs 35 feet below the surface of the water, throws the tailings 22 feet high and stacks them 90 feet back of the machine. The hulls of the steamers Ora and Nora are being used to form the twin hull of the dredger which J. J. Rutledge is building for Forty-Mile river. He will dredge the stream for 6 miles from the mouth up. A dredger which the Williams Co. is taking down the Yukon from White Horse will work a big concession in the Klondike basin, between the Klondike City bridge and Ogilvie bridge. —— It is reported from Fairbanks that 250 men have gone from there to the new Kantishna gold strike, 150 miles in the interior from Fairbanks. Steamers run within 75 miles of the diggings. Pans on Eureka creek yield from $5 to $10. A townsite has been started.

ARIZONA.

Cochise County.

The Tombstone Con. M. Co. expects to increase the capacity of the present Girard mill to forty stamps and put up a cyanide plant. The ore tests made have proven satisfactory and the plans for the treatment of the large ore reserves have been decided upon. The company owns the Grand Central mill on the river, and twenty stamps are to be brought to Tombstone and added to the Girard mill. The third large pump at the 800-foot level is expected to be in operation by September 1. At the Emerald, Lucky Cuss, Tranquility and Silver Thread, work continues with the same force.

Gila County.

J. C. Erman, in charge of operations at the Keystone Copper Co.'s mines, west of Globe, has been experimenting with electrolytic copper precipitation at the mine and has produced several sheets of copper. The ore in solution is allowed to flow upon large copper plates on which precipitation takes place and the sheets are stripped from the plates as soon as this precipitation ceases to be complete. The ore carries chrysocolla with occasional carbonates and a little chalcopyrite in an 18-inch fissure vein traversing granite. Considerable ore has been shipped to the Old Dominion smelter.

W. A. Thompson and Rayson have taken a bond on the Barnett gold mine at Bloody Tanks, near Globe. Machinery for treating the ores is to be put in.——Frank Thompson of Globe has bonded some claims on Pinto creek to A. W. Sydnor, who is associated with A. West & Bro. in operating the property. —— A. C. Sheldon of Phœnix, after examining the Iron Cap property, east of Globe, has interested capital in Salem and Beverly, Mass., to carry out the company's plans. Active work will be commenced within a month.

Graham County.

(Special Correspondence.)—Superintendent Rosecrans of the Standard Consolidated C. Co. at Clifton recently closed down the tramway for ten days while the towers were strengthened. In the deepest workings a 5-foot vein of ore has been uncovered which may average 10% copper. The first shipment is now ready from the San Jose mines. The company was formed as a merger of the Coronado M. Co., Standard copper mines and the San Jose mines, on Chase creek, 5 miles north of Clifton. The ore is carried from the mine to the Coronado Railroad by a 3200-foot Leschen aerial tram, with a drop of 800 feet, which carries the ore at a cost of 5 cents per ton, as compared with $2 per ton when shipped by burros.

Clifton, Aug. 14.

B. M. Crawford, manager of the Crawford G. M. Co., operating near Clifton, states that work is being pushed on three levels of the mine, and that two new winzes are being sunk. Development work has also been commenced on the Lefave property, recently purchased by the company. Good milling ore is being developed in all of the workings.

The Detroit Copper M. Co. will put in a new electric motor to handle the air compressor and hoist at the Old Yankee. The air compressor which is running the drills in that mine and which is on the third level will be brought to the surface. Gas has been used largely for power. A Loomis generator, with capacity for making gas to supply 1000 H. P. from New Mexico bituminous coal, has given satisfaction, averaging 1 H. P. hour from 1.5 to 1.75 pound of coal, making a saving of 30% in fuel cost. Gas is used for power throughout the mine and plant, except in the locomotives and hoists.

Mohave County.

(Special Correspondence).—At the West Gold Road mine at Acme Superintendent J. D. Spargo is putting up a blacksmith shop and office, and, for the present, is developing the mine with a 15 H. P. Union gas engine.

Acme, Aug. 16.

O. F. Kuencer, superintendent of the German-American mines, near Vivian, reports that sinking is in progress on the Thirty-fifth Parallel, Treadwell and Pioneer of the German-American group, but that the volume of water shows no appreciable increase. The shafts range in depth from 225 to 250 feet, and in all of them the ore bodies are improving in width and value. It is proposed to sink the shafts to a depth of 400 feet, and if water in quantity is not developed it is probable that a supply will be obtained from the Colorado river.

Yuma County.

It is reported that the Colonial M. Co. have sunk a 180-foot double-compartment shaft on their quicksilver mine at Cinnabar, 14 miles from Ehrenberg. Manager L. S. Judd has been purchasing material for a reduction plant.

Yavapai County.

The Richinbar M. Co. will put in a 50-ton cyanide plant at their works at Richinbar.

The Planet & Saturn mine, near Congress, has been sold to H. J. Beemer by W. A. Clark.

CALIFORNIA.

According to E. W. Parker, in a recent report of the U. S. Geological Survey, the total production of coal in California in 1904 was 78,888 short tons, valued at $375,581. All of the coal produced in both California and Oregon is lignitic in character. There are in California a number of rather widely separated lignite areas, the chief of which are the Mount Diablo and Corral Hollow fields. The principal production is from the counties of Alameda and Contra Costa, while small amounts are mined in Kern, Monterey, Riverside and Siskiyou counties. The Corral Hollow field is in Alameda county and Mount Diablo in Contra Costa county. Two other areas which have produced small amounts of coal are the Ione field, in Amador county, and a small area near Elsinore, in Riverside county. In a number of other counties coal or lignite beds have been prospected to a greater or less extent, and Butte, Del Norte, Orange, Fresno, Monterey, San Diego and other counties have produced small amounts in the past. Some recent prospecting has been done in Fresno, Mendocino, Placer, Orange and Trinity counties, but little encouragement is held out for any extensive development. The greatly increased production and increasing use of crude petroleum as a fuel has not encouraged the development of the coal mining industry in California in the last few years. It is believed, however, that the recent demonstrations made at the Geological Survey coal testing plant at St. Louis, Mo., and which have shown the excellent producer gas-making qualities of lignite, will create a demand for this class of fuel and stimulate production in this State. In 1903 there were produced 104,673 short tons, valued at $294,736. This indicates a decrease in quantity of 25,785 short tons in 1904 and an increase in value of $80,845. This increase in value, in spite of the smaller production, was due to the fact that all of the product of the Tesla mine, the largest producer in the State, was shipped to Stockton and manufactured into briquettes. The value is given for the briquetted fuel. The plant at Stockton is of new construction and has a capacity of 125 tons per day of ten hours. The briquettes produced are round, convex lenses, or "boulets," weighing from six to eight ounces. Asphaltic pitch from California crude petroleum is used as a binder, the reduction from the crude petroleum to pitch being done at the plant. The briquettes are compressed under very heavy pressure and each one is dropped 25 feet to a storage bin shortly after leaving the press. So far as the writer is informed, this is the only coal briquetting plant in practical operation in the United States up to the close of 1904. There are, however, a number of experimental plants in operation, and several plants are under construction or in contemplation. One of these is at Oakland and another at Pittsburg, both in California. The decrease of production in California in 1904 was due in most part to the mines at Pittsburg being shut down, awaiting the completion of the briquetting plant.

Butte County.

The Sky High mine, on Gravel range, near Powelton, has been sold by George Broden and Gordon Graham for $30,000.

Calaveras County.

S. W. Newell has contracted with Manager G. McM. Ross of the Union Copper M. Co. at Copperopolis to haul the supplies for the mines and the output of the smelters with a traction engine on the roads between Milton or a station on the Sierra Railway, as may be determined later.

The San Andreas Blue Gravel mine has been unwatered and sinking and drifting started.

Lake County.

(Special Correspondence). — The Baker mine, near Lower Lake, is now in operation under Manager Dack, and is producing about thirty-four flasks monthly. Until recently this mine was not a commercial success, but under the new management is said to be paying well.

Lower Lake, Aug. 14.

El Dorado County.

W. F. Russell of St. Louis and T. Arbuckle of Cincinnati have been inspecting the Argonaut mine, near Greenwood, and if satisfactory arrangements can be made, it is reported that they will put up a 60-stamp mill and work the mine. The mine is owned by John Smith of Greenwood and C. M. Jordan of Placerville. —— At the Live Oak mine, Reservoir Hill, near Placerville, the rich body of gravel holds good.—— At the Last Chance mine, Nashville district, some very rich ore is being taken out. Sinking is being done with fifteen men.——At the Havilah mine, near Nashville, a strong pay ledge is being developed and seventy-five men are employed.

Humboldt County.

In the Orleans Bar section the hydraulic claims are all shut down, on account of scarcity of water, and very little will be done there in mining until the rainy season commences, about November. The past season in that section has been very good for the miners, who have taken out as much gold as the average season.——Quigley Bros. & Hegler have finished a 280-foot dam at the Lew Doggett place on Klamath river, near Riverside, 12 miles from Arcata, and have pumped out the water, so as to commence sinking to bedrock in the river.——A. C. Brokaw of the Advance mine is ready to put in a new 10-stamp quartz mill at the mouth of China gulch. He will commence building a wagon road, also digging a ditch and building flume from Russian creek.——The Medina M. Co. at Oro Fino are working the Johnson mine. The work on the Gardner ledge is proceeding, and good ore is being taken out. The mill is closed down for lack of water.

Mono County.

The Noonday mine and the South End mill at Bodie have stopped work.

Nevada County.

The 10-stamp mill at the Culbertson mine, near Graniteville, is running, it having been leased by John Keller and son Albert, who are opening up their claim, which adjoins the Culbertson.

Under the direction of Superintendent W. M. Wilson, the Omega M. Co. has commenced building a new restraining dam in the canyon below the mine, near Washington. It is expected to have the dam ready for inspection before winter sets in, as the company desire to make a good run during the rainy season. The barrier will be larger than the one which was blown up last winter and it will be constructed of concrete.

W. S. May has completed overhauling the Pennsylvania mill, near Grass Valley, and will resume crushing ore from the mine.

Shasta County.

The Bully Hill C. Co. has twenty miners employed at the old Winthrop mine at Copper City. Day and night shifts are at work. Ore was recently found in the Upper Winthrop, which is worked through an upper tunnel.

Sierra County.

The Mabel mine, American hill, near Alleghany, is being worked with twenty men under the management of A. J. McCoy. This mine is owned by J. W. Morrell & Co.

Siskiyou County.

The Mono M. Co. at Punch creek, near Humbug, is putting in a 12-stamp outfit, also concentrators and cyanide vats to work the tailings and sulphurets. The mill is to be operated by electricity from the Siskiyou Power Co.——The Eliza quartz mine on north fork of Humbug, near Yreka, is to be opened by Patterson of Portland. At the end of the old tunnel a 7-foot ledge has been developed. The new owners intend putting up a 10-stamp steam mill, having figured that it is cheaper than to extend electric wiring 3 miles from the Mono mine.

COLORADO.

Clear Creek County.

Ore from the Santiago mine, in the East Argentine district, is being crushed in the Clear Creek mill, which was recently purchased by W. Rogers, general manager of the Hazelton-Santiago Con. M. Co. The mill has been overhauled and will handle from 50 to 100 tons of ore during each twenty-four hours. The treatment consists of first crushing the ore, then running it through jigs, after which it is reground and run over the tables. The plant is so arranged that the tailings will be dumped back of the mill, where they will remain until the cyanide tanks, which have been ordered, have been put in. The concentrating material which is being delivered at the mill is being taken from the dumps of tunnel No. 3. The smelting material is being taken from the development work now going on in tunnel No. 3. F. A. Maxwell, lessee of the Colorado Central, has made arrangements for the treatment of ore which will be taken from the upper dumps on that property. David Kennedy, owner of the Centennial, will also send ore to mill for treatment.——The Bi-Metallic tunnel on McClellan mountain, near Georgetown, is in 725 feet. It is understood that the Bi-Metallic G. & S. M. Co. will put in machinery. J. W. Boughton of Philadelphia, Pa., president of the company, recently visited the property and made arrangements for increased work.——At the Mineral Chief on Democrat mountain, near Georgetown, Manager W. C. Hood is working through the Moline tunnel.——Henry Seifried of Georgetown has purchased a one-half interest in the McClellan mine on Leavenworth mountain.——The Kirtley mine on Leavenworth mountain, near Georgetown, is to be developed. Jefferson Raynolds of Las Vegas, New Mexico, has bought a one-fifth interest in the property from the estate of C. A. Martine and preparations are under way for development through the Equator tunnel. A drift is to be run west 700 feet for the purpose of cutting under the old ore shoot.——The Independent M. Co., operating the West Griffith property on Griffith mountain has made connection with the East Griffith workings.

Near Empire, the Charter Raton Co. are developing claims on Breckenridge mountain, and have driven crosscut tunnels in 150 feet from the portal.——The Marshall Russell tunnel is still making good progress since the washing out of their water power dam and the bursting of their air compressor. They have put in a new air compressor. J. Bridge has a 500-foot contract on the tunnel, which enters the mountain near Empire Station.

Gilpin County.

Machinery is being put in by the Victoria-Phœnix G. M. Co., on Mineral hill, north of Boulder park in the Phœnix district, a new road having been built up Buckeye mountain.——At the East Boston shaft of the East Boston M. Co. drifting is being carried on in the 600-foot level, while in the 500-foot level both stoping and drifting is being carried on. The east and west levels of the Rialto are being extended and an upraise is being made to the 500-foot level both for opening up ore and improving ventilation. S. Hoskin is manager and W. Job is foreman.——It is reported that the owners of the Russell property in Russell district have decided to resume operations with F. Paxton as manager. A heavier plant of machinery is planned for the main shaft workings of the group.——The Perrin shaft in Russell district is down 200 feet.——The Esculapian G. M. Co. is developing the Star of the West, in the Lake and Russell districts, under the management of W. J. Blake of Denver. Operations are being carried on through the Gibson shaft, which has been retimbered and the levels cleaned out. The main shaft on the Gibson is down 225 feet, and after doing some development work in the 200-foot workings, Manager Blake decided that additional depth was needed in order to open up the ore bodies for production, and sinking operations have been commenced to go down another 100 feet.——The Raven group, in Russell and Lake districts, is being worked by the Pearce Gold M. Co., with H. G. Pearce of Denver as

manager A gasoline hoist, formerly on the Hamlet mine in Gregory district, is being put in and an addition is being made to the shaft building. The main shaft is down 200 feet and will be sunk another lift of 100 feet. F. Hardy is in charge of work.

The recent damage to the hoist of the East Notaway mine in Russell district, southeast of Central City, has been repaired and hoisting resumed by Superintendent T. G. Martin. —— A. Kapella has charge of work at the Powers mine in lower Russell district. Stoping is being done in the 200-foot east level and an upraise is being made from this level to the old workings of the Powers shaft. F. Murphy is manager for the owners.——Hoisting water from the Saratoga shaft was commenced with the water standing a little below the 450-foot level. Griffith & Co. will hoist the water to the 550-foot point, after which Owen & Co. are expected to take the water at least 200 feet deeper, so that work can be carried on in some of the lower levels. Griffith & Co. of Russell Gulch have been working the upper levels.

Gunnison County.

At the Midland mine, on Beaver creek, near Vulcan, the crosscut tunnel, which is to go in 1300 feet, has been run 100 feet. A new mill with amalgamation and cyanide equipment is planned. T. J. Thompson of Gunnison is interested.

The Ashland M. Co., operating the Carter tunnel under the management of C. M. Carter, near Ohio City, has cut what is believed to be the same vein that was lately cut by the Raymond tunnel. A larger compressor and drills have been ordered.

Lake County.

It is announced that the Yak tunnel will be extended from the Ibex mines into the Big Evans section to drain the mines in that quarter. The drive will be about 5000 feet. It is now over 2 miles long. It would strike underneath No. 2 shaft of the Resurrection, 30 feet deeper than the present depth of that shaft, which is 950 feet. The whole of the Big Evans basin would be drained and the mines will have no further trouble from water.—— Another find of molybdenite has been opened by Simons & Moorhead in their claims at Twin Lakes. Arrangements are being made with the Colorado Tungsten Co. to handle all of the output, and shipments will start in a few days.

Park County.

At a recent meeting of the Colorado-Minnesota M. Co., engineers recommended that the company erect a concentrating plant of a capacity of fifty tons per day, and this was ordered done by a majority vote. M. D. Sterrett of Colorado Springs was chosen president; F. O. Sterrett of Colorado Springs, secretary and treasurer; W. L. Boatright, assistant secretary. The company owns thirteen claims in the Tarryall district.

San Juan County.

(Special Correspondence).—On the Animas river, 6 miles north from Silverton, the Hamlet M. & M. Co. are operating their 50-ton mill, which consists of crushers, rolls, jigs and concentrating tables. A canvas plant is being added to the mill. This company are the owners of ten claims on Galena mountain, and so far the mine is developed by four tunnels on the vein, all of which are producing ore. Another tunnel is being driven 300 feet below the present workings. The present workings are 1000 feet higher, vertically, than the top of the mill. As the mine is developed and tonnage increased the capacity of the mill will be increased. The ore carries copper, zinc and some lead. A jigback tramway delivers the ore from the mine to the mill. A carload of concentrates is shipped every two and a half days. Geo. Robin is manager of mine and Chas. Gray, mill superintendent.

Howardsville, Aug. 12.

(Special Correspondence).—T. H. Kane, general manager of the Hercules Con. M. Co., has been blocking out ore preparatory to starting up his 100-ton concentrating mill. New machinery will be put in and the mill capacity will be increased to 150 tons.——About 1½ miles down Cement creek from the Gold King mill the Stony Pass M. Co. are driving a tunnel to tap several veins which are known to exist in Prospect basin. The tunnel is in 1420 feet and A. W. Hall, president of the company, thinks that the first large vein will be cut in the next 100 feet. They have already cut several small veins in the tunnel. The electric drill which was purchased some time ago will soon be started up. It is understood an electric hoist will be put in. J. W. Doolan is superintendent.

Silverton, Aug. 12.

(Special Correspondence).—The 80-stamp mill of the Gold King Co. is handling 300 tons of ore per day. After catching a good percentage of the values on the copper plates it passes over Frue vanners and from there to the new mill, which consists of four tube mills and thirty-six Wilfley slimers. It is said the tailings after passing through the new mill and which are sampled automatically contain but a trace of gold. The De Laval steam turbines, which were installed by the Denver Engineering Works, are doing excellent work at this mill.

Gladstone, Aug. 12.

The Ruby Basin M. & T. Co. is shipping 50% lead concentrates from the south Mineral creek mill, near Silverton. The best ore comes from a shaft now down to a depth of 25 feet on the December vein. This shaft will be put down to a depth of 100 feet, when levels will be run and a pumping station put in. The crosscut tunnel on the Ruby property is in the meantime to be continued from its present 1400-foot point on to the Tornado lode. T. J. Hurley has charge.

San Miguel County.

At Ophir Loop Superintendent Ladd has twenty men at work on the Butler vein of the Ophir Con. M. Co. and in the 10-stamp mill.——Chas. De Witt is to develop the Merrimac claims in the Ophir district.——The Gold King Basin M. & M. Co. is making preliminary tests of the ore carried by the principal vein of its claims in Gold King basin, preparatory to making improvements. Two mill runs, one from the upper tunnel and the other from the lower, are being taken out and will be treated at the Gold King 40-stamp mill. Chas. De Witt is foreman.

Summit County.

S. F. Stoughton has bonded and leased the Carrie mine and 10-stamp mill, near Frisco, for the King Solomon M. Co. The mill is being overhauled and refitted and the 900-foot tunnel has been cleared out.

The Carbonate and Little Tommy groups on Mount Baldy, near Breckenridge, have been bought by the Buckeye M. Co. and are being worked under the superintendency of G. E. Moon.——The Lucky mill, near Breckenridge, has been overhauled and started up by the Beaver Creek M. Co., on lead ore.

The new 100-ton capacity concentration mill of the Old Union M. & M. Co., on Mineral Hill near Breckenridge, was started, after some alteration in the machinery. The mill is believed to now be in good shape to handle the second-class ore from the tunnel which the company is driving to connect with the two shafts and the levels therefrom.——G. C. Smith is working the Copper King and Copper Queen ledges in Muggins gulch, near Breckenridge.

Teller County.

Geo. Kimball of Idaho Springs and Geo. Leyner of Denver have purchased the Gillett cyanide mill at Cripple Creek and have teams and men working over the dump of the Gillett reduction works. —— The lessees operating the lower shaft of the Agnes Co., on Beacon hill, Cripple Creek, have opened a new body of ore and are building ore bins to hold the rock.——The eighty men who were laid off for two weeks at the Portland property on account of repairs being made at the mill in Colorado City have been put back to work. The ore body recently opened is holding out well. It was found at a depth of 1350 feet in virgin territory.——At Cripple Creek the Moose Co. has finished timbering the Trilby workings and operations have been suspended until after the meeting of the company.——The K. C. Mutual M. Co., working a portion of the Jerry Johnson, have cut a strong vein in driving north in the 100-foot level. As soon as the surface water sinks sufficiently to permit sinking the shaft will be continued down to a depth of 250 feet.——The Stratton-Cripple Creek M. & D. Co. has appointed G. L. Keener lease manager of the company.

IDAHO.

Boise County.

L. and A. Unternaher of Boise are opening up a rich quartz property on Hay Fork creek, 16 miles east of Idaho City. It is reported that they intend putting in a mill this fall.

Owyhee County.

Work has been commenced on the Banner M. Co.'s property near Silver City, with Robert May in charge. ——At the Addie mill, near Silver City, the pans and settlers from the Scales & Smith amalgamating mill at Wagontown are being put in. Stoping is being done in the upraise in the mine.

Shoshone County.

Shipping ore is being opened up in the lower workings of the Stewart mine near Government gulch, near Wardner. H. F. Samuels is the principal stockholder in the Stewart and has charge.

The Sonora Co., which owns claims above Burke, has decided to resume work in an old shaft that has been idle since the 80's. The Powhattan M. Co. owning claims in Big creek, near Wallace, expect to resume operations with two shifts. O. M. Gaut is managing director.——The new double compartment shaft which the Sister Co. is sinking on its property in Canyon creek, east of Wallace, is down 135 feet, and is being sunk at the rate of 4 feet a day. Three eight-hour shifts are employed. The intention is to put it down 250 feet and then crosscut to the ledge. An electric hoist is to be put in.——At the Pittsburg Co's properties on Nine Mile the mill is shut down for lack of sufficient water for power purposes. The air pipe line has been completed to the workings in No. 3 tunnel level, and two drills are working double shifts on east and west drifts from both crosscuts on the level. Nothing will be done on the No. 4 level for at least a month. The compressor has not sufficient capacity to run machines on both levels at once. The company is overhauling and repairing the mill and increasing its capacity by the addition of a new set of rolls and four 6-foot vanners. It is also to be equipped with electric power, and as soon as this is done the mill will resume, as there is at all times an ample supply of water for milling purposes.

Washington County.

The Iron Springs M. Co. at Iron Springs will convert the Rankin mill into a cyanide plant and will put in a 50-ton crushing mill to determine the best process of ore reduction.

MONTANA.

Granite County.

Sherr & Looney are working the Nonpareil, near Princeton, with a small force. The shaft, which is down 400 feet, is being retimbered and the hoist is being overhauled. —— At the Albion, above Princeton, Wagoner and associates are developing. They expect to put in a mill to treat the ores from the property.

The Lennstrende-Buck syndicate is putting a mill on its properties near Garnet.

Jefferson County.

A. B. Keith is working claims near Clancy.——High-grade ore is being shipped from the Muskegon mine in Lump gulch, south of Helena.——Martin Mulvahill of Helena has secured control of the Nob Hill properties in Lump gulch, and will begin development at once, sinking 100 feet from the 130-foot level.

At the Gold Hill, 2 miles southeast of Parrot, Manager Van Zandt has replaced the surface equipment recently burned and has retimbered the shaft. Sinking has been started from the 200-foot level and will be continued to the 400-foot.——Fred Davis, Frank Pruitt and Tincture are taking ore from the Colorado mine, 6 miles from Whitehall, at a depth of 200 feet.

Lewis and Clarke County.

The East Helena smelter is getting a larger ore supply than for years before, most of which comes from properties in the immediate district. The Whitlach-Union at Unionville, south of Helena, being worked by the Whitlach M. Co., has put in a new electric plant to run its hoists, pumps and compressors. The shaft has been sunk to the 500 level and a crosscut is being run to cut the main vein at that depth, and will be run 170 feet to strike the vein.——The Brooklyn Bridge Co., owning properties 1 mile south of the Whitlach, has decided to abandon the old incline shaft and sink a 2-compartment working shaft.——The Sunrise mine in the same vicinity has been bonded to H. L. Frank of Butte, and is being developed under the direction of Miles Cavanaugh.—— J. A. Rowland, who has been developing properties in the Big Blackfoot in the Lincoln district, has purchased a mill which will be put up at once.——The Red Bird Co. is working men on their Red Bird and Copper Hill properties, near Helena. Another 100 feet will be sunk on the Copper Hill from the 250 level and a crosscut is being run to the vein from the 350-foot level on the Red Bird.

Silver Bow County.

The Berlin Co., north of Butte, has sunk its shaft 200 feet and it is likely that no crosscutting will be done until 500 feet is reached. The shaft is a double-compartment and is being timbered as sinking progresses. The capacity of the United Copper and Heinze smelter has recently been increased. There are now two converters in operation and three furnaces. With the ore of the Rarus, Corra, Minnie Healey, Lexington and the waste dump of the Belmont, together with the custom ore, the plant has been busy.

MICHIGAN.

Houghton County.

(Special Correspondence). — Three years ago it was thought that the ultimate productive capacity of the Lake Superior mines would be about 200,000,000 pounds per annum. This figure was exceeded in 1904 and will be exceeded in 1905, barring accidents. The properties of the district may be divided into five classes, according to production: The old producing mines; the new producing mines; the developing mines; the active prospects, and the inactive mines and prospects. Practically all of the old mines should at least hold their own in output for the next five years. The Calumet & Hecla has work under way which should result in increasing its production to 100,000,000 pounds per annum within the next few years. The Tamarack has been a slowly declining property for the past six years. The Quincy should show an increase. The northern end of the mine is showing improvement at depth, and the prospects of the property are brighter than for many years past. The Osceola Consolidated may be included in the list of old properties, and should show an increase. Atlantic should hold its own, as should Wolverine. On the whole it will be found that the old mines of the district show possibilities for increased production. Among the new mines there are excellent prospects of increased output. The South Range mines, controlled by the Copper Range Consolidated Co , the Baltic, Trimountain and Champion, will make more than 40,000,000 pounds of fine copper this year. On the north range the Mohawk, which is now making 10,000,000 pounds per year, is to be given increased capacity. The Michigan is likely to double present production, and the Adventure gives promise of also doubling its output. Of the developing mines the Allouez and Ahmeek should each be making 10,000,000 pounds or better within five years. Both are producing in a small way at present, carrying drift stopes which afford a limited tonnage of stamp rock for the mills. Among the prospects there are enough properties of promise to guarantee that from the number several good producers will be secured. The Globe tract, south of the Champion, is under option to the Copper Range Co. The overburden is very heavy and difficult of penetration, but the Copper Range Co. has funds to overcome unfavorable features of the early stages of development. Between the Globe and the Winona mines is the Erie - Ontario prospect, on which steady work has been performed. The Miskwabik has a promising property. Among the developments of the next five years should be the opening of a mine on Section 16 of the Atlantic Co.

Houghton, Aug. 14.

The Victoria has started to put in the permanent hoisting engine and is building the shaft rock house. The work on the three final cylindrical 5-foot shafts for the hydraulic compressor has progressed to a depth of 130 feet in each shaft, leaving 200 feet to sink in each of the shafts. The stamp head, the bed plates, anvil blocks, mortar block, mortar grate casing and the heavy frame legs have been put in position. The 5000-foot tram road from the mine to the mill is graded.

Keweenaw County.

(Special Correspondence). — In Keweenaw county there is activity in the southern end, at the Allouez, Ahmeek and Mohawk properties. The southern end of Keweenaw county is a continuation of the Calumet district, from which it is distant but a few miles, with continuous producing mines from the Osceola to the Mohawk at present. Farther north the Keweenaw Copper Co. has eight old mines, and will explore its property. The Calumet & Hecla Co. has bought Keweenaw county mineral lands during the present year. The Fitzgerald interests control the Arnold, Ashbed, Humboldt and Meadow properties.

Houghton, Aug. 14.

MISSOURI.

The United States Geological Survey has in press a report by H. F. Bain and E. O. Ulrich on the copper deposits of Missouri. Copper is now mined and smelted, near Sullivan, and copper deposits at other points in the State are attracting attention. Attempts to mine sulphide and carbonate copper ore have been made in Missouri since 1837, and at different times copper furnaces have been operated in Shannon, Ste. Genevieve and Crawford counties, while a matte, which carries also nickel and cobalt, has been steadily produced at Mine

La Motte. Copper is found commercially only in the southern part of Missouri, within the region broadly known as the Ozark uplift. This is an elliptical, warped plateau which has a major northeast-southwest axis about 300 miles long, and reaches its topographic culmination at Cedar Gap, west of the copper-bearing territory. In this region iron, lead, zinc, barite and manganese, as well as copper, are mined. The ores show a preference for certain stratigraphic horizons, and, being bedded, may be prospected with ease and economy. The common association of sulphides with specular iron of the sandstone region points to the advisability of the investigation of the old iron pits. In Shannon county the most favorable localities are along the contact of porphyry and dolomite at points where the conglomerate beds at the base of the latter fill in shallow basins in the crystalline rocks. In the disseminated lead district of southeastern Missouri copper occurs in connection with the lead, and at a few points can be saved to advantage. The mines near Ste. Genevieve have not been worked for several years, but the building of the Illinois Southern Railway to within a few miles of them so changes the situation that they can probably now be worked with profit.

Jasper County.

The Nest Egg M. Co. has leased of the Newell-Morse Royalty Co. forty acres of the Wilson-Rinehart section, near Webb City. J. J. Wickham of Cleveland, Ohio, recently leased another forty acres of this same tract. In each of these two leases there is a contract for the lessees to build two big mills. They are each to put two drills to work at once to test the drill holes already put down.——J. P. Hart, G. W. McClure and J. Crabtree of Carterville have struck a fine prospect on their lease on the Aylor ground at Alba.——The Beacon Hill mine, on the Leonard land in the Chitwood district, is being worked again.

Newton County.

The Auburn M. Co., with a lease on the Muenning land, southwest of Spring City, have their shaft down 181 feet and will sink to the 200-foot level.

NEVADA.

A petition signed by several hundred mining men and prospectors operating in southern Nevada has been received by Surveyor General Kyle, asking that a complete survey be made by the Government of all the public lands in the southern part of the State. At present the greater part of Nye and Esmeralda counties has been surveyed only by townships, the section lines not being run. This makes the location and proper description of claims extremely difficult, and serious litigation is apt to result. Surveyor General Kyle has endorsed the petition and the matter will be taken up at once with the authorities at Washington. Recently the Government ordered the survey by townships of several hundred thousand acres of mineral lands in Nevada, but the scope of the work is not large, considering the enormous unsurveyed section in the State.

Elko County.

The stockholders of the Dexter-Tuscarora Con. M. Co., with properties at Tuscarora, have ratified giving a bond and lease of the property to J. H. Mayham of Denver. The bond provides that Mayham is to sink the shaft to the 500-foot point, which is 200 feet below the present lowest level.——The Dexter had a good showing, but when the sulphide ore zone was reached it was accompanied with such a great volume of water that the management could not get it under control.

Esmeralda County.

It is stated from Bullfrog that J. Y. McKane and associates, representing Charles Schwab, have purchased the interests of the Montgomery Mountain M. Co., taking in the Shoshone Polaris property on the northeast and the Montgomery Shoshone M. Co. property on the east. The Crystal M. Co., which is controlled by Schwab, is the purchaser.

It is reported that a 100-ton mill and cyanide plant is to be put up at the Jumbo mine at Goldfield.

Eureka County.

Zinc discoveries are reported in the Roberts mountains, at the head of Pine Creek valley, 50 miles south of Palisade, on the Southern Pacific Railroad, and 12 miles to the west of the Eureka & Palisade Railroad, a narrow-gauge line. The shipping station is Alpha. It is 40 miles north of Eureka. Fletcher & Jameson of Eureka, the discoverers, have shipped a carload of ore to Kansas.

Lyon County.

Herman Davis of the Nevada Reduction Works has purchased the Briggs mill and tailings deposit in Gold canyon. He has men tearing down the mill and cleaning up the site, and the tailings, of which there are about 4000 tons, will be hauled to Dayton for reduction.

Nye County.

The narrow gauge railroad to Tonopah has been changed to broad gauge and hereafter no transfer of ore shipments will be necessary.

NEW MEXICO.

Grant County.

The Hermosa Copper Co., near Central, has closed down the greater part of its properties on account of the restrictions imposed by the forest reserve regulations, the Central district being included in the Gila Forest Reserve. Superintendent J. W. Bible hopes to make arrangement for resuming work.——In the Granite Gap district the San Simon group of six claims, owned by the Mineral Hill M. Co.; the Granite Gap group of seven claims, owned by the United States & Mexico Dev. Co., and the Louise group of six claims, owned by the Southwestern M. Co., are all being worked under the direction of Superintendent S. C. Pratt of El Paso, Tex. The Granite Gap shaft has been sunk 1000 feet on the vein, or 600 feet vertically. The ores are shipped from Antelope on the El Paso & Southwestern Railway. A good wagon road of 11 miles has been built from the camp to the railroad.

Otero County.

The Altamont M. Co. is to commence work on its Cuprite property near Jarilla. The shaft, which is of two compartments, timbered and lined, is down 130 feet and is to be continued to the 250-foot station cut, when two laterals will be started for the ore body.

OREGON.

Baker County.

J. K. Romig, manager of the Virtue mine, near Baker City, has leased the property to W. L. Vinson, manager of the Emma mine. Vinson says he will put a large force at work to operate the mine, but has not indicated whether he will continue the deep sinking begun with the new triple-compartment shaft or continue work from the lower levels of the old shaft. The tailings dump on the mine has been leased by J. H. Davey & Son of Baker City, who have a cyanide plant on it.——Manager F. T. Kelly of the I. X. L. mine at Greenhorn says he has ordered a large amount of sinking machinery and proposes to resume work with a larger force. The main shaft is down to the 300 level.

Manager Pierre Humbert, of the Cornucopia mine at Cornucopia, has started shipping to the Sumpter smelter.

At the Eureka & Excelsior mine at Bourne, Superintendent Jas. E. Wyatt has put a Jeanesville duplex pump with a capacity of 400 gallons per minute on the 550 level which will enable sinking to the 900 level. The water power plant is being increased, to furnish power for an Ingersoll-Sergeant 8-drill compressor, and 1200 feet of 14-inch pipe has been laid to make a new high-pressure line with a fall of 460 feet, giving at the highest stage of water flow 590 H. P. During the lowest stage a minimum capacity of 155 H. P. is had from the low-pressure flume, which is 700 feet long, 3 feet wide and 2½ feet deep, carrying 150 inches of water with a fall of 260 feet. In addition to this, 525 feet of 20-inch pipe has been laid to utilize an extra flow of water in the early spring, which will give approximately 200 H. P. By these improvements sufficient power will be generated at all times of the year to furnish mine and mill with power for operation and air for ventilation, and will eliminate the burning of wood from March to August. Crosscutting to the vein on the 550 level is in progress and is expected to be reached in the next 60 feet, after which drifting will begin and the shaft extended to the 700 level, later to be extended to the 900 level. Drifting is in progress on the 400 level.

It is reported that the Curby copper claims on Snake river, near Homestead, has been sold to the same syndicate which purchased the McDougal property. —— At the Mayflower mine of this district the cyanide plant being put up is arranged to separate the slimes and sands and treat them in distinct tanks.

Jackson County.

A controlling interest in the Opp mine, near Jacksonville, has been sold to Albany, N. Y., parties through Foster & Gunnell of Grants Pass, represented by R. Murphy.

Josephine County.

Operation this summer at the Takilma smelter, 45 miles from Grants Pass, has been constant since the plant was blown in. The output of matte is twenty to twenty-three tons daily, the product carrying 30% copper and about $10 gold.

The Argo M. Co. of Bellingham, Wash., has started its new 5-stamp mill in the Galice district.

Because of the success of the pump at the power dam of the Golden Drift M. Co., operating hydraulic giants in the Dry Diggings, the company has begun enlarging the penstock and placing eight more turbines of 400 H. P. each. This will supply power for two more pumps the size of the one now operated, or will give water and pressure to a battery of six giants instead of two. The company is operating its giants continually.

The Greenback Co. has begun placing thirty additional stamps in its lower mill on Grave creek, near Greenback. The addition of these thirty stamps, together with the forty already at work and other equipment that will be placed, will give the Greenback a daily capacity of 200 tons.

The Oregon Belle's new 10-stamp mill has been started. ——A 5-stamp mill has just been placed on the Rogue River mine of Merlin district and a 5-stamp mill and equipment is being put up at the Gold Pick mine of Sucker creek, having been hauled by wagon to Holland.

Consolidation of the Almeda and Rand mining properties on lower Rogue river at Galice has been perfected, the new company to be known as the Almeda Consolidated Mines Co. There is 1300 feet of work on the Almeda. Arrangements have been made to put up a smelter of 100 tons capacity. O. M. Crouch, formerly president of the Almeda Co., has been named president of the consolidated company, J. F. Wickham vice-president and manager, R. C. Kinney secretary and treasurer and L. B. N. Simonds financial superintendent.—— The Homestake mine, near Woodville, is to be opened up. There is a 5-stamp mill at the mine, run by a gasoline engine, which is being replaced by electric motors for power from the Condor Water & Power Co. The concrete foundation for the transformer and two dynamos have been put in, and it is expected to have the transformers and motors in place within the next two weeks. Water for milling has been secured from a gulch near the mine, but in dry seasons this supply fails, and to overcome this difficulty a pump will be put in to take the water from Rogue river, a distance of 1600 feet.

SOUTH DAKOTA.

Custer County

Superintendent J. N. Wright intends enlarging the Extreme mill and adding a cyanide plant. The mine is 2 miles northwest of Custer.

Lawrence County

At Galena, J. D. Hardin is putting in a 180-stamp mill, a 3-mile railroad and a large hoisting plant. —— President R. L. Bailie of the Golden Crest M. Co. has made arrangements for resuming work at the company's mines, 3 miles from Galena. —— The shaft of the Dizzie mine, near Maitland, is being sunk by H. H. Francis. A new pump is to be put in.

Pennington County.

At the Gertie tin mine, near Hill City, Manager E. C. Johnson has secured the necessary brick, cement, etc., for a small reverberatory for smelting the tin concentrates he is getting from the 35-ton experimental mill. The ore, which is a granite of exceptionably coarse grains and containing considerable mica, is crushed by jaw crusher and steam stamp to 20 mesh. It is then run over 15-foot copper plates to recover the free gold. No trouble has been caused by the mica scaling. The pulp is then concentrated on Wilfley tables.——The Canton M. Co. will continue their shaft, northwest of Hill City, from the 135-foot to the 200-foot level.——A 5-stamp mill is being put up by the Gopher M. Co., near Hill City. A hoist is being put in and an aerial tram between mine and mill is expected to be running by fall.——At the Clara Belle mine, near Oreville, Frank Herbert has put in an air compressor and two machine drills. A new vertical shaft is to be sunk and a 10-stamp mill and cyanide plant to be put up.——A working shaft is to be sunk on the Mercedes mine, west of Rochford, by Superintendent James Cusick.

UTAH.

Beaver County.

In the Star district, near Milford, ore is being shipped from the Moscow mine by D. Ferguson and from the Marionette mine by J. Favey.

Juab County.

At the Carisa mine at Eureka, Manager H. S. Joseph reports three new stopes, two being within Spy ground, between the 600 and 700-foot levels, another on the 200. In addition to these the stope on the 150-foot level in the Carisa vein is giving good ore.——Work has been started on a raise for air connection with the 400-foot level of the Victor Con.

Salt Lake County.

Superintendent and Acting Manager A. O. Jacobson of the Columbus Consolidated mine of Alta reports that his company has twenty-two teams hauling ore from the mine to the reduction works.

The Bingham–New Haven aerial tramway is expected to be in operation by October 1. The survey has been completed and Contractor Joseph Dederichs has men framing timbers and excavating for towers. The company has finished a new assay office and equipped it with new apparatus. The water system has been enlarged and gives protection from fire. C. H. Doolittle of Salt Lake City is manager.——The Conger mine, near Bingham, is being opened up by G. G. Hall.

Summit County.

Sinking has been resumed at the Silver King Consolidated mine at Park City. The mine is now equipped to take care of the water, which prevented the work being carried on earlier in the year.

Utah County.

At the Wyoming mine in American Fork canyon fifty men and twenty-five ore teams are being worked by George and F. C. Tyng, the operators.

Wayne County.

A deposit of uranium is reported to have been found 2 miles from Fruita. The deposit is said to lay flat and to be 2 feet in thickness. The ore carries copper and some gold. T. E. Nixon is the owner.

WASHINGTON.

Ferry County.

A. Sharp, mine manager for P. Burns & Co., has taken a bond on the Comstock-Treadwell group, 6 miles north of Orient, from J. F. Mears, J. A. Connolly, H. M. Vantine, Metz, J. H. Clarke and A. Abrahamson, and will start sinking at once.

Pierce County.

It is reported that an arsenic mine, near Elbe, is producing twenty-five tons daily. The plant is said to be the only one in this country where arsenic is taken directly from the ore. It is usually collected from fumes, as in Anaconda and other smelters. The present product is white arsenic.

Snohomish County.

It is reported that the shaft of the Wayside mine on the Stillaquamish, near Granite Falls, is to be unwatered and sunk from the 500-foot to the 1000-foot level. K. A. A. Stahlgren has instructed President Haebecker to resume work.

FOREIGN.

AFRICA.

Transvaal.

The production of gold at the Rand in July is officially announced at 419,505 ounces, the largest on record. The production in June amounted to 412,317 ounces, and the outturn of July last year was 307,840 ounces.

AUSTRALIA.

New South Wales.

The Mining Journal reports that at Barraga the Lloyd Copper Co. have put in a new reverberatory furnace, said to be the largest in the Commonwealth. The State Mines Department has decided that the cost of carriage of trial parcels of ores from the mines to the ore reduction works be guaranteed by the Department, on the explicit understanding that the carriage shall be the first charge upon the proceeds after treatment charges have been met. In the event of the value of the ore being too low to cover the expenses of carriage and treatment, the Department will pay any deficiency out of the prospecting vote. In order that the Department may be assured that assistance to forward any parcel of ore is fully warranted, inquiry will be made into the merits of each application by an inspector of mines, as is

done in respect to ordinary applications for aid from the prospecting vote. The Prospecting Board will have to be satisfied that the ore is worthy of a test, and that reasonable facilities for testing the same do not exist in the district. The board will also determine the quantity which may be forwarded. The Sulphide Corporation, Ltd., Cockle Creek, has agreed to assist the Department by making what concessions are possible in respect of all parcels of ore forwarded with the approval of the Prospecting Board. An important discovery of a silver-lead lode has been made in the Fumberumba district, where a 50-acre lease has been taken up by a Melbourne syndicate. An official report speaks favorably of the find, which is in good auriferous country. The specimens of the ore, with the fluorite forwarded by the Warden, have been assayed by the Department of Mines with the following average results: Gold traces, silver 13 ozs. 15 dwts. 20 grs. per ton; lead 59.3%. Also a very small amount of antimony is present, but no copper. At Cwira creek, 37 miles from Goulburn, a promising copper lode has been discovered, a sample assay giving 50% copper, 12 ozs. silver and 20 dwts. gold. Copper has also been found near Blayney. The proposal of the London syndicate to provide working capital to provide Broken Hill South Blocks with necessary plant, etc., is generally approved, and the work of reconstructing the company, subject to the approval of the shareholders, will be proceeded with. The new company is to consist of 200,000 shares, each £1, fully paid up; 100,000 of these shares to go to shareholders in the present company, and 100,000 shares to go to the syndicate, who, in exchange, are to place £50,000 in cash to the credit of the new concern. Of the 100,000 shares received for the sale it is proposed to give 75,000 to paid-up shareholders of the company. At a recent meeting in Melbourne of the North Broken Hill, an agreement was signed between Rutter Clark, acting on behalf of Messrs. Clark & Robinson of London and the directors of the North Broken Hill Co., by which the directors sold to that firm 10,600 shares for 30s each, cash, and 10,000 shares at the same price, with delivery at or within three months' time. This means that the present company will, if the transaction is ratified by the shareholders, sell its mine and plant to a new company of 140,000 shares of £1 each. Of these shares 10,000 will be held in reserve. Shareholders in the existing company will be allotted share for share, the difference of 20,600 shares going to Messrs. Clark & Robinson at 30s. The capital derived from the sale of the 20,600 shares will be ear-marked for the purpose of sinking a new shaft and developing the mine, and out of the profits in hand, an amount over £12,000, a dividend of 2s per share will go exclusively to the holders of the 109,400 shares in the present company.

CANADA.

BRITISH COLUMBIA.

Boundary District.

The Granby Co. has shut down its smelter at Grand Forks to put in two additional copper furnaces which will be of larger capacity than those at present in use. It will give eight furnaces all told and increase the present capacity of the smelter 50%. The present Dominion C. Co. (the old Montreal & Boston) expects to start a few men at work on the Brooklyn and Stemwinder mines in the Phœnix camp to get the mine in shape for shipping. The new compressor plant and machine drills of the Providence mine have been started.

The Granby Con. Co. has bought the Gold Drop claims in Phœnix camp for $250,000 from the Gold Drop M. Co., of Montreal. The company has purchased from Vaughan & McInnis, prospectors of Phœnix, the No. 13 claim, between the Granby and Gold Drop groups. The diamond drill prospecting by the Granby Co. demonstrated the existence of large ore bodies of similar quality and value to the ore in the Knob Hill and Old Ironsides. The group will be operated in conjunction with the main Granby mines. Specifications are being prepared for the headworks for the new three-compartment shaft to be sunk at the Granby property this fall. The hoist will be electrically driven, and probably of 200 H. P., capable of lifting a five-ton skip from a depth of 1000 feet.

Rossland District

John Harryman of Baltimore, the owner of the O. K. M. Co.'s interest in the O. K. mine, mill and water rights on Sheep creek, near Rossland, contemplates working the base ore in connection with the milling ore. The mine is equipped with a 10-stamp mill and concentration plant.

Superintendent Eugene Choteau is shipping to the Trail smelter from the Cascade Bonanza at Rossland. ——At the White Bear drifting is being done on the 700-foot level to connect with the upraise to the 600-foot level. No shipments will be made from the White Bear until the new 400 H. P. motor is put in.

Slocan District.

It is reported from the Payne mine, near Sandon, that 12-ounce silver ore has been struck in three tunnels. G. F. Ransom is manager.

Vancouver Island.

T. S. Lippy and Grant of Tacoma are to receive a half interest in the June group of the Copper Mountain M. & D. Co., at Quatsino sound, provided that within three years they have completed 1800 feet of underground work, built a railroad and smelter and put in mine equipment.

ENGLAND.

Consul Stephens of Plymouth, England, reports on mining operations in Cornwall and Devon. Last year was not a prosperous one for metalliferous mines in Cornwall and Devon. There was, however, slight increase in the number of persons employed. Cornwall in 1904, with 54 mines at work, employed 3503 persons below ground and 2717 above ground, a total of 6220. Devon, with 24 mines at work, employed 285 persons under ground and 144 above, a total of 429. These figures show an increase of 79 in Cornwall and 60 in Devon. No females are employed in Devonshire mines, but 228 found employment in Cornish mines, all above ground. With regard to the output of minerals, the production in Cornwall last year was: Arsenic, 827 tons; arsenical pyrites, 43; copper ore, 4433; silver ore, 35; tin, dressed, 5986; tin, undressed, 646, and wolfram, 156, making a total of 12,126 tons. Devonshire produced of arsenic, 149 tons; clays, 71,646; copper, 210; manganese, 177; slimes ore, 322; stone, 3187, and tin, dressed, 9; a total of 75,700 tons. Last year Cornwall had 419 quarries at work, employing 5814 persons, and Devon 449 quarries, giving employment to 2299 persons. Of the employes, 4 were females, and these were all employed in Cornwall. Devon during the year produced 921,274 tons of minerals from its quarries, the details being: Chert and flint, 18,504 tons; china clay and china stone, 68,533; potters' clay, 198,897; gravel and sand, 13,755; igneous rock, 87,592; limestone, 471,501; ocher and umber, 600; sandstone, 54,420; slate, 6772, and other minerals, 700. In Cornwall the production was 924,489 tons, comprising: Chert and flint, 3615; china clay and china stone, 582,445; clay, unwrought, 38,616; gravel, 1032; igneous rock, 242,936; limestone, 16,237; sandstone, 11,594; slate, 20,758, and other minerals, 7166.

MEXICO.

Chihuahua.

At the Grenadena mine, near Santa Barbara, the 60-ton concentrating plant will be in operation about September 1. The Grenadena will be mined for zinc principally, as will the San Diego mine near there, belonging to the Torreon smelter people. A concentrating plant, said to be of 200 tons daily capacity, is being put up on this latter property.

Jalisco.

H. M. Sunde is developing the San Jose de las Agujas mine at Navidad. A double-compartment shaft is down 170 feet.——Ore is being shipped from the San Antonio y Anexas silver mines in the Tapalpa district, which were recently purchased by the Chatterton M. Co. from Silviano Camberos of Guadalajara.

Sonora.

(Special Correspondence).—At the Cananea mine the concentrator is being enlarged on each end of the table and vanner room, to double the capacity of the mill, which now treats 1440 tons daily, using eight tons of water to each ton of ore. There is also being built a large steel sampling mill with steel ore bins and belt conveyors, also an immense ore bedding plant of steel, 450x206 feet.

Cananea, Aug. 12.

It is reported that the Babicanora mine, near Baviacora, is again in operation.——Near Huepac, on the Sonora river, Robt. Graham and associates are developing the Anita mine. — The mining camps, El Tiro, La Yaqui and San Francisco de los Llanos, in the Altar district, have been consolidated and named El Tiro. The total population is 1319.——Work of sinking the shaft of the Santo Domingo mine at Aduana is progressing satisfactorily.

NORWAY.

Of iron ore, 39,000 tons was exported from the Fehn mines, near the Nordsjo, where about 230 men were employed during 1904.——At Melo, in Bjarko, in the Tromso district, the presence of iron ore was proved in 1903 by magnetometric tests. In 1904, 4878 tons of iron ore were produced here, containing 57% iron and .02% phosphorus; 2954 tons of this were exported.——Other mines exported smaller quantities, and the total export of iron ore from Norway in 1904 amounted to 45,000 tons, compared with 41,575 tons in 1903.——The briquette works at the port of Guldsmedvik in Moi Ranen have been commenced, and the removal of the surface layer and other preparatory work on the ore fields at Urtvand has been taken in hand, so that 5000 tons per day can be quarried in the summer of 1905. The whole works, which are the finest industrial works in Norway, will be ready by the summer of 1905, and the exportation will then commence; an annual export of 750,000 tons of ore per year is planned for the next few years.

SOUTH AMERICA.

Argentine Republic.

It is reported that a number of companies have been formed in Buenos Ayres to dredge for gold in various rivers in the Argentine Republic and in Bolivia, Brazil and Chile. The mining law of the Argentine Republic does not provide the security of title conferred by the laws and codes of the neighboring countries, especially by Bolivian mining law, but this is largely due to the discretionary powers vested in her administrators. The present Minister of Agriculture, however, has included in his budget for the current financial year a large sum of money, which is destined to effect improvements in the prevailing methods. A large number of dredgers are to be ordered. The severity of the climate will be an obstacle to dredging during the winter months in Tierra del Fuego and Patagonia.

Colombia.

The emerald mines of Muzo are owned by the Government and are among its most valuable assets. Colombia is seeking a loan in foreign markets with which to carry on operations in the mines. Lloyd-Owen was employed by the Government and made a report, from which the following is taken: The Muzo mines are in the State of Boyaca, near Muzo, three days' riding on mule back from Zipaquira, the terminus of the Northern Railway. Under great heat and pressure, due no doubt to further and subsequent volcanic action, these various minerals in the fissures or veins have crystallized in different shapes and forms, according to the various minerals contained in any particular vein or fissure. Under favorable circumstances the most beautiful deep green emeralds have been formed in these small veins, the green color being undoubtedly due to the presence of chrome in sufficient quantity. In other veins the emeralds are found of a light green color, due, no doubt, to the fact that there was not chrome enough present to give the deep green color. In other veins no chrome was present, and as a result the crystals are pure white or colored red or yellow by oxide of iron. Many of the crystals are pure silica and others have various minerals combined with the silica. The general tendency in these emerald-bearing rocks is to form crystals of emerald of green color, and the quality of the emerald, if it is clear and free from flaws, depends upon its size and color, the darker green being the most valuable. The thickness of the emerald-bearing strata at the present workings of the Muzo mines varies from 100 to 200 feet. Although some emeralds are found in the upper strata, the amount is inconsiderable and practically all the emeralds are found in the lower strata. Large quantities of barren rock and strata have to be removed in order to get at emerald-bearing ground by open workings, and as it would not pay to remove this overburden by hand labor water is employed. A small stream coming down the mountain side above the workings is intercepted and caught in a tank. When this tank is full the water is released, and, rushing down and through a long, winding ditch, finally comes to some of the debris and washes it down the valley, where it accumulates until washed away by the stream from the cross hills. It is necessary that after the present accumulation of debris has been removed work should at once be commenced to remove the overburden from the next portion of emerald-bearing ground proposed to be worked, and this should be pushed on as fast as possible during the wet season, when water is available. There should never be less than twelve months' work of emerald-bearing strata exposed and clear of debris. It is stated that the production of the mines for the period included between May 1, 1904, and January 31, 1905, was as follows, stated in carats: First-class emeralds, 262,548; second-class, 467,690; third-class, 22,700; fourth-class, 16,000. These figures give a total of 768,938 carats sent to Bogota in the period named.

Peru.

A. W. McCune, in an interview at Salt Lake City, Utah, said that the Cerro de Pasco mines, 210 miles from the city of Lima, are being connected to the coal mines, 17 miles distant, where the Cerro de Pasco Co. will have its coke ovens. The copper smelter will go into commission about Nov. 1. The plant was originally designed to handle 1000 tons of ore per day, and equipment has been provided accordingly. To begin with, only the first unit of 500 tons will go into commission, but the capacity will be gradually brought up to the maximum. The labor question in South American countries is not a serious one, and Mr. McCune finds that the natives give very good satisfaction after a little training.

Commercial Paragraphs.

THE Hercules Gas Engine Works, 215 Bay street, San Francisco, Cal., were totally destroyed by fire on the 13th inst.; loss $100,000, insurance $25,000. The works will be immediately rebuilt.

H. P. GILLETTE AND G. H. GIBSON have formed a partnership as "advertising engineers," under the name of the Geo. H. Gibson Co., with offices in the Park Row Bldg., New York City.

THE Compressed Air Machinery Co. of San Francisco, Cal., has recently shipped four of the Word Bros. improved drill makers and sharpeners to the Oliver Iron M. Co. of Duluth, Minn., making a total of seven machines placed with this company.

THE Wellman-Seaver-Morgan Co., Cleveland, Ohio, have established a branch office at No. 216 Dooly Block, Salt Lake City, Utah. H. V. Croll, M. E., has been appointed manager thereof, and inquiries addressed to the Salt Lake City office will have his personal attention.

THE S. H. Supply Co., Denver, Colo., report the following recent shipments of machinery: Two No. 1 Wild mills, suitable for mule-back transportation to Mexico; No. 3 Wild mill to California; fifty-ton cyanide plant complete with No. 2 Wild mill to New Mexico; complete fifty-ton concentrating plant with No. 2 Wild mill to Arizona; 75 H. P. Lidgerwood double-drum hoist to Mexico.

THE Colorado Iron Works Co., manufacturers of ore milling and smelting equipments, state that their New York sales agency, formerly in charge of the Traylor Engineering Works Co., 114 Liberty St., New York City, has been discontinued, and for the present the company is not represented there, all inquiries, requests for specifications, estimates, etc., being handled direct from the main office at Denver, Colo., until further notice.

THE Pelton Water Wheel Co. report orders from the Homestake M. Co., Lead, South Dakota, for one 800 H. P. Pelton water wheel unit direct connected to an electric generator; the Nevada Power M. & M. Co. for an additional Pelton wheel, 3000 H. P. maximum capacity, direct connected to an electric generator and operating under a head of 990 feet. This company is installing two Pelton wheels for direct connection to 750 K. W. generators and proposes to transmit power to Tonopah and Goldfield, Nev. Through Mitsui & Co., San Francisco, was placed an order for 500 H. P. wheel for use in electric light station in Japan.

Trade Treatises.

A neatly illustrated booklet from the Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York City, describes the construction and operation of the "Radialax" coal cutter.

A finely executed folder from the De La Vergne Machine Co., Foot of East 138th St., New York City, N. Y., exemplifies the construction of the Koerting gas engines, suction and pressure producers.

The Powell "White Star" valve is described in detail with sectional illustrations in a little book issued by the Wm. Powell Co., 2525-2531 Spring Grove avenue, Cincinnati, Ohio, showing the value and economy of their use.

Personal.

J. H. CURLE has returned to London, Eng., from South America.

H. K. WHEELER has returned to Los Angeles from San Francisco, Cal.

CHARLES A. MOLSON of Salt Lake City, Utah, is on a visit to New York.

W. A. FARISH is examining mines in the Clifton-Morenci district of Arizona.

RICHARD A. PARKER of Denver, Colo., has returned from Salt Lake City, Utah.

JOHN C. DALY of Salt Lake City, Utah, has been visiting in San Francisco, Cal.

J. C. GOODWIN of Tempe, Ariz., is visiting the Lewis & Clark Exposition, Portland, Or.

F. R. FIELDING, who has been dangerously ill in San Francisco, Cal., is reported convalescent.

J. PARK CHANNING of New York City is in Salt Lake City, Utah, after visiting San Francisco, Cal.

T. R. HENAHAN, manager Silverton M. Co., Silverton, Colo., has returned there from Chicago, Ill.

GEORGE E. WEBBER, manager Rand Mines, Ltd., is on a visit to California from Johannesburg, S. A.

ERNEST GAYFORD'S temporary address is "The Southern Manufacturers' Club, Charlotte, N. C."

W. L. HONNOLD is taking a holiday in Wisconsin. He will return to Johannesburg, S. A., in October.

C. GARDNER has been appointed manager Garden Wall M. Co., working lead mines near Wiota, Wis.

T. J. LUDLOW of Berkeley, Cal., has taken a position with the Alaska Central Railway, at Seward, Alaska.

J. W. CONNER, manager Veta Colorado M. & S. Co. of Parral, Chihuahua, Mexico, has been in New York City.

T. A. RICKARD is in Nova Scotia, as advisor to the Provincial Government in its effort to stimulate gold mining.

JOHN ROSS JR. has returned to the Wildman mine, at Sutter Creek, Cal., from professional business in Nova Scotia.

G. G. VIVIAN, manager Hidalgo mines and smelter at Sultepec, State of Mexico, Mexico, has been at Georgetown, Colo.

H. E. WILSON, manager Eureka Nest Egg and Erie mines, White Pine, Colorado, has returned there from St. Louis, Mo.

CHAS. M. GUNN, general manager Columbia Engineering Works, Portland, Or., has returned from a brief California visit.

C. T. DURELL, manager Gold Reef mine, Gilt Edge, Mont., has resigned to become manager Spotted Horse mine, Maiden, Mont.

EDWARD HOOPER will leave London, England, in September to examine the Great Boulder Perseverance mine in Western Australia.

N. W. HAIRE of Ironwood, Mich., succeeds W. E. Parnall as manager of the Bigelow Syndicate's interests in the Lake Superior country.

R. GILMAN BROWN of San Francisco, Cal., is supervising experiments with the Moore process at the mill of the Standard Con. Co., at Bodie, Cal.

A. F. ROGERS of Columbia University has been made assistant professor in the department of geology and mining at Stanford University, Cal.

NORRIS ENGLISH, superintendent Darien G. M. Co., at Cana, Panama, has returned to San Francisco, Cal., and will probably remain until spring.

W. GILLETTE SCOTT, general manager and superintendent of mines for the Great Western Gold Co. at Ingot, Shasta county, Cal., has resigned.

F. MORGUES, general superintendent Quintera M. Co., at Alamos, Sonora, Mexico, has resigned and will leave for Paris. George La Brun is his successor.

CHARLES M. BECKER, manager Stratton's Independence, Cripple Creek, Colo., has gone to New York to meet F. W. Baker of the Venture Corporation.

W. F. COCHRANE has been chosen president and manager Great Northern Mines Co., operating in Trout Lake division, N. W. Kootenay district, B. C.

S. B. CHRISTY, professor of mining at the University of California at Berkeley, Cal., has returned from a visit to the mining camps of Colorado and Nevada.

E. H. WEBSTER, formerly superintendent Grand Central mine, at La Colorada, Sonora, Mexico, is assistant manager Dolores mine, Minaca, Chihuahua, Mexico.

Books Received.

Each trade and profession has a language of its own, and the expression and interpretation thereof is often puzzling to the uninitiated. The vocabulary of the machinist is admirably presented in "Machine Shop Tools and Methods" by W. S. Leonard. This has been written for the instruction of students in the machine shop, and is particularly useful in that it not only defines the tools, but tells how they should be used to get certain results. The book is written so as to be easily understood by students who know very little of practical machine shop work, and is consequently exhaustive in its description of even the commonest machine tools. The book tells the why and wherefore of many methods of doing certain work that machinists may have been doing for years, but, having been taught how to do it when apprentices, they have not learned the reason for so doing. It will prove valuable for every student in an engineering college, and a fine reference book for anybody interested in machine shop tools, as it treats of the most modern machines. For reference in a commercial machine shop the description of the construction and use of portable pneumatic tools would be much appreciated, because these tools are constantly used in large shops, but their construction and inner workings are only understood by the tool keeper and his assistants. The treatment is logical and comprehensive, yet eminently practical. It is published by John Wiley & Sons of New York City and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $4.

Folio 124, "The Mount Mitchel Quadrangle," of the U. S. Geological Survey, describes the geography and geology of a part of North Carolina and Tennessee. Soapstone, talc, mica, precious gems, corundum, marble, serpentine, building stone, graphite, magnetite, brown hematite, chromite, lime and brick clay are the economic minerals.

"New or Imperfectly Known Rodents and Ungulates from the John Day Series," by W. J. Sinclair, a bulletin of the Department of Geology at the University of California, Berkeley; price, 25 cents.

Latest Market Reports.

SAN FRANCISCO, August 18, 1905.

METALS.

SILVER. — Per oz., Troy: London, 27⅜d (standard ounce, 925 fine); New York, bar silver, 60½c, refined (1000 fine); San Francisco, 60½c; Mexican dollars, 46c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, $15.62½; Lake, 1 to 3 casks, $15.62½@15.77½; Electrolytic, 1 to 3 casks, $16.00; Casting, 1 to 3 casks, $15.25 @ 15.50. San Francisco: $16.50. Mill copper plates, $17.50; bars, 18@24c. London: £69 5s spot per ton.

LEAD.—New York, $4.70; Salt Lake City, $3.50; St. Louis, $4.52½; San Francisco, $3.70, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £13 18s 9d ℔ long ton.

SPELTER.—New York, $5.80; St. Louis, $5.18; London, £24 12s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $32.55@32.85; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 35½c; less, 35½c; bar tin, ℔ lb., 35@37½c. London, £149 15s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $41.00@$41.50, large lots; London, £7 7s 6d; San Francisco, local, $38.50@39.00 ℔ flask of 75 lbs.; Denver, $42.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.00c; San Francisco, Plumbers', 100-lb. lots, 19.00c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 33@37c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.85; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$21.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 12½c; Hallett's, 13c; San Francisco, 1000-lb. lots, 11c; 300@500-lbc. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12½c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

OILS.—Linseed, boiled, bbl., 64c; cs., 69c; raw, bbl., 62c; cs., 67c; Lucol oil, boiled, bbl., 56c; cs., 61c; raw-bbl., 54c; cs., 59c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¾c; less than 500 lbs., 8c.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

DETORSION TIMBER SQUARE.—No. 796,645. Aug. 8, 1905. James Herche, San Francisco, Cal. The object of this invention is to provide for such corrections in the timber as will enable the operator to correctly effect the desired results. The device comprises a rectangular block with intersecting guides parallel with its sides, blades and means for adjustably holding them in said guides, a level fixed parallel with two of the sides of the block, and standards adjustable upon the horizontal blade. There are other details of construction adapted to bring about the desired result.

PROTECTIVE CAPS FOR TUNING PINS.—No. 796,677. Aug. 8, 1905. Isidor B. Rosencrantz, Alameda, Cal. This invention relates to a removable covering for the tuning pins of pianos. It is well known that the strings of pianos and other instruments are more liable to get out of tune where they and their tuning pins are subjected to any considerable or sudden changes in temperature. This is due particularly to the tendency of the pins to expand or contract, and so put the strings out of tune. The object of this invention is to provide a simple, inexpensive, practical, protective cap or covering for the tuning pins which may be quickly and easily applied to the pins of any piano, and which will grip all the pins alike to hold it in place, and at the same time will allow of the proper circulation of air about all the pins and not allow one pin to be affected by temperature more or less than any other pin. It consists of a protective cap for piano tuning pins, composed of flexible material and of greater length than width, and having interior longitudinal integral portions to engage the opposite sides of all the pins alike and to retain the cap in place, at the same time permitting the free circulation of the air between the several pins.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR WEEK ENDING AUGUST 1, 1905.

796,172.—ORE DRESSER—Anderson & Bennie, Clifton, Ariz.
796,390.—ORE DRESSER—Anderson & Bennie, Clifton, Ariz.
796,285.—BOTTLE—S. E. Bell, Represa, Cal.
796,186.—ROAD ROLLER—A. E. Burns, Los Angeles, Cal.
796,114.—THERAPEUTIC APPARATUS—H. E. Currey, Baker City, Or.
796,197.—UNDERREAMER—E. Double, Los Angeles, Cal.
796,118.—FISH TANK—J. B. Duryea, Tacoma, Wash.
796,305.—HOSE COUPLING—L. W. Epley, Colville, Wash.
796,204.—LIFTING JACK—E. H. Goodwin, Olympia, Wash.
795,972.—CURTAIN POLE—M. M. Harding, Monrovia, Cal.
795,837.—FLOWER STAND—Hyde & Buchanan, Wadsworth, Nev.
796,125.—LUBRICATOR—H. P. Josewski, S. F.
796,228.—ROCK DRILL—E. R. Langford, Los Angeles, Cal.
796,232.—ANIMAL DIPPING MACHINE—J. Manifold, Willows, Cal.
795,997.—SURFACE DRESSING MACHINE—D. Mathews, Los Angeles, Cal.
796,001.—PLANE—J. H. McGhan, Baker City, Or.
796,143.—LINE GRIP HOLDER—A. Nord, S. F.
796,253.—TREATING STONE—H. Ryan, Seattle, Wash.
796,150.—FRUIT SHEARS—T. A. Ryles, Pomona, Cal
796,156.—FRUIT PACKING MACHINE—S. H. Shelley, San Jose, Cal.
795,866.—INHALER—J. R. Spanogle, Athena, Or.
796,265.—STEAM BOILER—C. A. Sturm, Castlerock, Wash.
796,164.—DRILL HOLE ENLARGER—T. M. Topp, Raymond, Cal.
796,377.—PIPE FITTING—F. Walker, Los Angeles, Cal.
796,028.—HAME FASTENER—W. G. Youngs, Montesano, Wash.

MINING AND SCIENTIFIC PRESS.

Whole No. 2351.—VOLUME XCI. Number 9. SAN FRANCISCO, CAL., SATURDAY, AUGUST 26, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Situation a Factor in Mining.

In the development of a new mine or a new mining district the situation is often one of great importance in securing the necessary capital for development and equipment. Naturally it would seem that the situation might, to a great extent, dominate all other considerations; but such is not always the case, though often there is less difficulty in securing the needed capital for opening and equipping a new mine in a situation where the conditions are favorable than where they are difficult. There are, however, a sufficient number of exceptions to be interesting. In Colorado no situation seems impossible to the miner and capitalist. If the vein only shows up sufficient value to make it attractive, the necessary money is usually promptly forthcoming. No altitude seems too great. No difficulties of transportation, apparently, are insurmountable. If railway facilities are wanting, railroads are built. If expenses can be reduced by concentration, concentrating mills are hauled into the most rugged and highest mountain basins adjacent to the mines, and an aerial tramway forms the connecting link. Nature obtrudes many obstacles to success, but the ingenuity and enterprise of the miners surmount these as fast as they present themselves. Idaho has offered many difficult situations to the progress of mining enterprise, but where the mines justified it, as in Colorado and Idaho, these difficulties have been overcome. In earlier days in California—thirty years or more ago—there were numerous companies operating mines in the Sierra Nevada. A large amount of gold and silver was taken out, but at great cost. Hundreds of thousands of dollars were expended in the construction of roads alone. Mining and milling machinery were hauled in and an active campaign was carried on. These enterprises, for most part, are now idle and abandoned. The mechanical difficulties were overcome, but there were other troubles as great or greater. The ores were, for the most part, base, and the extraction was both low and expensive. Supplies and wages were higher than now, and results were not always satisfactory. Now things are different. Most of the ores can be reduced successfully, supplies and wages are lower than at that time, and the mechanical appliances and methods are both superior to those in use in the former years. Notwithstanding these facts the mines of the high Sierra are mostly idle. The California miner, as a class, has found mining in the foothill region, surrounded by gardens and orchards, with the railway station within easy reach, far more to his liking than a life among the towering, snow-clad peaks of the Sierra. He loves to look upon them from a distance, and in the sweltering heat of a midsummer day wishes himself somewhere amid the snow fields, on a pleasure trip, but he seldom thinks of the mining possibilities awaiting a more energetic fellow.

The accompanying illustrations, and those on page 137, are of the equipment of the Nickel Plate mine, near Hedley, B. C. Here is an instance where difficulties of situation did not count for much. When this property first came to the attention of the manager, it was many miles off the main lines of travel surrounded by high and snow-capped mountains. There was little inducement to even visit such a desolate wilderness, other than the story of a good-sized vein of rich gold rock. This sort of thing tempts many engineers to make what proves to be "wild-goose chases," but in this instance, the "story" seemed well founded. Development was commenced in midwinter and continued uninterruptedly. Gradually the property was equipped, and is now going steadily, increasing in magnitude of operations, equipment and value. The difficulties of situation have largely been overcome. Propositions of this character demand something more than money. They require that the engineer understand his business and that he be able to judge fully andwith an approximation to exactness what is required, what will it cost, and what the probable result will be. If these problems can be satisfactorily solved then the investment may be safely made, or the project dismissed as too hazardous, or of no value at all.

Mill of the Nickel Plate Mine, Hedley, B. C. (See Page 137.)

The Village of Hedley, B. C., Showing Nickel Plate Mill. (See Page 137.)

THERE is a saying among geologists, especially those who devote their attention more particularly to the economic features, "Once mineral, always mineral." This refers to the probabilities of minerals of economic importance occurring through a succession of geological formations. Thus, in the Black Hills of South Dakota it is positively known that the Algonkian schists were gold-bearing in pre-Cambrian times. The overlying Cambrian, Silurian and Cretaceous rocks are also mineral-bearing. Whether still later rocks—the Cretaceous and Tertiary, which no doubt also at one time occurred there, but which have since been removed by erosion—were also mineral-bearing, it is impossible to say. In this Dakota instance, at least, the saying seems well founded.

IN view of the rate at which gold is being absorbed in dentistry at the present day, the "prehistoric burying ground" of the distant future is likely to prove a rather profitable gold mine.

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IT is said that D. G. Delprat, manager of the Broken Hill Proprietary mines, at Broken Hill, N. S. W., has conspicuously posted in the company's works a sign bearing in effect the following legend: "Look around and see where money can be saved. Any suggestions in this direction, together with the name of the writer, if placed in the box beneath, will receive the prompt attention of the manager." Mr. Delprat is a well-known and successful mine manager, and the above appears to indicate why he is successful. He evidently endeavors to surround himself with men who use their brains as well as their hands. Without doubt, the workman who makes a valuable suggestion receives substantial reward for his earnestness in behalf of his employer. The experienced manager may sometimes learn valuable lessons from the most humble man on the payroll. There are those whose success has carried them so far that they feel no longer the need of advice or suggestion from their peers, to say nothing of those in their ranks, but the wise manager never rises to this dangerous height. The ideas of the men who daily come in contact with the details and the drudgery are often well worthy of consideration.

A MINE bookkeeping system may be made more or less elaborate according to the needs of the business or the wishes of the manager. If itemized costs be desired, it is impossible to obtain them without a careful and complete segregation of accounts. Every department concerning which detailed information is wanted must of necessity have its separate account. The various charges should be made on exact information, and not by guess, or by an apportionment among several departments, as, for instance, the amount of powder used on each of the several levels of a mine. An accurate record must be kept of the powder going to each level, and if any be taken from that level to another place, the level from which it was taken should be credited on the books with it, and the amount charged against the place where it is actually used. A bookkeeper who was more noted for his love of leisure than for the energies devoted to his business undertook to apportion the powder used among the several levels and working places, gaging the several amounts by the number of men employed in each level. Against one level several hundred pounds of powder were charged, when during that particular month only retimbering and repairs had been going on, a knowledge of which fact by the manager at once exposed the fallacy of a scheme so foolishly devised and applied.

"Tricks of the Trade."

That there are "tricks in all trades," has come to be accepted as an axiom. There are probably more "tricks" in cyaniding than in any other branch of metallurgy. By "tricks" in this instance are not meant deceptive or crafty performances, but a certain adroitness in manipulation, or a keen understanding of the requirements in perplexing situations. The field of experimentation in cyaniding is broad, and if followed intelligently and faithfully, it will bring out the latent powers of the operator in a manner that few other callings can equal. In cyaniding, "rule of thumb" and precedent must be abolished if the highest success is sought. Because a successful operator has accomplished what was acknowledged to be a difficult task at one place, is not proof positive that he can do the same thing elsewhere in exactly the same manner. He may have to modify his treatment or method considerably. He must be flexible. The only way in which he can afford to be stubborn is to persistently refuse to accept defeat, but if failure is succeeded by failure, try again along somewhat different lines, but always be rational.

A difficult ore problem presented itself to several cyanide operators. Filter-pressing was found out of the question. The slimes flowed like water through every grade of filter cloth. When the fabric was fine enough to act as a filter the meshes clogged with the slime and soon filtration either ceased altogether or the slimes were forced through with the solution. Another operator tried to treat this same material by agitation and flocculation with lime. The pulp would not flocculate. More lime was tried, but without success. Another operator, more willing to try extremes in an emergency, undertook the same plan, starting with very little lime. It did not do as well as was required, but was an improvement. The caustic lime was then pulverized, screened and scattered over the tank with a shovel—an ordinary 2½-gallon bucket of lime to a 30-foot tank of slimes, so fine that a high power microscope was required to see the individual particles in the sludge when spread on a slip of glass. In an hour the pulp was clear. The usual filter bottom with canvas was used and filtration was discouragingly slow, particularly the last 18 inches of sludge. An experiment was tried. Cocoanut matting overlaid by jute bagging was tried, and the filtration after decantation was rapid and complete.

These instances merely illustrate the need of adaptation of the methods to conditions. The latter usually cannot be materially changed, the methods can be, and it is up to the cyanide operator to be fully acquainted with all the "tricks of his trade," and to practice them whenever it is required of him to devise a new method or to improve an old one.

Equity in Mine Taxation.

Several of the mining States of the West are struggling with the problem of mine taxation. All who have ever had experience with this aggravating proposition know that it is a matter not easily dealt with to the satisfaction of all concerned. The owner of the operating, paying mine thinks himself entitled to favorable consideration, for upon the industry under his direction depends, to a proportional extent, the prosperity of the town, district or county in which he operates. If he and the other mine operators of the county were to close down their mines, all other industries in the district would probably cease to exist with them, for all are built up by and depend directly upon the mining industry. Let the mines shut down and deserted villages would quickly result. The district would soon be depopulated and the region revert to a wilderness. The owner of the unprofitable mine declares he is already placed at a great disadvantage and an exception should be made in his favor, as he is spending money in an effort to develop a mine which some day may become profitable, and he will then be able to contribute to the support of the county and State Government. The owner of the idle mine says he cannot afford to pay taxes on a property which brings him in nothing, and protests vigorously against taxation. In Arizona there is serious talk at the Territorial capital of raising the assessment of all mining property in the Territory—each county to have its assessment raised from 100% to 15,000%, according to the existing assessment and conditions in the respective counties. That this proposition is meeting with vigorous resistance, it is needless to say. In South Dakota the Mining Men's Association, which is the representative body in that section, is earnestly protesting against a threatened increase in assessment. The proposition is by no means a new one, and many schemes have been tried by means of which to raise the money necessary to meet the expenses of county and State Government. Direct taxation on valuation of the mines, taxation of improvements, bullion, or output tax—each of these and others have been tried, but from the miner's standpoint none of them are popular.

The Cheapest Mining.

South Dakota still continues to attract attention, as one of the regions of cheap mining in the West. The Black Hills is a section of the mining country favored above some others in many ways—there usually being abundance of timber and water—but, on the other hand, it labors under some disadvantages. The extremes of temperature are its greatest drawback, but, notwithstanding the fact that the thermometer ranges from 110° in midsummer to 40° or more below zero in midwinter, little time is lost in mining operations due to the weather. The Wasp No. 2 mine, situated in the Black Hills, on Yellow creek, about 2 miles south of Lead, and which has become somewhat noted for the heavy blasting operations carried on there, has recently fired another "big shot," in which it is said 7000 tons of ore was broken down in the open cut. The ore shoot lies flat, and affords excellent opportunity for such feats in mining. Unfortunately, the cost of mining and milling at the Wasp is not available, but it is known that by cyaniding a profit is made on ore assaying under $5 a ton.

Elsewhere herein is the description of mining practiced at the Benedict mine, in Pennington county, in the southern Black Hills, where gold ore is being mined and milled at present for about 35 cents per ton, which is about as cheap as the cost of mining and milling is done any place. At one time, about 1890, mining and milling were accomplished for (it was stated at the time) less than 50 cents per ton, at the Dalmatia mine, in El Dorado county, Cal., but as soon as the open cut method was no longer available costs went up, as the workings went deeper.

Two miners picked down and sent to mill 115 tons of ore daily, or at the rate of 7½ cents per ton. The mill equipment consisted of three Huntington mills and ten stamps. The ore contained $2 per ton. It seems likely that if the cost of power on capital account be added to the Golden West statement it would bring the expense to about 40 cents per ton, which is still less by about 10 cents per ton than the cost at the Dalmatia.

At the Big Indian mine, near Helena, Mont., mining and milling were being done in the summer of 1903 for $46\frac{7}{10}$ cents per ton. This mine was worked by the open cut and mill hole method, 310 tons of rock going to the 60-stamp mill daily. In this instance two expert miners did all the drilling. Besides these there were employed the foreman, a carman, blacksmith and twelve laborers. Miners received $3.50 per day and laborers $3. The mill capacity was high—over five tons per stamp. In these charges were included power, insurance and general expenses.

It does not appear that the managers of any of the above mentioned properties have any cause to blush for their record as expert and careful miners. This sort of work cannot fail to stimulate others to emulate the very good example these several performances afford.

CONCENTRATES.

THE mineral lands on the Uintah, Utah, reservation will not be open for entry till October 27, 1905.

NEARLY 50% of the zinc product of the United States is absorbed in making galvanized iron and large amounts are used in the manufacture of brass.

WOLFRAMITE AND SCHEELITE may occur associated in the same vein or deposit—one being tungstate of iron and manganese and the other tungstate of calcium.

SOME mill men consider graphite an excellent lubricant for cams in stamp mills; others prefer the old-fashioned "dope." The graphite eliminates the danger of grease.

DURING the fiscal year ending June 30, 1905, the British Columbian Government bounty of 50 cents per 100 pounds, in lead produced therein, aggregated $332,418, which includes the bounty paid on exported lead.

PENSTOCKS, sluices, mill races and other places where ice forms may be quickly cleared of the obstruction by the use of water under pressure, as in hydraulicking. The ice melts or breaks up under the continued force of the stream.

A ROUGH pine board, placed below the lip of the mortar and at the head of the apron plates of a stamp mill, affords an excellent indication of the condition of amalgam within the battery, and is a guide to the feed of quicksilver.

THE element columbium (Cb) is the same as niobium. It is a metal of steel gray color, having a brilliant luster, and has an atomic weight, as referred to oxygen, of 94. Niobium is the name more commonly used in the United States, though in England it is still often called columbium.

UP to the present time all efforts to reduce cinnabar by wet processes have proved commercially unsuccessful. The distillation of the mercury by fire applied directly to the ore, or to the concentrated ore in retorts, has thus far been the only successful method of treatment.

MARBLE is usually intended to include those rocks composed of carbonate of lime or of lime and magnesia—limestones and dolomites—but the term has been extended to embrace some other varieties of stone, such as some altered varieties of serpentine, and called verde antique marble.

BITTERN is the liquid remaining after sodium chloride and some other salts have been crystallized from sea water by evaporation. Bittern contains bromine in the form of bromide of magnesium and bromide of sodium. Bromine also exists in certain mineral springs. Bromine is the only element beside mercury which is liquid at ordinary temperatures.

THE true onyx is silica and occurs in nodular masses having various colored bands—black and white or shades of red and white, yellowish red, brown and white, etc. In recent years some banded aragonites (calcium carbonate) deposited by calcareous springs have also been called onyx. The Mexican onyx and that from Big Bug, Yavapai county, Arizona, is of this kind.

SO FAR as known to "Concentrates," the largest mass of native copper ever found was taken from the Phœnix mine, in Keweenaw county, Mich., and weighed 500 tons. Its extraction is said to have necessitated the calling of a $20,000 assessment. This large mass was cut in place with long-handled chisels, to sizes that could be hoisted, by men who make a specialty of that work.

AIR COMPRESSORS may be fitted with automatic devices which regulate the pressure within fixed limits, as, for instance, 90 to 100 pounds. When the pressure falls to 90 pounds the machine starts up automatically. When the pressure has been raised to 100 pounds the machine automatically cuts off and the compressor stops, only to start up again when the pressure is down to 90 pounds.

MICA SCHIST, hornblende schist and some other metamorphic rocks are often found mineralized, more or less silicified, and gold-bearing along a certain strike, with rather indefinite walls, sometimes none at all, the commercial result being the only definite limitation when working the deposit. Although such deposits cannot be defined as veins, this need not render them less valuable, as many such deposits have been worked with good profit.

IN some instances concentration can be accomplished by rather coarse work, resulting in large capacity per crushing unit. A well-appointed modern mill, with hydraulic classifiers, etc., would do much closer work, but where the product is low grade the less scientific method produces the best economic results. Where the concentrate is high grade the proposition assumes a different phase and close sizing, and classifying before concentration are justifiable.

POWER has been successfully and economically transmitted by wire rope for considerable distances—upward of a mile—the rope running on idlers attached to low towers. This line was employed in running a pump to supply a quartz mill with water, the power being transmitted by the mill engine. In another instance power was transmitted from a mill run by water power half a mile up hill to a hoist. This also was run by wire rope and proved satisfactory and economical.

THE quantity of water discharged through the nozzle of pipe under known head may be approximately determined as follows: Extract the square root of the head in feet and multiply this by 8.03. The product will equal the spouting velocity in feet per second. Multiply the area of the nozzle at the mouth by this velocity and the result equals the cubic feet of water discharged per second. Thus a 6-inch pipe under a 400-foot head will discharge $\sqrt{400} = 20 \times 8.03 = 160.6 \times 28.27 = 4523.8$ cubic feet per second.

THERE should be no difficulty in concentrating scheelite from its matrix. Quartz, feldspar and the other ordinary rock-forming minerals have a specific gravity of about 2.6, that of scheelite being 5.9 to 6.1, or more than twice as heavy as minerals of the gangue. Pyrite, which usually concentrates readily, has a gravity of 4.9 to 5, being considerably below that of the tungsten ores. If the proper machinery is used in crushing and concentrating, the scheelite should give no trouble whatever. Tungsten ores are successfully concentrated in Boulder county, Colo., and elsewhere.

THE single-phase commutator-type alternating current hoisting motor is essentially a series wound motor and may be controlled by any method which changes the impressed voltage. With alternating current there are several ways of doing this, but the simplest method is by means of a rheostat such as is used in controlling direct current series motors. Recently automatic hoist controllers have been placed on the market which produce an even and proper acceleration without regard to personal characteristics of the operator and without danger to the motor or operating mechanism.

A GRAVITY TRAM is better suited to a fairly uniform gradient than an aerial wire tram, where the distance between terminals is not too great; but where there are many inequalities of surface, such as intervening canyons and gulches, ridges, etc., the aerial tram is far superior, both in first cost and in operating expense. The gravity tram is not well adapted to numerous and decided changes of grade. The latter can usually be satisfactorily constructed with three rails, with a turnout at the center. The curve at either end of the turnout must not be sharp, or cars may frequently be derailed.

IT is estimated that for good ventilation in mines at least 100 cubic feet of fresh air should be supplied for each man employed underground. Some mines have ventilating plants which actually supply this amount, but the system of air distribution is so poorly arranged that in some places the fresh air is in excess of requirements, while in others it is deficient. It is evident that a single machine drill exhausting 180 cubic feet of air per minute when in actual operation supplies no more air to two men working there than they actually need, and that it falls below the theoretical requirement.

DAMPERS in ventilating pipes in mines, employed to deflect air currents, should be made of heavy plate, similar to that used in turn sheets, for the heavy Russia iron usually used will not stand the shock incident to blasting, but double up around the damper rod. The pipes must also be made of material heavy enough to resist collapse, due to the momentary semi-vacuum produced within the pipe by the explosion. Where it is necessary to carry the pipe close to the blasting face, it is well to either use old pipes or three or four lengths of extra heavy pipe to withstand the damage of flying rocks.

USUALLY the effect of explosions is most noticeable where there has been the most resistance. The explosive force exerted on the air is not noticeable, but the effect on the ground or on rock where powder has exploded is clearly evident. This has led many to think that the explosive force of powder is downward only. If a stick of powder be placed in a horizontal crevice in the rock, or in a hole drilled horizontally into rock, and the burden given it not too great, the overlying portion of the rock will be shattered and blown off. If the explosive force were downward only, the overlying rock would not be materially affected.

FEW of the surface equipments in the Missouri-Arkansas zinc-lead field are extensive or expensive for the reason that the individual ore shoots or deposits are comparatively small though numerous. This condition renders a surface plant of only transitory value, and it has usually soon outlived its usefulness, and may be transferred to a new place. For this reason head frames are made of light timber—2x6 and 2x8 pine, and the hoisting engines are mostly small, not being required generally to hoist from a greater depth than 200 feet. It is generally cheaper to sink a new shaft than to continue to tram ore 700 to 1000 feet underground only a few feet below the surface.

THE first hydraulic mining of which there is an authentic record was at Yankee Jims, a placer camp in Placer county, Cal., about 3 miles west of Forest Hill. A ditch was dug along the hillside and from this a flume was built outward toward a small ravine, where the mine had been opened. This flume was carried out until it had reached a point 40 feet above the ground. Here the water poured into a barrel, to the bottom of which was attached a hose or pipe of rawhide. The nozzle was a tin pipe about 4 feet long and shaped like an ordinary horn, having an opening 1 inch in diameter at the end. With this small and simple apparatus E. E. Mattison, the inventor, soon proved the superiority of his device over shoveling, and the idea was at once adopted and quickly improved and enlarged upon.

BLASTS have been successfully discharged by means of the electric spark for many years. The spark is generated in a device made for the purpose, the spark being created by friction. If all the holes loaded and primed are connected to the electric wires, all of the holes are discharged simultaneously, which frequently results in greater or less damage to timbers. If it is the intention to shoot the entire round at once by means of the electric spark, the holes should be given a lighter load than where they are fired miscellaneously or after a prearranged succession, by cutting the several fuses of different lengths. Efforts have been made to produce a fuse which would make it possible to fire holes previously loaded and connected up at one time, so that they might be discharged in series, but this attempt has as yet only met with partial success.

A BUCKET from a vertical shaft may be easily dumped by means of what is known as a "trip rope." This rope is secured at some point above the shaft, usually 12 to 15 feet, and at a place which will cause the bucket to dump at the desired spot, either in front of or behind the shaft, into a bin or car, or on the ground, as desired. The rope is provided with a hook, which is caught by the bucket tender into the ring beneath the bucket. When the engineer slacks the hoisting rope the bucket is drawn either backward or forward by the trip rope, and at the same time inverted and the contents fall wherever desired. At some shafts two ropes are used, one in front of the shaft, the other behind it. By this means ore is dumped at one place and waste at another. Where the trip rope is used the shaft should be provided with doors, which may be closed before the bucket is dumped. This gives greater security to the men below, and without such precaution the use of the trip rope is extremely dangerous.

IT is dangerous to store large quantities of high explosives in the mine, as frequent disaster from the practice shows. A magazine built of stone is considered by many the best place in which to keep dynamite and other high explosives. Others think light frame structures covered by corrugated iron better than heavy stone magazines, as in the event of an explosion, there is less flying debris to increase the danger. Still others believe the underground magazine better than either of the former. Without doubt a more even temperature can be had in an underground magazine, and such a storage place is superior to all others if it be dry, but this fact does not warrant the placing of powder in mine workings that are in use or which are connected with the main exits, and in a situation between these and the working faces. If there are abandoned workings in the mine, at some point distant from the main tunnels or shafts, and in a place where no great damage would result to the permanent improvements, nor to the workmen employed should an explosion occur, in such old workings a good storage place for powder may be found. Not more than a day's supply should be kept at the loading bench on any level, in the mine, and the caps should be kept in a separate place.

WHERE gold ores contain copper it is often difficult to secure satisfactory results by the cyanide process. Metallic copper is slightly soluble in cyanide solutions, but, like gold, is not acted upon sensibly if in large grains or sheets, but many of the ores of copper decompose cyanide solutions, some of them, such as the carbonates and oxides, so rapidly as to render the direct application of the cyanide process, for the extraction of gold, commercially a failure. In such cases some success has been attained by first leaching out the copper with a weak solution of sulphuric acid; washing the ore to displace the acid, and when necessary neutralizing the remaining acid by the addition of lime, and the subsequent treatment of the ore by the cyanide process for recovery of the gold. This process is said to have been introduced with considerable success at Barstow, Cal., on ores from Camp Rochester in San Bernardino county. Ores containing as high as 3% copper can sometimes be treated by cyaniding better than by any other process, but it as often occurs that an ore containing less than 1% copper will give much trouble, the copper accumulating in the circulating solution until it can no longer be used. Where copper becomes thus troublesome it is often better to use the electrical process for precipitation. There is considerable literature available on the subject of electrical precipitation of gold and silver from cyanide solutions.

The Nickel Plate Mine of British Columbia.

Written for the MINING AND SCIENTIFIC PRESS.

Within the past few years there has been developed, near the little mining village of Hedley, B. C., one of the richest gold mines in the world—the Nickel Plate of the Hedley Reduction Co, Ltd. Hedley is an obscure little place in the valley of the Similkameen river, at present off the line of railroad travel and up to the present time but little has reached the outside world concerning the Nickel Plate mines. In 1900 the mine came to the attention of M. K. Rodgers, who is the general manager, while he was in Victoria, B. C. For five years before finding the Nickel Plate, Mr. Rodgers had been in search of a large and profitable mining property for Marcus Daly, of Butte, Montana. In the furtherance of this desire to find a good mining property, he traveled many thousands of miles, examined over 500 mines and prospects, scattered over a good part of the world, and finally met the owner of the Nickel Plate at Victoria, when the mine was still in the prospective stage. The mine was visited with difficulty, for at that time there were no such conveniences of travel as at present. It "stood up" to critical superficial examination, there being little development, and eventually it passed to the present owners. The property comprises about twenty claims of fifty acres each.

The Nickel plate mill and office buildings are in the valley of the Similkameen, the mine being upon the mountain. The mine and the mill are connected by gravity tramway and electric railroad, the former 9000 feet long with a difference of 4300 feet altitude between terminals. The mill buildings and tramway are well illustrated by the accompanying engravings.

At the head of the gravity tram is an electric road, on which cars run between the ore bin and the mine—the cars running directly into the stopes. The cars descend by gravity to the upper loading terminal of the gravity road, and are hauled back to the mine by electric motor. On this line are twenty-two cars of two tons each.

The gravity tram has not got a uniform gradient, but varies between 10% and 66 8%. When first built this tramway was all in one section, but, owing to the frequent changes in grade, it was decided to operate it in two sections, which was found to be far more satisfactory. At the head of the upper section is a hoist driven by compressed air, which is connected with the winding drums of the rope. The function of this hoist is to hold the cars under constant control, and to equalize the uneven tension on the ropes, due to variable gradient. At the middle station the cars are detached and connected to the ropes of the lower section, thus dispensing with the necessity of reloading. At the lower end of the lower section, the cars run upon a tipple and dump automatically into a bin. Here the ore is reloaded into cars of five tons capacity, which deliver it to the breakers at the top of the mill.

The great difference in altitude between the mill and mine in that latitude makes a marked difference in the climatic conditions, there being about three months more summer at the mill than at the mine.

The ore, for most part, contains an auriferous mispickel, showing more or less free gold. The formation is greenstone, and in places this rock is sufficiently mineralized to constitute good pay ore, these mineralizations constituting the veins and ore shoots. Up to the present time the greater part of the ore is mined by open-cut and mill-hole method.

The reduction equipment comprises a complete stamp mill and cyanide plant, though all of the ore is not amenable to this treatment, some of it being smelting ore.

The mill is equipped with forty stamps, sixteen vanners and the usual rock-breaking machinery.

All power for the mine is generated by water, supplied by Twenty-mile creek. A flume 14,200 feet long was built to carry 1000 inches of water. A head of 406 feet is obtained at the lower power house. A 20-inch steel pipe carries the water to the wheels. A second pipe line, 16 inches in diameter, runs to wheels at the mill, operating under a head of 207 feet. At the main power house are the large compressors, electric dynamos, etc.

The mill is built on benches graded into the solid rock of the hillside. It is a gravity mill throughout. It covers a floor space of 43,500 square feet. The ore is delivered to a large bin at the upper part of the mill, 150 feet above the lowest floor. From this bin it passes through a chute to a grizzly, with bars spaced 1 inch apart. The oversize goes to a jaw crusher set to break to 1½ inch. The ore passes another grizzly, the oversize going to a smaller breaker, from which it drops onto a belt conveyor, which delivers to a second conveyor running longitudinally with the mill bins and at right angles to the first. By means of the second belt the ore is distributed wherever required in the bins below, keeping the ore supply evenly distributed. These bins have a storage capacity of 2000 tons, which is sufficient to supply the stamps for twelve or more days. There are three water wheels attached to the mill—one for the breakers, one for the stamps and the third for concentrators. The mill has at present forty stamps, but sixty more are to be added. The stamps weigh 1050 pounds and drop 7 inches ninety-two times per minute. The discharge is 6 inches above the die, through a 20-mesh brass wire screen. About four tons per stamp are crushed each twenty-four hours. The free gold is caught by amalgamation inside the batteries and on the outside plates. It has been found advisable to increase the number of concentrating machines, there being at present two vanners to each battery of five stamps. This will be increased by the addition of eight more machines, and the new addition of sixty stamps will be similarly equipped. The concentrates are almost wholly mispickel, to the extent of 10% of the ore. The concentrates are at present being stored, until experiment demonstrates the best means of treatment—an important matter not yet determined.

The tailings are treated by the cyanide process, the plant covering a floor 220x50 feet. There are twenty-four tanks, 34 feet diameter and 6 feet deep. They are arranged in two series, one above the other, for double treatment. The mill force, including those in the power department, requires the services of thirty men.

*See illustrations on front page.

Gravity Tramway, Nickel Plate Mine, Hedley, B. C., 9000 Feet Long, 4300 Feet Fall.

The Nickel Plate Mine, Hedley, B. C.

THE veins of scheelite (calcium tungstate) recently discovered about 5 miles east of Randsburg, San Bernardino county, Cal., is said to be from 6 to 18 inches wide, and to carry about 30% tungstic acid throughout. The pure ore runs about 80% tungstic acid.

Cheap Gold Mining and Milling in the Black Hills.

Written for the MINING AND SCIENTIFIC PRESS by E. J. KENNEDY.

California and Montana have each furnished examples of remarkably cheap mining and milling in the years gone by, and some excellent records have been made in these and other Western States. It seems almost needless to state that these low costs have always been made where the mining was done by the open cut method. In California some of the deep mines operate at a cost not exceeding $2 per ton, but when the cost drops below $1 the open cut method may at once be surmised to be a factor in the case, even when the conditions are unknown to those at a distance from the mine.

In the Black Hills of South Dakota are the largest gold mines in the world, and the most extensive operations in the world under one company are those of the Homestake at Lead, in Lawrence county. There are other large mines in the Hills, particularly in Pennington county, and some of these latter are now making good records for low mining and milling costs, after years of idleness resulting from various causes. Among these is the Benedict mine, owned by the Golden West Mining Co. The property is situated in Hornblende district, at the head of White Weasel gulch, and the mill 2700 feet distant, at the forks of North Castle creek and the main Castle creek, in a heavily timbered region, and in the heart

of the southern gold belt of the Black Hills.

The writer undertook the development of this property three years ago, following the ore in development. Shafts, cuts, drifts and crosscuts were driven, mostly in ore, and the ore thus mined in the course of prospecting and development was hauled in wagons to a 10-ton Chile mill run by water power. This was an inexpensive prospecting outfit, costing about $900—mill, flume, water wheel, and everything connected with the plant, ready to run. The cost of hauling and milling in this somewhat primitive manner was about $1.25 per ton, the mining cost not being included, as it was charged to development work. The ore sent to mill ranged in value from $1.25 to $5 per ton, the average for the first summer season being $3.15 per ton. During that season—1902—about 100,000 tons of ore were blocked out, which was considered sufficient to warrant the extension of our plant.

A flume and pipe line were built, 2½ miles long, having a capacity sufficient to carry all the water of Castle creek. The head at the mill was 123 feet. This gives us 300 H. P., which is more than is at present required.

The cut at the mine is 270 feet higher than the mill, with which it is connected by aerial tram, which operates without the least trouble. Only one man—the loader—is employed on this line. During the present season (1905) five men mine 100 tons of ore daily from an open cut. Cars are run close to the face of the cut, where rough, portable plank chutes are set up, and the ore is caved into the cars, which run on a level with the top of the ore bin at the upper terminal of the tram.

We also have a belt conveyor for certain places. This is quickly adjusted at any desired place and the ore is shoveled onto the belt, and this is also delivered into the upper terminal bin. The belt conveyor takes its power from the upper terminal wheel, the tram being connected to the power at the mill—everything being operated by water power owned by the company. The buckets are dumped automatically into a large gyratory crusher at the mill, which is situated above an ore bin of 500 tons capacity. The mill crew consists of two men on day shift and one at night, the mill crushing 100 tons every twenty-four hours. No night crew is worked at the mine, the day shift easily keeping the mill supplied for the full period of twenty-four hours. In the event of any stoppage in mining the mill bin, containing 500 tons, and the bin at the upper terminal may be drawn upon, and are capable of keeping us going nearly a week.

Ordinarily our expenses for a day's operations at mine and mill are about as follows:

Five miners at $3 per day	$15 00
One loader at $3 per day	3 00
Two millmen at $4 per day	8 00
Superintendent at $5 per day	5 00
Total	$31 00

We have a large Chile mill, in which the wear on steel is very light. The cost of the mill steel, oil, repairs, etc., will not exceed $4 per day. This makes the cost of mining, transportation and milling 100 tons of ore daily but $35, or a cost per ton of 35 cents. This is a very low cost, and is, I believe, a record breaker for a $3 camp. Of course, the surrounding natural conditions are all in our favor. We have abundance of timber, free water power—more than is required; the ore is decomposed and soft and free milling, the tailings only being worth about 20 cents; no drill steel is required, as no drilling is necessary; little powder is used, the blasting being in crevices and in bulldozing larger masses. Altogether, we are at present fortunately situated. Later, as depth is attained, the expenses must increase somewhat, but then the glory hole system will be put into practice, and as gravity can still be utilized the additional cost is not expected to be prohibitive.

The formation here is hornblende and micaceous schist, with small lenses and veins of quartz, and broad silicified zones impregnated with auriferous pyrite and gold. This ore at the surface is oxidized and free milling. In depth the oxidation will gradually disappear, and we will then have a less simple and more expensive metallurgical problem to contend with than at present.

The Hornblende district, in which this property is situated, extends in a belt about 3 miles in width from the property of the Black Hills Copper Co., in the canyon of the main Rapid creek, at the northwest corner, to the Golden West property on the southeast. The postoffice for this district is Rochford, near which are the Stand-by, Montezuma, Alta-Lodi and a number of other mines.

A 260,000,000-GALLON WATER SUPPLY through a 240-mile conduit at a cost of $23,000,000 is the large project announced by the city officials of Los Angeles, Cal., says the Engineering News. The officials report that options on water rights and on conduit right-of-way have been secured and that the people will soon be asked to vote on the necessary bond issue. The source of the proposed supply is the headwaters of Owens river, on the eastern slope of the Sierras, in Inyo county, Cal. It is said that a concrete conduit, 15 feet wide and 9 feet high, is proposed, and that there will be about 17 miles of tunnel. It is expected that the provision of an abundant water supply will lead to the consolidation of outlying municipalities with Los Angeles, and in any event contribute materially to the growth of Los Angeles and vicinity. Wm. Mulholland is superintendent of the water works of Los Angeles and Owen McAleer is Mayor. In development of this water supply scheme an important part has been taken by Fred Eaton, M. Am. Soc. C. E., who has served as both city engineer and Mayor of Los Angeles.

The Ventilation of Mines.

NUMBER II.

USE OF COMPRESSED AIR FOR VENTILATING PURPOSES.—The air set free from the rock drills is without doubt a most useful addition to the stock of air in the mine, and is liberated where it is most wanted, at the place where the men are working. This portion of the compressed air, too, has done its mechanical work in actuating the drill, and has repaid as far as is possible the cost expended in compressing it. With air set free from the mains to blow out smoke the case is different, for the air which has been compressed at considerable expense is used without doing any mechanical work, and the quantity so liberated gives a very poor return for the cost expended on it. The commission questioned a great many witnesses as to what was the cost of the compressed air used for ventilation, and what proportion of the whole of the compressed air sent into the mine was used for this purpose as compared with that used through the rock drills, but only very vague replies were received, very few of the users of compressed air having apparently troubled to go into the matter. One witness said plainly he was afraid to go into the cost of ventilating in this manner, knowing that it must seem out of all proportion to the result obtained. The reason for using the compressed air, in spite of its admitted high cost, is that it is so convenient, the pipes having necessarily to be led through all the workings close to the "faces" and the hose pipes for the drills being available at any time for blowing out smoke.

To use any other system of ventilating requires the employment of a separate pipe system, or brattices, air sollars, or other means of dividing the air currents, and the very heavy blasting usual in our mines, where from thirty to fifty pounds of blasting gelatine are frequently fired in one round of holes, making it impracticable to carry any of these devices close up to the working points.

One Kalgoorlie mine superintendent, well known for able and economical management, held that notwithstanding the high cost of the compressed air it was cheaper to use it than to employ any of the other suggested methods, loss of time in fixing ventilating appliances and the cost of maintaining them in good order being, in his opinion, so great as quite to equal or even surpass the cost of the compressed air. It must be admitted that there is great force in this contention, and that the destruction of ventilating pipes and other appliances by the unavoidable heavy blasting is a very serious difficulty in their practical application. At the same time we must point out that the quantity of compressed air put into the working places is often very inadequate for their proper ventilation, and that, owing to its cost, there is a strong inducement to cut down the amount allowed to be used to the minimum that will permit the men to work. This is especially the case where the compressor is rather small for the needs of the mine and there is a pressing demand for air for the drills, a condition liable to recur from time to time as the mine extends and reaches nearer and nearer to the capacity of the compressor. While there is a general agreement of opinion among most of our witnesses that the air in the immediate vicinity of the machines is fairly good while rock drills are actually working, it takes very little calculation to show that the quantity of air put into the mine through the compressed air mains is altogether insufficient of itself for proper ventilation. Let us take the case of the Associated Mines at Kalgoorlie, which have a very fine large air compressor, designed for sixty drills, and stated to be able, with an expenditure of 1000 H. P., to compress 5000 cubic feet of free air per minute. According to the returns made to the commission by the manager, the amount of air ordinarily put into the underground workings is 1700 cubic feet of free air per minute, which supplies twenty drills and two air-winches, while about 100 cubic feet per minute are used in driving pumps. Taking the winches as using 300 cubic feet per minute, and neglecting leakages, the amount supplied to each drill would average 65 cubic feet per minute. The number of men underground is returned at 292, or, say, 100 men in one shift. The total amount of air per man put into the mine by the compressor, therefore, only averages 17 cubic feet per minute. Taking the men on the drills only, each drill having two men, the quantity per man averages 32½ cubic feet per minute. As each drill, when actually working, liberates probably over 100 cubic feet of air per minute, the average of 65 cubic feet must be much higher than the amount set free while the drill is not working, and the amount supplied to the men while setting up the machine must be very small. Usually the air is used for blowing out the smoke, and then is cut off, or almost so, while the men rig the drill. During this period the ventilation is often very deficient. The analyses made by Mr. Mann show that in point of fact, even when the drills are running, there are places where the ventilation is very far from perfect.

We do not wish to be understood to mean that in the instance quoted, and similar cases, the only ventilation in the mine is that from the compressed air, for as a matter of fact the principal air supply to these mines is obtained from natural ventilation. The figures quoted were meant to show that the compressed air by itself is a quite insufficient supply, and would not alone be able to maintain the air in a pure state. Usually there is a certain amount of air from the main airways slowly finding its way into even such places as are some distance from the main air currents, and gradually removing the vitiated air.

Many working miners hold the belief that air from the compressed air mains is inferior for breathing purposes to air sent in by other means, there being a common impression that the air has been in some way injured by compression.

The analyses made by Mr. Mann of samples of compressed air from the mines' ordinary supply show that this opinion is mostly a prejudice, the air being practically pure. The air in passing through the rock drill often receives a charge of atomized oil, as oil has to be used very freely in the drill to keep it in good running order. Besides the oil in the air there is also, however, at times a very offensive odor, probably due to organic matter in the pipes when they are laid, the composition used in making the joints, the finely divided oil from the compressor, and dust in the air compressed. The moisture in the air compressed is often incompletely condensed before the air enters the pipe system, and therefore condenses in the pipes, and lying in low parts of the pipe line it may become very foul and offensive. It is a not uncommon occurrence for such water to be blown out of the pipes through the drills. Occasional traps on the pipe line, automatically blowing themselves off when full of water, are therefore advisable.

(TO BE CONTINUED.)

Scientific Blasting.

Written for the MINING AND SCIENTIFIC PRESS.

Occasionally miners are required to perform difficult blasting operations, where buildings, flumes or other structures in the vicinity are endangered and must be protected. Experienced workmen can usually overcome these difficulties by the judicious pointing of holes and in careful use of powder. Not long since, in a city which it is needless to name here, it became necessary to remove a number of concrete piers which had been constructed in the basement of a large brick building. These piers were foundations of large size made from the best material by competent engineers, and had been placed in position as foundations for heavy machinery and had been in use for more than ten years. It became necessary to remove these foundations, and it goes without saying that it had to be done without injury to the building. The foundations were built on a concrete floor and extended upward to about the level of the main floor of the building—the street level. For a day or two men were engaged in the attempt to remove these concrete piers with picks, hammers and gads, but they made most discouraging headway. One of those interested made inquiry of an expert miner, H. P. Gordon, and asked if the foundations could be mined or blasted out. Mr. Gordon examined the proposition, felt satisfied the job could be done and accepted the contract. After drilling two holes and firing them, there seemed to be no longer an experiment in the proposition and the contract was undertaken. For a period of thirty-five days from four to seven miners were employed under direction, drilling and blasting these concrete piers. In addition to these miners, a crew was employed sledging the larger pieces of concrete and in shoveling the debris into wagons. During this time a total of 470 holes were drilled in the concrete, the most of them being 30 inches deep, a few of them being short block holes. Sixteen hundred feet of fuse, 170 pounds of No. 2 dynamite and 470 detonators were used. The result of these municipal mining operations was 740 wagon-loads of broken concrete, about 2220 tons. The work was continued to a successful conclusion, no damage whatever was done, and these unusual operations did not even attract the notice of passersby nor of those occupying the neighboring buildings. All work was done during the day, the blasting being accomplished whenever the round of holes was ready. As no permit was obtainable for work of this character, it had to be done secretly; but no unusual precautions were observed. The holes were well tamped with moist clay and each hole was loaded with nearly one and a half sticks of powder, the block holes requiring less.

The success of this operation shows that blasting may be successfully accomplished without damage within the limits of a metropolitan city if the necessary care is exercised in the work.

Cyaniding Silver-Gold Ores of the Palmarejo Mine, Chihuahua, Mexico.*

NUMBER V.

Written by T. H. OXNAM.

GENERAL REMARKS.—The total quantity of solution passing through the zinc boxes during 1904, divided by the quantity of sands for the same period, shows that, for each ton of sand treated, 3.27 tons of solution left the leaching vats, of which 2.63 tons were weak solution and 0.64 ton strong solution.

It is found in the treatment, that large quantities of the weaker solution give more satisfactory results than small quantities of the strong solution, and it is always made an important point to pass as much weak solution through a charge as possible. Experience has demonstrated that in a given length of treatment a rapid leaching rate and a large quantity of solution is more efficient than a slower leaching rate and a consequently lesser quantity of solution. The solution pipe lines and launders occasionally become quite choked in places with scale deposited from the solution. This scale, taken from lines carrying precipitated solution, contained from a trace of $1 of gold and from 1 to 7 or 8 ounces of silver per ton. The scale deposited from the unprecipitated solution usually runs higher, several assays taken having averaged about $5 of gold and 18 ounces of silver per ton.

Ordinarily the solutions do not become excessively fouled. They usually contain small percentages of iron and manganese in addition to the zinc compounds present. Alkaline sulphides are very rarely or never noticed in solution. Sulphocyanides and ferrocyanides appear to be constantly present, however, in fair quantities. The average of a number of determinations made at various times gives about 0.41% of ferrocyanides and 0.048% of sulphocyanides.

The sands charged averaged about 0.09% of latent acidity, and, as a rule, they contain no free acid.

The concentrates produced are sold to the same company that buys the cyanide precipitates. When making the original cyanide experiments on this ore, a good deal of time was devoted to an attempt to treat the concentrates by cyanide, but without success. Experiments on both raw and dead-roasted concentrates reduced to various degrees of fineness, by leaching and agitation, for varying periods of time, up to 34 days, and using solutions varying from 0.2% to 2% of KCN, proved entirely unsatisfactory.

Table VI gives the working costs for milling and cyaniding during 1904. It should be remembered that the cost of all supplies is considerably increased by the very heavy freight transportation expenses, as well as by the duties placed by the Mexican Government on most of the supplies used. The freighting facilities have not improved any since the change in the milling operations—the difficulties of transportation remaining as described earlier in this paper, and being, therefore, the source of an unusually heavy portion of the expenses for the supplies.

TABLE VI.—WORKING COSTS PER TON.

Milling—	
Supplies	$0.640
Labor	0.357
Lubricating	0.023
Assay office (labor and supplies)	0.035
Concentrating	0.092
Power (ditch, maintenance and supplies)	0.234
Salaries	0.264
Miscellaneous (lighting, etc.)	0.018
Management and general expenses	0.336
Total	$1.999

NOTE.—$1.999 Mexican currency during this period was equivalent to $0.95 gold.

Cyaniding—	
Cyanide (2.95 lb. @ $0.63)	$1.859
Zinc (0.96 lb. @ $0.30)	0.288
Lime (4.33 lb @ $0.0118)	0.051
Other supplies	0.050
Labor	0.329
Salaries	0.371
Assay office (labor and supplies)	0.036
Power (ditch, maintenance and supplies)	0.017
Miscellaneous (lighting, etc.)	0.004
Management and general expenses	0.186
Total	$3.191

NOTE.—$3.191 Mexican currency during this period was equivalent to $1.52 gold.

The cost of realization on cyanide precipitates has not been included in above cyanide working costs. This cost is naturally very high, the quantity of precipitates produced being much greater in proportion than that produced when treating gold ore only, while the treatment charges per ton of ore are no less. Transportation expenses on the precipitates are also very heavy. In addition to this comes the heavy item of Government bullion taxes.

The average cost of realization on cyanide precipitates per ton of ore cyanided is as follows: Government taxes, $0.84; treatment charges (including transportation expenses), $1.06. Total, $1 90.

The cost of realization on the concentrates produced is also unusually high on account of the heavy transportation expenses and Government bullion taxes. The average cost of realization per ton of ore crushed is as follows: Government taxes, $0.35; treatment charges (including transportation expenses), $1.08. Total, $1.43.

TREATMENT OF SLIMES.—As before mentioned, the accumulated and currently produced slimes are now being treated in a separate plant by a system of agitation and decantation, centrifugal pumps being used as the means of agitation. The slime plant consists essentially of the following parts and accessories:

Four agitation and four decantation vats, all provided with conical bottoms and each being connected with its own separate centrifugal pump; two solution tanks placed at the head of the zinc boxes, which receive the solution from the decantation vats; four sets of zinc boxes and three solution sumps, which receive the solution leaving the zinc boxes; one special solution tank placed at a higher level than the rest of the plant and used principally to supply solution to the pump bearings under pressure; two ordinary 3-inch centrifugal pumps, used only for pumping solution from the sumps to any desired vat or to the upper solution tank just mentioned, they being so connected up that either pump can be used should the other get out of order. Each pump is run by a friction clutch pulley, which enables it to be started or stopped in a moment, independently of the other pumps. A small 14x15-inch friction-geared hoist is used to convey the slimes from the slime pits to the agitation vats. The entire plant is run by a 5-foot Pelton wheel, making about 115 revolutions per minute and operating under a head of 81 feet, using a 4-inch nozzle. Water power is obtained by means of a 14-inch riveted steel pipe, tapping the main pipe line supplying power to the mill. This 14-inch pipe line was brought in by mule back, riveted in 10-foot lengths, although some difficulty was experienced in its transportation.

Figs. 4 and 5 give plan and section of the slime plant.

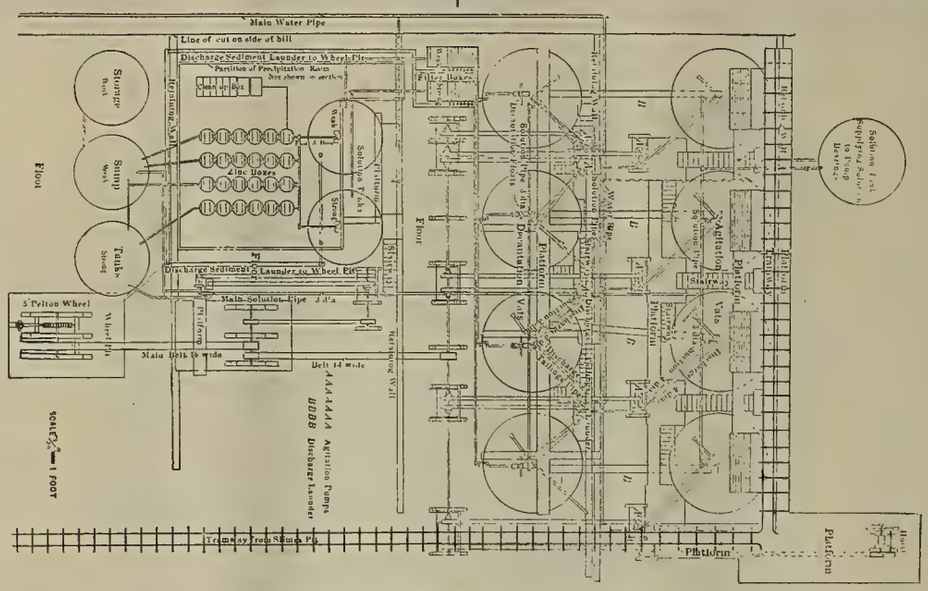


Fig. 4.—Plan of the Slime Plant, Palmarejo, Mexico.

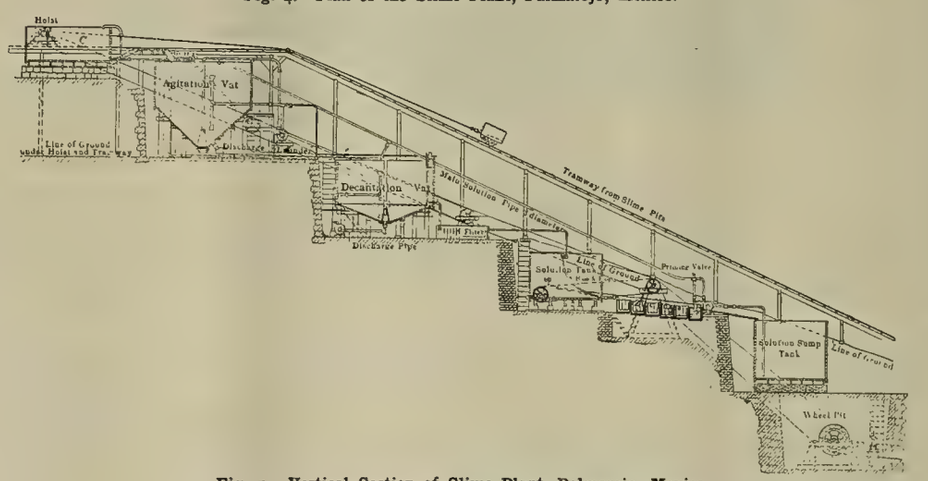


Fig. 5.—Vertical Section of Slime Plant, Palmarejo, Mexico.

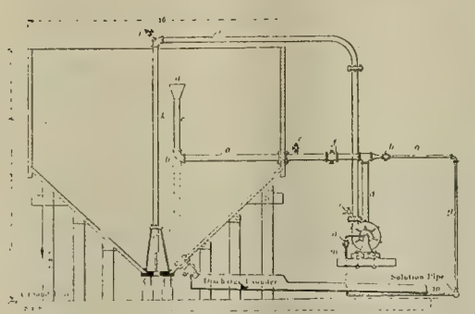


Fig. 6.—Agitation Vat and Pump Connections.

The method of treating the slimes is quite similar to that ordinarily practiced by agitation and decantation and consists briefly in giving the slimes about a two days' agitation in the agitation vats, with from two to three times their weight of cyanide solution, followed by another two or sometimes three days' treatment in the decantation vats, during which latter portion of the treatment the charge, after having been sufficiently agitated with the addition of slaked lime, is allowed to settle as much as practicable, and the supernatant clear liquor is deposited and passed through the zinc boxes. This operation of agitation, settling and decantation of clear solution is repeated as many times as permissible within the time limit of the treatment, ordinarily being but three or four decantations.

The material being treated, when dried to from 20% to 25% of moisture, is quite tough and of the consistency of soft putty. It contains, however, a certain percentage of very fine sands, and, when viewed in vertical section, presents a somewhat stratified appearance. As previously mentioned, it cracks on long drying into layers almost absolutely impervious to leaching.

DESCRIPTION OF THE PLANT.—The four agitation vats, made of 3-inch redwood throughout, are provided with conical bottoms, slanting at 45°. As shown in Fig. 6, each vat has an inside diameter of 15 feet 7 inches, and their vertical depth from top of side staves to the iron casting at point of conical bottom is 15 feet, the inside depth of vertical side staves being 7 feet 3 inches. Each agitation vat is connected with a special manganese-steel lined, 4-inch centrifugal pump, which runs at a speed of 900 revolutions per minute. The pump is connected with the vat by the 4-inch suction pipe, a, which enters the vat through the side staves about 6 inches above their juncture with the bottom staves and extends nearly to the center of the vat, where it is connected by means of a movable elbow, b, with a short piece of 4-inch pipe, c, provided at the free end with a good-sized screen or strainer, d, made of ¼-inch sheet iron, punched with a number of 1-inch holes; this short piece of pipe, together with the screen, is of such a

*Trans. Amer. Inst. Min. Engrs.

length that when being lowered the screen will just clear the bottom staves. The screen is provided with a small iron ring, to which is fastened a piece of rope, by means of which it can be raised and lowered.

Just outside of the vat, the suction pipe is provided with an air cock, e, which admits air to the material going through the pump. This air cock, however, is very rarely used at the present time. The service cock, f, permits the shutting off of the material from the pump at any time it may become necessary—as, for instance, to repack the stuffing-box or to examine the interior of the pump. The 2-inch pipe line, g, provided with the valve, h, connects with the upper solution tank.

When it becomes necessary to shut the pump down for any length of time, either at the conclusion of the agitation of the charge or at any time during the treatment, the 2-inch valve, h, is opened and the service cock, f, is closed, thus allowing clear solution only to pass through the pump. The friction clutch pulley running the pump is now thrown out of clutch, and after the pump has stopped the valve, h, is closed. By this means is avoided the accumulation in the pump interior of solid matter that would naturally be deposited, when the pump is stopped for any length of time, from the slimy material ordinarily passing through it.

The 4-inch discharge pipe, i, of the pump is provided with a small bibb-nosed pet-cock, j, a few inches from the body of the pump, by means of which samples can readily be taken of the material passing through the pump. The discharge-pipe passes over the top of the vat, and at a point vertically over the center of bottom casting is provided with an elbow and drop pipe, k, which reaches to within about 15 inches of the bottom casting. This pipe is held firmly in position by means of an iron clamp and four legs made of 0.75-inch bolts fastened to the bottom casting and which serve as a tripod. The distance of the lower end of this discharge pipe from the bottom of vat is a matter of some importance in the agitation, and a number of experiments made along this line have indicated that the best satisfaction is obtained at a distance of 15 inches from the bottom casting.

Different shapes of discharge ends, or nozzles, have been tried at the lower end of the drop pipe, but experience so far has shown that the plain 4-inch pipe end gives as satisfactory results as any other shape. The discharge pipe of the pump tends to act as a siphon when the pump is stopped at any time during the agitation, and would therefore cause inconvenience when repacking the stuffing-box or making any necessary repairs. To prevent this, air is admitted to the pipe by opening the small air cock, l, tapped into the elbow at the upper end of the drop pipe. This air-cock, l, is also frequently used to allow the entrance of air into the charge being agitated, it being found more preferable for this purpose than the air-cock on the suction pipe. (It might be supposed that when this air cock is open during the agitation, a steady stream of the material passing through the discharge pipe would be ejected through it; and with regard to the air cocks similarly situated on the pump connections of the decantation vats, such is the case. As regards the pumps connected with the agitation vats, however, the effect is found to be quite the reverse, and rather a strong air suction usually occurs when this air cock is open.)

The pump bearing nearest the pump shell is tapped with a small pipe line, m, provided with the valve, n, which connects with the upper solution tank previously mentioned. By this means, the bearing is supplied with clear solution under pressure and the wear on the shaft and bearing is greatly reduced. At the commencement of operations, clear water was supplied to the pump bearings and was also used for cleaning out the pumps and for priming, when necessary. It was soon found, however, that the quantity of water added in this way increased the volume of stock solution very appreciably, and, of course, an equal quantity of weak cyanide solution had ultimately to be run to waste. Not only did this cause an unnecessary, mechanical consumption of cyanide, but the quantity of water added through the pump bearings naturally reduced the strength of the working solution in the vat under operation, with a consequent deleterious effect on the percentage of extraction. The quantity of solution that will be added to a vat during the usual period of agitation (from 40 to 44 hours), when the shaft and bearing is a little worn, is surprising, amounting in some cases to 15 tons, even when the greatest care is exercised. The amount of solution added in this way is naturally the least just after the pump has been equipped with a new shaft and new liners, and the bearing re-babbitted. On an average, however, the quantity of solution added to each charge through the pump bearings is from five to six tons. The agitation pumps in use, while in most respects proving very satisfactory, have nevertheless certain defects in their design, which contribute largely to the rapid wearing of the shaft and the bearing next to the pump shell, and also to the wearing of the interior, renewable manganese-steel wearing parts. The life of these parts naturally varies somewhat, but ordinarily it becomes necessary to equip a pump with a new shaft and certain portions of the manganese-steel wearing-parts and to re-babbit the bearing, about every six weeks. The pumps are equipped with a pulley having a 6-inch face, but it is found preferable to use a 4-inch belt, since this reduces the weight on the pump shaft with a consequent decrease in its wear, while a 4-inch belt runs the pump equally as well as a 6-inch one. Wire lacing is used on all the belts.

The results of the sizing test in Table VII represent an average of those obtained from the material treated up to the present time.

TABLE VII. SIZING TEST ON SLIMES

Size of Material.	Weight	Assay Value.		Percentage of Total Values Contained	
		Gold.	Silver	Gold	Silver.
	%.	Value	Ozs.	%.	%.
Retained on 80-mesh	1 1	$2 38	14 22	0 63	0 77
Retained on 100-mesh	2 7	2 06	13 60	1.35	1.81
Retained on 120-mesh	5 6	1 96	13 02	2 66	3 59
Retained on 150-mesh	3 1	2 27	14.14	1.70	2.16
Retained on 200-mesh	2 7	2 16	13.10	1.41	1.74
Passed 200-mesh	84 8	4 54	21 68	93.22	90 52
Totals	100 0			100.97	100 59

Assay value of material was $4.13 of gold and 20.30 ounces of silver per ton.

(TO BE CONTINUED.)

THE PROSPECTOR.

The rocks from A. J. T., Yerington, Nev., are: No. 1, a very much altered and indeterminable rock containing copper carbonate; the white mineral is calcium sulphate (gypsum). No. 2 is a much altered diorite, also showing a little copper carbonate; gypsum is also associated with this rock. No. 3 is an oxidized ore from near the surface; it consists principally of iron oxide; the iridescent colors are due to copper; there is gypsum in this ore also. No. 4 is a much altered eruptive rock carrying a large percentage of iron sulphide (pyrite). No. 5 consists chiefly of epidote (light yellowish-green mineral), specular iron (the brilliant metallic mineral), and calcium carbonate (the white mineral); the general appearance of the rock suggests a greatly altered diorite, in which there has been a secondary formation of several foreign minerals.

The silver ore from P. F. G., Mascota, Mexico, contains several complex combinations of silver with sulphur, antimony, etc. The larger piece contains principally the ore known as freieslebenite, a complex combination of silver, antimony, lead and sulphur. In this there is also a very little black sulphide of silver. The smaller and darker piece contains considerable argentite (silver glance) or black silver sulphide, and also combinations of silver, sulphur, antimony, etc., occurring so intermixed as to render their determination individually almost an impossibility.

The three mineral specimens from Roosevelt, Idaho, have been determined as follows: No. 1. Quartz-porphyry. No. 2 is an acid eruptive in which stratification seems to have been induced by pressure. The rock presents many of the characteristics of aplite, though stratification is unusual in that rock. The determination of small specimens is often difficult. No. 3 is vitrophyre, a variety of volcanic glass.

The rock samples from Havilah, Cal., are: No. 1 is a micaceous schist, heavily stained with iron oxide. No. 2 is a very siliceous mica schist which evidently at one time contained pyrite, the oxidation of which has rendered the rock porous, giving it a honeycombed appearance; the rock may be gold bearing. No. 3 is a silicified dike rock (probably pegmatite), the greater part of the quartz having a flint-like appearance. No. 4 is also a siliceous dike rock, through which are scattered numerous feldspar crystals; this rock may also be gold bearing.

The minerals from Forest Hill, California, are: No. 1, steatite. No. 2 is a basic rock altering to a talc schist. No. 1 evidently represents a further state of alteration of the same rock. These rocks may be, as stated, gold bearing, as similar auriferous rocks occur elsewhere in California.

The white crystallized rock samples from Gisborn, Utah, are calcite (calcium carbonate). The specimens are only translucent. When perfectly transparent this mineral is known as Iceland spar and possesses the remarkable property of double refraction. That is, two images are seen in looking through it. This property is taken advantage of in microscopic petrography by the use of what are known as nicol prisms, which are made from clear, transparent, flawless Iceland spar.

An End-Dumping Wheelbarrow.

Written for the MINING AND SCIENTIFIC PRESS by MATT. W. ALDERSON.

A number of articles illustrating self-dumping arrangements for the hoisting bucket have been published. Recognizing the value of self-dumping skips, under certain conditions, the writer has, nevertheless, been unable to see where they can be made of practical value to the prospector. In hoisting it does not seem possible to arrange to dispense with at least one man on the surface and, as a general rule, this man is the man who has time to spare. After receiving one bucket and sending an empty one down, he has time to empty several buckets while the one below is being filled. A self-dumping arrangement only gives him more time, which he has no use for. This would not be true, of course, if the bucket below was loaded from an ore pocket or bin, but prospectors generally would not put in such, till developments warrant. What seems to be needed is arrangements to save work below.

Where hoisting is done, after the shaft is sunk, by windlass, whip or whim, it is not often that the ground is hoisted as broken. Generally a man will work several days breaking, throwing the dirt behind him, till there is accumulation to justify a day's hoisting. It is of advantage to have the dirt to be hoisted as near the shaft as possible and when one gets his level in over 20 feet he cannot throw the material behind him and near the shaft without great waste of time in walking back and forth. And he can not pile it close behind him very long and leave room to get out. As a remedy for this condition of affairs the writer has used a wheelbarrow so arranged as to dump conveniently on the end instead of at the side. This contrivance, illustrated here-

End Dumping Wheelbarrow.

with in all its crudity of construction, is a wooden-framed wheelbarrow in which the construction has been changed so the bed of the barrow is raised till it is 20 inches above the floor. The bed is also turned, so the ends of the barrow are forward and back instead of to the sides. The wheel is set so as to be under the barrow, the front of the wheel being in line with the end of the tray—not much farther forward, as in most wheelbarrows. The legs are 22 inches apart at the bottom. The handles are short—36 inches in all, from hub of wheel, and 26 inches apart at the hand holds.

It will be understood that this barrow, when loaded, is top heavy and one needs to exercise care in loading and handling it. It is well in loading to lay large pieces across the front of the scoop, thus preventing fine stuff from falling off onto the track. One needs a clear track over which to run the barrow, as it dumps so easily that a piece of rock on the track the size of a hen's egg will overturn it. But it is a great convenience. One easily runs the dirt out from the face, piling it up along the track to a depth of 18 inches to 2 feet. The best way to unload the barrow is to give it a quick forward thrust instead of dumping. At one stormy period in the winter time, when it was not practicable to attempt to hoist in the exposed place where the shaft was situated, work progressed for weeks with this contrivance where otherwise it would have been necessary to suspend operations. At another time, when the face was in exceptionally hard rock, the miner worked on for six weeks before needing assistance to hoist. Then what was broken was taken out with a whip in two and a half days. If it had been necessary to have a man and horse on the surface every day or so, say once a week, the expense would have been greatly increased. The level was fitted with track for the truck carrying the buckets used by the whip, and was thus also ready for a car when developments warrant, a temporary plankway being put down between the rails on which to run the wheelbarrow. This plankway facilitates shoveling and the material of which it is composed may be easily moved when chutes are put in and buckets or car can be loaded direct from them.

Gold Dredging in California.

NUMBER II.

The continuous-chain bucket dredger is practically the only type that is in successful operation in the gravels of the Sacramento Valley districts, New Zealand, Montana, Idaho, Colorado and Oregon, and it holds the field in gravel where there is an excess of water and where conditions are generally favorable for dredging. There are many differences in detail in the different dredgers, but under favorable conditions, such as exist in the Sacramento Valley district, in New Zealand, in the States named and in Alaska, the results obtained from these dredgers do not differ much except where the conditions are abnormal and difficult. The dredger in use is much like the ordinary continuous-chain bucket dredger used for other work, so far as the digging part goes, except that the size of shaftings and strength and weight of all parts are greatly increased. For gold mining it consists of a hull, a digger, screen, sluice-table and sluice-boxes, a stacker, a pump, amalgamator, and sometimes a sand-pump, with lines or lines and spuds to hold the boat in position and separate motors for each part where power is required.

View Showing Tailings Stacker.

The Main Drive.

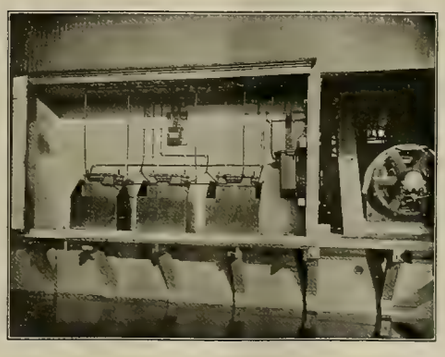
The Bucket Line and Pilot House.

The Buckets in Operation.

Beginning the Work of Dredging in a New Pit.

Folsom Development Co.'s Dredger No. 1.

A Completed Dredger.



The Transformer on a Modern Dredger.

HULL.—So far, in California, all the hulls are made of wood, but some dredgers sent to Dutch Guiana have been built with steel hulls. This hull is rectangular in shape, with a slightly reduced width in the bow of the boat. As, practically speaking, all the parts of the machinery of a dredger are renewed during the life of a dredger, it has been suggested that steel hulls would give a longer life and more solidity; but so far none have been constructed, and probably will not be until there is a nearer approach to perfection of the machinery and a better knowledge is had of the limits of the capacity of the dredgers, for the tendency is to discard the smaller dredgers and to build those of larger capacity. To allow the digging ladder and its chain of buckets to descend to the bottom of the ground to be worked, the hull in the forward part is divided by an opening called the well, in which the ladder is moved up and down. The dimensions of the hull vary with the size of the buckets. The hulls vary in width from 30 to 40 feet, in length from 80 to 120 feet, and in depth from 7 to 9 feet.

GAUNTRIES.—Near the center of the hull there is a main gauntry, to support the upper end of the digging ladder and the main drive of the bucket chain. These have commonly been made of wood, but lately some have been constructed of steel plates. There is a stern gauntry to support the tail sluices, the conveyor ladder and the spuds, if they are used.

DIGGER.—This consists of a ladder frame, built strongly of iron or steel so that a chain of buckets may travel continuously around its length. On the best of these, manganese steel is used in the lips and bushings of the bucket, and on the ladder rollers. It has been found that a large saving in cost of repairs, which is the main cost, and where future saving can be made in the cost of dredging, is in strengthening the wearing parts of these buckets and links. A reference to the tables of cost will show how large is the proportion of the cost of working caused by the breaking of the buckets and other parts of the digger. However, this has been very much reduced since the first successful work was done at Oroville, and is being continually reduced as new dredgers are constructed. The greatest improvements are now being made by the use of special steels and in the shape of the buckets.

The bucket line is either what is called of a "close connection" or of an "open connection;" that is, the buckets follow each other on each link of the chain, or there are open links between the buckets.

Wherever there are no large bowlders and the gravel is comparatively loose, there can be no question that the close-connected buckets, with less speed, will dig more ground than will the open-connected. As to the difference between the open and the close-connected bucket in hard ground, the question as to the greatest capacity has not been settled, but it is probable that the close-connected bucket will give more satisfactory results. However, where there are large bowlders, the open-connection must be used, or the backs of the buckets will be jammed and broken. The close-connected buckets are run at a lower rate of chain speed than the open-connected buckets, the former moving at the rate of about 50 feet, or 18 to 25 buckets per minute, and the latter at 60 feet, or 12 to 15 buckets per minute. Yet in hard ground the open-connected buckets are filled to their full capacity more often than the close-connected buckets. In this connection it may be said that most of the newer dredgers at Oroville and Folsom are equipped with close-connected buckets.

Owing to the greater weight of the close-connected chain of buckets and the greater yardage handled, more power is required than for open-connected buckets. The following tables will give an idea of the difference:

The different motors in the Oroville Gold Dredging and Exploration Co.'s 5-foot Risdon dredger are of the following capacities:

	Horse Power.
Main drive	50
Stacker and screens	20
Side lines and head lines	10
Ladder hoist	15
Water pump	40
Primer pump	3
Total	138

The average amount of horse-power used in the dredger was 90. No returns were made of the proportion of the full capacity of each motor used.

The following figures are given by the builders of the Bucyrus close-connected, belt conveyor, shaking screen dredgers, as to the horse-power of the motors as built:

DREDGER WITH 3 CU FT. BUCKETS.

	Horse Power.
Digging motor	50
Winch motor	15
Screen and conveyors	20
Water pump	30
Sand pump	30
Priming pump	3
Total	148

Actual consumption, about 100 H. P.

DREDGER WITH 5 CU. FT. BUCKETS.

Digging motor	75 or 100
Winch motor	20
Screen	15
Conveyor	10 or 15
Water pump	50
Sand pump	30
Priming and clean-up	5
Total	235

Actual consumption, about 125 to 150 H. P.

DREDGER WITH 6 CU. FT. BUCKETS.

Digging motor	100
Winch motor	30
Screen	15
Stacker	15
Water	50
Sand pump	50
Priming and clean-up	7½
Total	267½

Actual consumption, not yet known.

The following data have been given as to the actual consumption of power, as per report in L. J. Hohl's paper read before the California Miners' Association:

For a 3 cu. ft. close-connected bucket dredger, with shaking screen and belt conveyor:	Horse Power.
Main drive	26 to 45
Stacker and screen	12 to 16
Water pump	45 to 50
Winches, maximum	28
Sand pump	32 to 50
For a 5 cu. ft. dredger of the same type:	
Main drive	42 to 70
Stacker and screen	10 to 20
Water pump	50 to 75
Winches, maximum	27
Sand pump, not tested.	
For a 5 cu. ft open-connected bucket dredger, with revolving screen and bucket conveyor:	
Main drive	60
Water pump	52
Screen and stacker	18½
Other motors, not tested.	

Yuba dredger, 6 cu. ft. buckets, close-connected, with shaking screen and belt conveyor. This dredger digs 60 feet deep:

Main drive	108
Water pump	68
Sand pump	63
Stacker	9
Shaking screen	11
Auxiliary supply	13

(TO BE CONTINUED.)

Placer Mining in Alaska.

NUMBER III.

SELF-DUMPING CARRIERS.—The conditions in the Klondike district appear to have necessitated the adoption of this expensive method of placer mining. Outside the Klondike field the method was not seen except at one place on Mastodon creek, in Birch Creek district. The method is adopted to work rich gravels where conditions do not permit working by ordinary shallow open cut methods, and where drifting is impossible or inadvisable.

The average depth of eight Klondike operations was 17.5 feet, being greater than that economically advisable (namely, 15 feet) for open-cut operations in general. The operator adopts this method because there are thawed streaks and channels in his deposit If such ground is drifted, the chances are that he will increase his expense to a prohibitive amount through excessive timbering and through pumping of seepage water, whereas by the open cut method the water is handled by drain. As $2.14 was the average cost of the above mentioned eight operations in the Klondike, seven drifting operations in similar deposits, with an average depth of 25.3 feet, gave an average cost of $1.95 per cubic yard, the depth of the pay or thickness of gravel actually sent to the sluice being almost exactly the same in both cases, and the capacity in the drifting being only 17.5 cubic yards less in twenty-four hours. Granting, however, that in a given deposit carrying $3 to the cubic yard of pay, the depth being 16 feet, drifting is impossible, and the rich pay, 75 feet in width, must be worked by open cut. Whatever method be adopted the moss must first be plowed up and about 6 feet of muck ground-sluiced off at a cost of 17 cents per cubic yard. Next 6 feet of barren gravel or sand must be removed, either by horse scrapers at 60 cents per cubic yard, or, if the plant warrants the operations, by steam scraper at 49 cents per cubic yard. The 4 feet of pay being laid bare, what method shall be adopted to get it into the sluice? On account of the necessarily short life of the operations, a plant whose first cost exceeds $5000 is out of the question. The greatest expense will then result from the hand shoveling in the pit The getting of the material into the receptacle in which it is conveyed to the sluice is the principal item of expense in the operation. It is therefore necessary that the high-priced shovelers get as much gravel into the wheelbarrows or buckets as possible. The bucket, 37 inches square on top, 35 inches square on bottom, and 25 inches deep, holding ¾ cubic yard, is dropped into a crib built in the bottom of the pit, to which the shovelers wheel their dirt in wheelbarrows. From four to six wheelbarrows are necessary to fill the bucket. There is no mobility to the bucket; it must always rise and fall to the same spot. Men instead of occupying all their time in shoveling are employed nearly half of it in wheeling and dumping. Five operations are necessary to get the gravel from the bank to the sluice, namely, (1) shoveling into wheelbarrows, (2) wheeling to bucket, (3) dumping to bucket, (4) raising bucket to carrier, (5) conveying and dumping to sluice.

This may now be compared with the derricking system. On Pedro creek, Fairbanks district, an open cut 15 feet of depth with 9 feet of pay gravel is worked by derricking. The plant has a capacity of 233 cubic yards a day, which is handled at a cost of $1.75 per cubic yard. The plant costs no more than the average price of a self-dumping carrier plant of daily capacity not exceeding 200 yards. The first cost of all, including a 30 H. P. boiler, was said to be $4500. Here the gravel is shoveled into buckets holding 8 cubic feet. These buckets are trammed on small trucks running on wooden tracks, hooked onto by the derrick cable and lifted and conveyed at same time to the sluice. The derrick boom has a radius of reach of 40 feet, and a much smaller proportion of time is consumed by the shovelers in tramming than when the fixed bucket on cable is used. The expense was increased in this plant by the necessity of continually thawing with twenty-four points.

As against the five operations of the cable tram system, there are only three in the derricking system if properly handled. The proof that the derricking system is superior to the wheeling and cable tram system is evident from the comparative cost. The services of a man at the dump box are generally necessary in all cases under the present sluicing practice, so that the self-dumping arrangement of the bucket helps but little.

It should be noted that the Fairbanks operator was working under higher prices generally than the Klondike miners, both for labor (at $10 a day, as against $7.50 a day) and for general supplies, and he also had an excessive amount of steam thawing. His lower cost depended primarily on his increased capacity, resulting for the most part from the increased duty of each shoveler, owing to the expeditions and adaptable system of hoisting and conveying afforded by the derrick. A derricking system in use on Seward Peninsula will be separately described.

The conclusion is that while the cable tram system, using the Dawson carrier, is excellent for drifting work, it is not to be recommended for open cut work where it is possible to obtain space for installing a derrick.

DERRICKING.—The plant described below is located on Ophir creek, in the Council mining district of Seward peninsula. The stream has been turned aside and work is proceeding in the old bed. The distinctive feature of the plant is the use of derricks in overcoming exceptional difficulties encountered in the character of the deposit. Hand labor is used in excavation, while transport of material to be washed and disposal of tailings are accomplished by derricks.

The pit in which work is being done depends for its shape and size upon the method of working and length of the derrick boom. An area of 30 feet beyond the end of the derrick boom is worked. A pit, roughly circular, having a diameter of 140 feet, is the result, since the boom reaches approximately 40 feet in its sweep, and the buckets are hauled 30 feet from the bank. Under a stratum of sand and soil, varying from 4 to 5 feet in thickness, the gravel, in places considerably mixed with sand and clay, descends to bedrock, usually 30 feet below the surface. The gravel is entirely unfrozen, rounded, and for the most part small, not over 10% exceeding 6 inches in diameter, while no bowlders are found above 18 inches. Bedrock is a massive limestone, extremely irregular in its position, and causes the greatest difficulty in the extraction of much of the gold, though this same feature must have played an important part in the enrichment of the claim. In places deep holes have been made by action of water, and the depth to which work is carried in the recovery of the gold depends entirely upon the economy with which it is extracted. There is no doubt that much gold remains below, to obtain which would not be profitable under present conditions.

Excavation is accomplished entirely by pick, the gravel being shoveled into the derrick buckets. These buckets are hauled by the derrick line, guided by hand, upon wooden skids, to a point directly beneath the end of the boom, where they are hoisted and carried to the dump box.

The buckets are of 11 cubic feet capacity and warrant detailed description. They are made of crude oil drums or gasoline tanks, cut to a height of 2 feet 8 inches, and are 2 feet 5 inches across the top. Two lugs to hold the bale are set opposite each other one-fourth distance up from the bottom. The bale is made from the original hoops of the drum. The bottom edge is strengthened by the original flange of the tank, while on the upper edge has been riveted the flange originally at the top of the tank. The bale is supplied with a catch which, when the bucket is traveling, rests in a notch constructed on its edge, which holds the bucket in an upright position. On reaching the dump box, a man on the platform with his shovel frees the catch, and the bucket dumps in turning bottom upward. In fitting the lugs holding the bale, a piece of iron 9 inches square is riveted to the inside of the material composing the drum, which is ⅛ inch thick. To the outside of the drum a strip 9 inches long, 2½ inches wide and ½ inch thick is also riveted, and to this the lug (2 inches long) is welded, making a very strong construction. These buckets weigh 140 pounds, and, including labor, blacksmith fuel and original price of drum, cost about $25.

The skids upon which the buckets are hauled are ordinary smoothed timbers, and are not fastened down. This admits of rapid change in accommodating the hauls to the advancing work. It is desirable to have these timbers as much as possible in a radius of the circle described by the derrick, as this gives a straight haul on the boom.

The derrick in use at this plant is of a very simple and practical design, there being but one haulage line, which with gravity utilized in the lean of the derrick accomplishes the desired work. The derrick leans toward the pit in which excavation is taking place—i. e., when at rest the boom swings away from the hoisting engine. (See Fig. 6.) The hauling line passes through a block at the foot of the mast and a few feet in front of it, or toward the direction of haul. In this position immediately upon receiving a hauling strain the boom tends to move toward the dump box, and once there, having disposed of its load, returns by gravity to the pit. To the end of the boom is attached a rope by which a man in the pit giving his entire attention to this operation can regulate the swing of the boom to a nicety. By snubbing this line about a post set firmly in the ground, hauls can be made in any direction with no inconvenience from the swinging of the boom, and the dumping of the load on the platform can be accurately adjusted. The derrick on an average lift raises material about 25 feet and carries it approximately 85 feet to the sluices. The amount of material handled is generally 500 cubic yards in twenty-two hours. Power is obtained from a 15 H. P. boiler and 8 H. P. double engine hoist, which burns one-half cord of

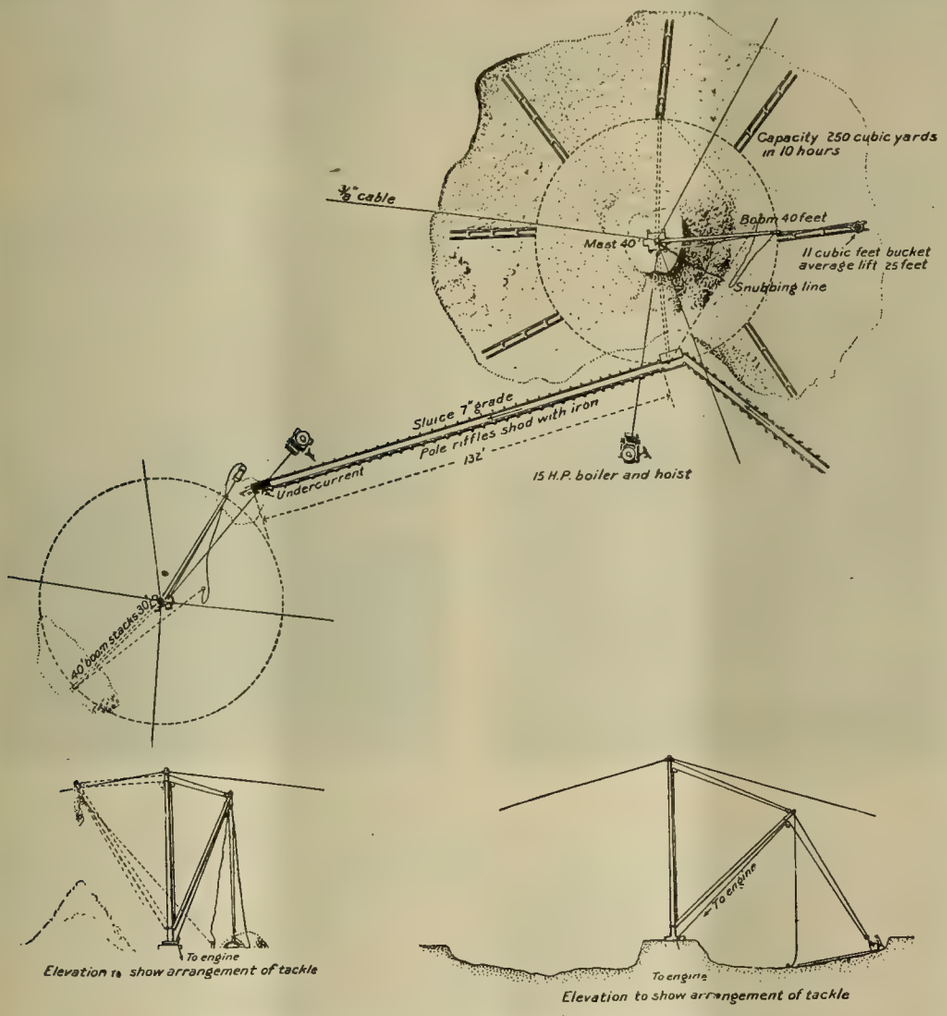


Fig. 6.—Plan of Derricking Plant, Ophir Creek, Seward Peninsula, Alaska.

wood in twenty-four hours at $15 a cord. The derricks are of Washington fir, both boom and mast being 40 feet long. The hauling line, ½ inch in diameter, is of crucible steel wire, plowshare steel not bending easily enough, and the guy lines ⅝ inch in diameter, also of steel, are tightened by watch tackles.

Stones over 12 inches in diameter are not sent through the sluices, being piled by hand in the center of the pit. Larger stones and boulders are handled by the derrick and piled in the same manner. The removal, however, of stones exceeding two tons in weight is not attempted with the derrick. A move is necessary each thirty days, and in advancing the entire plant approximately 110 feet eighteen hours are generally consumed. An auxiliary flume and dump box must of necessity be used to permit such rapid change.

The dump box, which is furnished with a platform sufficiently large to prevent spilling of material, is from 6 to 12 feet above the ground. It is 16 feet long and has a grade of 14 inches. Below it are 132 feet of boxes, 20 inches deep and 16 inches wide, with a grade of 7 inches to the box length (12 feet). These are furnished with pole riffles made 2 inches square, capped with iron, and will last two seasons. At the end of the string is a very efficient undercurrent, invented on the ground. It consists of an ordinary sluice box furnished with iron bars approximately ⅜ or ½ inch in diameter, running lengthwise with the box and placed side by side. Beneath these bars, held by Hungarian riffles, is a quantity of quicksilver, which catches any gold that may have passed the preceding string. Such an arrangement, though of considerable use when gold is generally coarse, will not serve when fine gold is encountered. An undercurrent of greater surficial area and greater grade, carrying the water in a thin sheet, would then be demanded.

In washing the gravel 150 miners' inches are used. The water is brought from Ophir creek in a ditch 1½ mile long. It is 6 feet on the bottom, 9 feet on top, and has a grade of $\frac{1}{10}$ inch to 100 feet. It cost $8000.

Tailings are handled by a derrick and a self-dumping scraper. Power is supplied to the latter by hauling directly from the derrick boom, and its operation is directed by two men. In this case the derrick leans toward the dump pile, to which it carries its load by gravity, being hauled back by the steam winch. To the scraper is attached a rope which, on tightening as the derrick swings, dumps the load at its destination. (See Fig. 6.) Both the derrick boom and mast are 40 feet long and are arranged like the excavation derrick, except that the mast leans in the opposite direction. A 15 H. P. boiler and 8 H. P. winch are used, and there are three men on each shift. The tailings derrick is not occupied more than one-fourth the working time of the pit derrick.

In all from fifty-five to sixty men are employed about the plant. A man is continually needed at the mud box to trip the bucket and to feed the gravel as regularly as possible to the sluices from the platform. A winch man is needed at each derrick. A man in the pit devotes his entire attention to the snubbing line, while two men are necessary on the scraper. The latter feature could possibly be improved by some mechanical method not requiring hand labor. Wages are 50 cents an hour, with board, and work is continued eleven hours each shift.

Besides the derrick plant described above, another, seen on Ophir creek, made use of iron skips of 1½ cubic yard capacity, which were run on trucks to the working face, and, after loading, were trammed within reach of the derrick and lifted to the sluice. As nearly as could be learned, while the capacity of this plant was from 15% to 20% higher than the one previously described, the work was not being done so cheaply. In the last case it was necessary to pump the seepage water from the pit, while in the first case all seepage water was naturally disposed of by draining into the peculiar cavernous limestone bedrock. In derricking plants in general, large rather than small buckets or skips are to be recommended, but the various elements of the plant should be so co-ordinated that the capacity of the derrick is not above that of the shoveling and tramming or of the sluice.

The derricking plant seen on Pedro creek, in the Fairbanks district, has been described in connection with the method of using the cable tram and self-dumping bucket in open cut work. Its efficiency was found to be high and its cost low in comparison with this well-known Klondike method. In general, it may be said that derricking is a simple, efficient, adaptable and comparatively cheap method of working open cuts where gravel must be shoveled into the first receptacle by hand and the bedrock cleaned by men.

(TO BE CONTINUED.)

THE agriculturists of the Deer Lodge valley, Mont., who for some time past have been suing the Anaconda Copper Co. for damages sustained to their crops because of smelter fumes, etc., are now in a quandary. That region the present summer has been visited by unusual rainfall, and as a result the crops are abundant — proof positive that it was not the smelter fumes, but the lack of moisture that has diminished their crops. The farmers are now said to be offering to settle on almost any terms.

The Transvaal Gold Mines.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS by THEO. F. VAN WAGENEN, E. M.

Here something should be said as to the nature of the formation in which the gold is found. It is called a "banket." The word is Dutch, and signifies a cake that has raisins or nuts or seeds of some kind scattered through it. The Rand banket is really a conglomerate made up of small quartz pebbles (up to 1 or 1½ inches in diameter), tightly held together by a siliceous cement. Three parallel beds or layers of this pudding stone have been recognized by those who have made a study of the formation, one of which is from 12 to 60 inches or even more in width, but does not average over 30 inches, while the other two are narrower. The broadest vein carries from a quarter to a half ounce of gold per ton, while the narrower ones are of higher grade. The metal exists in the cementing material and not in the quartz pebbles. The three beds are separated from each other by bands of quartzite, and the entire zone is bounded on both sides by walls of the same rock. It is universally conceded to be a water formation, but the geologists are not wholly agreed as to the method of its deposition. Writing broadly, it is rarely over 25 feet from wall to wall of the entire mineral formation, and often less. Sometimes one or both of the narrow beds are absent, or so thin as to be economically unworkable. Again, the whole series is, in places, and throughout large areas, very nearly barren of the precious metal. Along the outcrop there were found many very rich spots, as is common with all gold deposits, and underneath these are the bonanza portions of the reef, but unlike the experience in the ordinary gold fissure vein, the payable sections of the Rand banket exhibit great uniformity in the matters of width and grade and continuity of pay ore, within those limits. A very small amount of pyrite was found in the upper parts of the outcrop properties, but as depth was attained the percentage of iron slowly but steadily increased, until in their lower parts and in the "Deeps," it has become a constant component. In certain parts copper pyrites have also begun to appear, and it is generally believed that in due time enough of this metal will be present to seriously interfere with the usefulness of the cyanide process. Up to date the ores of the region have averaged from $7 to $12 per ton in recoverable values. The amount of silver present with the gold is insignificant.

So far the method of treatment has been crushing under stamps, amalgamation on copper plates and a supplementary treatment of the tailings and slimes with a solution of cyanide of potassium. As English companies are great admirers of tonnage, and great believers in fine crushing, the weight of the stamps and the speed of their drop have been increased until a duty of at least five tons per head per twenty-four hours, through a 40-mesh screen, is expected, and is obtained. This naturally has resulted in the production of a very high percentage of fines and slimes, so that the retreating or secondary parts of a Rand gold mill has become a most important affair. On the principle that the best way to clean up a muss is not to make one, it is quite open to question whether, on the whole, fully as high a percentage of recovery could not be obtained by coarser crushing, followed by concentration, with a much larger duty per head of stamp. In some of the mills where the ore showed base metal early in the game, concentration machinery has already been installed with good results, and the concentrates treated by the chlorination process.

Costs (including everything) range from $6 to $8 per ton, and when analyzed are found to consist mainly, as elsewhere, of the two items of labor and management, but at the Rand these items are larger proportionately than is the case in any other part of the gold mining world. As the walls of the reef are very hard, and stand perfectly, the expense of timbering is very small, which is most fortunate, as the country is quite devoid of timber of any kind. With one or two exceptions water gives no trouble. The consumption of steel and explosives is large, because of the hardness and toughness of the rock. The installation of electric lighting circuits for all the main galleries has reduced this item of cost to a minimum. A fair quality of steam coal is obtainable at the mines at $4 per ton, so that power is cheap, as far as fuel costs are concerned. So, if further economies in the district are to be realized, they must be mainly attained in the two items of labor and management, and it is in these directions that the best efforts of those that are in control are being made.

The native is the natural laborer in the Transvaal, as in the rest of Africa. But he is (at his best) only a very poor miner. Naturally and racially shiftless and easy going, he sells to his employer, and grudgingly, only his muscle and time, and not his brain. In Africa the fallacy of cheap and unskilled labor is still believed in, and even regarded as a necessity at the foundation of things. Consequently the Chinaman has lately been introduced there as a worker, in the hopes of exciting the ambition of the native, or of compelling him, through competition, to do better work. The great fault of the negro is that he will rarely stay at his job more than six months at a time, so that he never becomes manually proficient or reliable, and the force at the mines is constantly changing and requiring new training. Moreover, as he exhibits no ambition to accumulate money beyond his immediate needs, which are insignificant, he cannot be induced to do a full or good day's work, even by an increased wage. The Chinaman is not expected to become a skilled workman, in fact is prohibited by law from becoming one, and the change from black to yellow workmen has been brought about only to secure economy as an indirect result from attaining a steady and reliable supply of manually well-trained miners and laborers. It is too early as yet to say to what extent this end has been secured, or is likely to be attained in the future.

In the matter of supervision, an enormous corps of white underground and surface bosses are steadily required, or thought to be, to handle the workmen, the proportion being about one white to ten or twelve negroes or Chinese, and these whites absorb as much wages as the real workers, and add only a minimum of efficiency. The South African managers are earnestly searching for ways and means to alter or improve this system, recognizing that it is an entirely unnatural one, and that it almost exactly doubles the cost of labor at the mines. But there are many obstacles in the way that will be hard to overcome. Unhappy is the land where manual labor is considered undignified or unworthy, of the people who endeavor to advance themselves by means of the toil of an alien and despised race in their midst.

(TO BE CONTINUED.)

Tailings Wheel, Robinson Mine, Johannesburg, S. A.

Head Frame, City and Suburban Mine, Johannesburg, S. A.

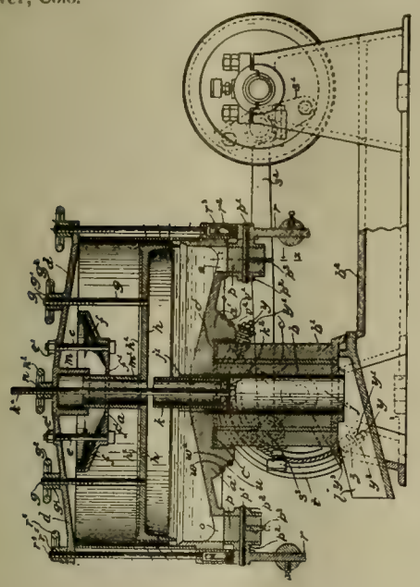
DIAMONDS were mined in India and Brazil long before they were discovered in South Africa, though the latter country has produced by far the greatest mines.

Mining and Metallurgical Patents.

PATENTS ISSUED AUGUST 8, 1905.

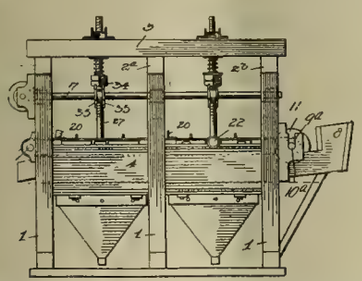
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE CONCENTRATOR.—No. 796,110; I. A. Cammett, Denver, Colo.



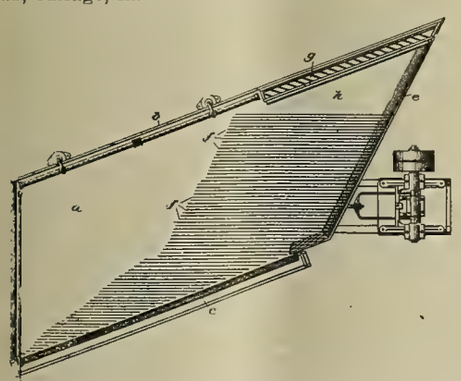
In ore concentrator, combination of bowl, means for producing centrifugal movement within same, discharge opening for waste material from bowl, discharge opening for concentrates in outer portion of bottom of bowl, oscillatory rotary valve for controlling concentrates discharge opening, and adjustable means for limiting rotary movement of valve.

ORE JIG.—No. 796,553; M. P. Baugh, Pueblo, Colo.



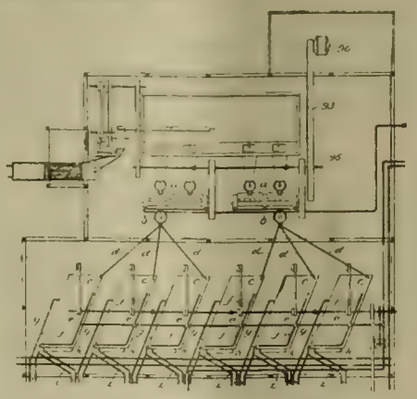
In ore jig, ore screen, hopper beneath same, fluid-forcing means co-operating with hopper, plunger connected to fluid-forcing means and having upper end guided in one of frame members, square collar threaded on plunger above frame member, vertical plate bearing against collar for preventing rotation, and means for operating plunger.

CONCENTRATING TABLE.—No. 796,940; T. F. Sheridan, Chicago, Ill.



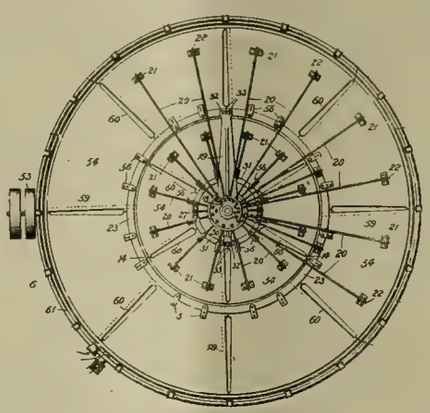
Reciprocating transversely inclined concentrating table having lower side edge and forward end edge in oblique relation to each other, series of riffles of equal length extending from forward end toward rear end of table upon upper portion thereof, smooth surface portion between rear ends of such riffles and rear end of table, and second series of riffles of progressively diminishing length extending progressively from lower side edge of table wholly subtending such smooth surface portion and adapted to return concentrates thereto.

PROCESS OF TREATING ORES.—No 796,754; J. R. Parks, Spokane, Wash.



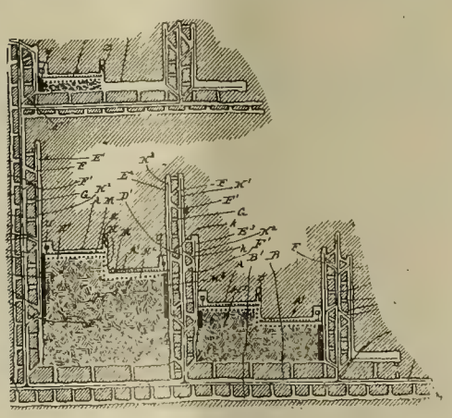
Process of treating ores, which consists in intermixing pulverized ore, cyanide of potassium, and fluid electric conductor and simultaneously passing current of air and current of electricity through mixture and retarding escape of air from mixture.

MACHINE FOR TREATING ORES.—No. 796,753; J. R. Parks, Spokane, Wash.



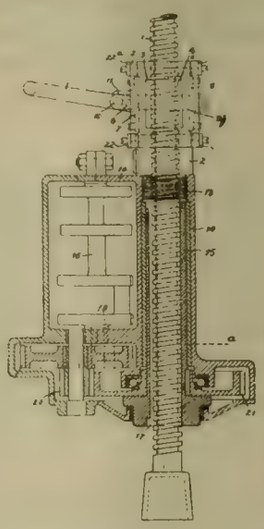
In machine of class described, combination of outer shell forming chamber and provided with inner metallic portion, second metallic element mounted adjacent to such inner metallic portion insulated therefrom and forming chamber between such parts for containing mixture having pulverized ore therein to be operated upon, means for connecting such metallic elements to negative and positive poles respectively of source of electric supply, means for agitating mixture containing pulverized ore to be operated upon, and means for forcing air into chamber formed by shell.

ART OF MINING COAL.—No. 796,499; C. R. Claghorn, Wehrum, Pa.



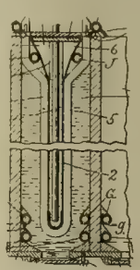
Improvement in art of mining coal, which consists in forming main heading, cross headings connected therewith, two or more of which extend in same direction as sides of relatively wide intervening area of coal, forming clearance space or upriser near each heading, main heading, cross headings and uprisers being relatively deep and provided with track systems, forming two working faces, both transverse to cross entries, breaking down coal along working faces, transporting broken-down coal along one face by endless conveyor in one direction toward clearance space or upriser and depositing coal in cars therein and transporting coal in opposite direction by second endless conveyor extending from opposite heading and delivering coal to cars in clearing space adjacent to heading.

ROCK DRILL.—No. 796,890; J. T. Blackett, Guisborough, England.



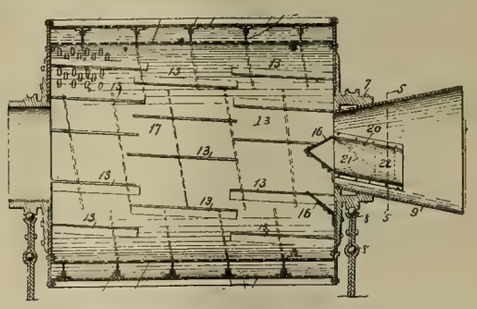
Combination with revoluble feed screw, of stationary feed nut casing, feed nut formed in two sections which engage with screw and which are slidable in casing, operating lever pivoted to one nut section, link extending crosswise of feed screw and pivoted to lever and to other nut section, and stop arranged in path of last nut section.

APPARATUS FOR TREATING SLIMES IN ORE REDUCTION.—No. 796,503; G. A. Duncan, Deadwood, S. D.



Apparatus for treatment of ore slimes, consisting of filtering cell having length and breadth respectively horizontal and vertical and thickness small relatively to other dimensions; tank in which such cell is suspended and which accommodates same with relatively small space at opposite sides; suction pipes intruded into cell from top, terminating open near bottom; means for producing suction through such pipes and means for supplying slime-bearing liquor to tank and for aerating same from bottom.

APPARATUS FOR PLACER MINING.—No. 796,780; J. L. Weaver, Boise, Idaho.



Screen provided with inner foraminous cylinder having series of angular or inclined flights on inner side overlapping at adjacent ends, outer and concentric foraminous cylinder or wall, screw between walls, approximately volute discharge vanes at one end, and spout having central discharge for coarse material, and provided with opening in wall for discharge of finer material.

PROCESS FOR THE TREATMENT OF ORES CONTAINING ANTIMONY.—No. 796,849; J. S. MacArthur, Glasgow, Scotland.

Process for treatment of ores containing antimony, consisting in, firstly, treating ore with solution containing not more than 4% of caustic soda, solution being meanwhile maintained at temperature exceeding 50° centigrade, whereby antimonial content is dissolved; secondly, precipitating, by carbonic acid gas, antimony from antimonial solution thus obtained and forming at same time carbonate of soda therein; thirdly, regenerating alkali solution by treatment with lime.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ARIZONA.

Cochise County.

(Special Correspondence).—The Tombstone Con. M. Co. is opening up new ground with satisfactory results. A rich strike was made recently in the shaft of the company between the 600 and 700 levels. Regular shipments are being made from the various mines of the company at the rate of three cars per day. An additional oil tank is being built which, when completed, will have a capacity of 104,000 gallons. This is being done so as to provide against washouts and delays. The additional pumps which were ordered recently arrived and will be put in at once and will increase the pumping capacity to 6,000,000 gallons per day. Work on remodeling the old Girard mill is progressing rapidly, and it is expected that it will be completed and its additional stamps added within three months, at which time the concentrator, which is being built on the grounds, will also be finished.

Tombstone, Aug. 21.

Gila County.

The Silver Belt in describing the hopper scale charge weighing appliance at the Old Dominion smelter at Globe, put into operation during the latter part of June, says that the different ingredients of the charge, such as all classes of ores, oxides, sulphides, acid flux and limestones, the black copper slag, coke, etc., each have their respective pockets in the large ore bins into which they are delivered from steel hopper bottom cars, each material being provided with four chutes, which, on opening the gate, deliver their material to a steel hopper, which takes the place of the platform of an ordinary scale of 2500 pounds capacity, and is allowed to run therein until the beam indicates that the desired quantity has been received. The charge train of three cars and an electric motor passing under the hopper scales, stops and receives three charges of coke, then limestone, ore, sulphides, old slag, etc., in such quantities as the metallurgist may designate and takes them to the furnaces. Manual labor is reduced to a minimum, the varying weights of the different cars have no effect on the charge contained, and an error in any one of the component parts does not affect any of the remaining ones, which was always the case with the old system where too much ore meant too little coke, or vice versa.

Mohave County.

Work has been temporarily suspended at the Blue Ridge mine and mill near Vivian. —— C. D. Pickering, superintendent of the Yucca Cyanide M. & M. Co.'s San Francisco mine at Cedar, reports that the mine on the lower level is showing up good bodies of ore. A 50 H. P. compressor and machine drills are to be put in at once and work on the mine rushed.

Pima County.

(Special Correspondence).—The Helvetia C. M. Co.'s Isle Royale shaft at Helvetia is down to the 800-foot level and crosscutting has been started. The mines are in the Santa Rita mountains, 35 miles southeast of Tucson. The nearest railroad station is at Vail, 16 miles from the mines. The formation resembles that at Bisbee, the carboniferous limestone being of the same geological horizon with similar porphyritic intrusions. The ores turned to sulphides on the third level. A 2¾-mile railroad connects the mine and smelter. The first smelter was burned in 1900 and rebuilt in 1901, the present plant having a daily capacity of 150 tons. The furnaces are to be started before November 1 on ore now being blocked out. Crosscutting has been started at the fourth level down. Water has been struck at the bottom of the shaft and will be pumped and impounded for smelter use.

Helvetia, Aug. 20.

Pinal County.

(Special Correspondence).—Superintendent A. C. Seiboth of the Lake Superior & Arizona M. & S. Co. received returns recently from a 30-ton shipment of ore to El Paso that netted the company over $70 a ton. This company has recently opened up a large body of gold ore. The mines are in the Pioneer district, near Florence. The property shows three copper ore bodies, mainly in limestone, near a quartzite contact. The ores are mainly oxides and carbonates, associated with iron and manganese.

Florence, Aug. 21.

Santa Cruz County.

(Special Correspondence).—The Grubstake gold and silver mines of Oro Blanco have passed into the ownership of the Grubstake Con. G. M. & M. Co.

Oro Blanco, Aug. 21.

Yavapai County.

The shaft of the Bauman Copper Co. at Dewey is below the 300-foot level and will be continued to the 1000-foot level, making short crosscuts at each 100-foot level. The country rocks are quartz, porphyry and slate, the principal veins occurring as fissures in quartz porphyry, with heavy gouge in foot wall. The ores are cuprite, malachite and azurite above, with chalcopyrite below. W. H. MacKay is superintendent. —— At Crown King the Ore Bell has eighty men working in the mine and 10-stamp mill. The Crown King is regrinding and retreating the tailings.——Manager Timmons has ten men working at the Gold King, near Crown King.——The 10-stamp mill at the Lincoln is to be started as soon as new boilers have been put in.

CALIFORNIA.

Amador County.

The strike of the Amador Miners' Union against the Fremont M. Co. of Amador City has been officially declared off.

Calaveras County.

At the San Andreas Gold Quartz mine, John L. Henry has put up a gallows frame and whim. When the shaft is down a sufficient depth to admit of crosscutting, a larger force will be put on.——Active operations are to be commenced at the Round Butte mine, near San Andreas. The property is under the management of James Stewart. The first work to be done will be the sinking of five shafts on the property.——The Yellow Boy M. Co. of Salt Lake City is operating the Red Gold mine, west of Murphys, and the Gum Boot, on San Antonio creek.

El Dorado County.

It is reported that another rich body of ore has been struck in the Union mine, El Dorado district.——At the Cedar Creek mine, Fairplay district, the tunnel is in 100 feet of the 750 feet necessary to tap the channel.

At the Havilah mill, near Nashville, twenty stamps are dropping on ore from the mine, where seventy men are at work.——It is reported that a mill is to be put on the Last Chance mine, 6 miles north of Plymouth. The shaft is being sunk by Manager Smith.

Manager F. M. Curtis is putting in an auxiliary steam power plant at the Red Raven mine, near Placerville. This will run the 10-stamp mill when water power is not available.

Placer County.

The Rawhide mine, near Towle, on the American river, has reopened under the management of the original Rawhide M. Co. Since the failure of the Soldon M. Co., at the expiration of the year for which it had bonded the mine, all work has been suspended. John Mottrom has been elected president of the old company.——The Whisky Diggings mine, 9 miles northeast of Lincoln, has been reopened by a company of San Francisco men, who will sink the old shaft to a depth of 1200 feet. A new hoist and other machinery is being put in.——At the Evening Star mine, on Rock creek, work is being carried on on the 60-foot level.——The Lewis Hill Gravel M. Co. is developing its mine, 3 miles below Newcastle. The work is in charge of R. M. Mooer of Auburn. The lower tunnel is in 380 feet and the upper one 120 feet. There is an upraise of 70 feet, which furnishes fresh air.

Plumas County.

W. P. Hammon is interested with H. H. Yard and J. H. Leggett in a large dam being built to increase the storage capacity of Silver lake by raising its surface 6 feet. Five thousand horse power of electricity will be developed by the water from the lake, and this will be used to operate a system of electric cars that will convey the sand and gravel on the claims held by them from the place of excavation to the points where water will be available for washing it. The claims are in canyons and on hillsides and cannot be worked by the dredger.

Shasta County.

The rates the Mammoth Copper Co. has established for treating siliceous ores at the smelter at Kennett may vary from time to time, but those now offered follow: Ore from $3 to $15 a ton in assay value will be smelted free and 75% of the value returned to the shipper. On ore between $15 and $25 a ton 77½% of the assay value will be returned and there is no charge for smelting. Ore from $25 to $50 per ton, 90% returned; $3.50 a ton smelting charge. Ore from $50 to $75 a ton, 95% returned; $5 a ton for smelting. Ore from $75 to $100 a ton, 95% returned; smelting charge $7 a ton. Ore from $100 to $200 a ton, 95% returned; smelting charge $10 a ton. In addition to the above percentages of gold, 90% of all silver assays will be returned on all ores carrying over five ounces of silver. If less than that amount of silver is contained in the ore, according to assays, no returns will be made. Only siliceous ores going as high as 90% in silica will be treated free. Ores deficient in silica are subject to a charge for smelting. Gold will be paid for at the rate of $20 per ounce and silver at the current New York quotations. Ore must be shipped in lots of not less than ten tons.——Work is progressing rapidly on the aerial tramway to supply the smelter with ore from the Mammoth mine.

Sierra County.

(Special Correspondence).—At the White Bear gravel mine, north of Downieville, Superintendent Wm. J. Belcher finds that a small part of the gold is left in the tailings and has decided to impound them, as the gold may be recovered after the clay has been weathered. The flume is to be lengthened.——The Forest City M. Co. have cut two quartz ledges in their main tunnel being driven to open up the old Mabel Mertz, near Forest City. Superintendent H. B. McCormack is employing ten men and will start an upraise soon. This is a drift mine and heretofore little attention has been paid to quartz.——It is claimed that the Bald Mountain gravel channel has been tapped by the 2500-foot tunnel of the South Fork drift mine at Forest, after twelve years of work. Fred Kuhfeld is superintendent.——At the Lucky Dog drift mine, 2 miles west of Forest City, the channel has been found, after being cut out for a long distance by lava.——W. J. Finney, superintendent of the Telegraph Drift M. Co., purchased an electric plant for the Telegraph mine, north of Downieville. This mine has both quartz and gravel, and is equipped with a 5-stamp mill. The new power plant will be used for milling, ventilation and pumping. —— T. J. Lamouroux has taken a bond on the property of the Sovereign G. M. Co., near Downieville, and will put up a 10-stamp mill.

Downieville, Aug. 21.

R. J. Fitzgerald has bonded the Carson mine at Allegany.

Trinity County.

The hydraulic mine, originally operated by Fordyce Bates and J. F. Tourtelotte at Minersville, has been bonded by A. F. Johnson, who has men cleaning up preparatory to putting in a hydraulic elevator.——The La Grange Hydraulic M. Co., operating the placer mine on Oregon Gulch mountain, near Weaverville, has started repairing the flume from near the head of Stuart's Fork to the great inverted syphon across that stream, below Van Metre creek. The water supply system of the La Grange mine includes the large inverted syphon, 35 miles of flume and ditches and a 10,000-foot tunnel.

At the Headlight mine, near Trinity Center, eight men are employed under Frank Kidd. A tunnel is being driven to cut the vein.——Work has been resumed on the Dorleska mine on Coffee creek.——The dredger on the Trinity, above Trinity Center, is running steadily with four men under Superintendent G. W. Payne.

Tuolumne County.

At the Clio mine, near Jacksonville, a level has been made at the 400-mark and sinking to the shaft will continue.——At the Horse Shoe Bend mines, near Columbia, E. A. Skewes of Liverpool, England, has started grading for the mill.——After a thorough overhauling the mill at the Del Monte mine, near Groveland, has been started. At the mine the pump has lowered to the bottom of the main shaft. On the 90-foot level, 100 feet east of the main shaft, an upraise is being made. H. M. Stanley is superintendent.——At the Cosmopolite mine, at Groveland, eleven men are at work in the lower tunnel. A crosscut is being run 94 feet from the mouth of the main tunnel, while old timbers are being replaced with new. Superintendent Wm. Pool is in charge.

Yuba County.

At the Peerless mine at Smartsville the shaft has been cleared. A gasoline engine has been put in to handle the debris and water in the shaft.

COLORADO.

Boulder County.

A half interest in the Livingstone mine, near Boulder, has been sold by W. R. Doty, who retains the other half, to F. G. Shaffer of Denver.——The Potato Patch, as it is familiary known to the mining world, was at one time worked with plows and scrapers and the earth loaded in wagons was sent to the smelters and brought the owners over $200,000. Since that time the vein in place has produced over $200,000, and the deepest workings on the property are less than 300 feet.——The Good Morning tunnel, which enters Sugar Loaf at Wall Street, 8 miles above Boulder, is to be driven 6000 feet to tap the Gladys, Ragged Top, Livingstone and Cross and Sphynx properties. All of these properties have been profitable and heavy producers, and were recognized as such until the question of water in the workings became such an expensive one.——The Livingstone property has three shaft houses, a mill and a power plant. New machinery is to be added.

The Cash mill at Magnolia has, according to recent accounts, solved the problem of ore treatment in that camp by oxidizing the telluride products in a roasting cylinder and then cyaniding. The Boulder Times says that F. A. Leonard, the manager, has met with such success that he has decided to put in two more leaching vats. He has made a saving of 95% and $30 ore is being treated in the mill instead of being shipped to the smelters. The fuel used is crude petroleum from the Boulder oil wells. The amount treated is fifteen tons per day, but when the new leaching vats are in place the capacity will be doubled.

Clear Creek County

A strike of high grade gold, silver, lead and copper ore is reported from the Little Flat mine, in Cascade creek, in the drift being driven east from the 400-foot level. The mine is owned by the Allen M. Co., J. B. Allen of Idaho Springs being resident manager. It is the intention of the company to build a concentrating mill on Chicago creek when a sufficient amount of ore has been blocked out in the mine. The property will be cut by the Burns-Moore tunnel within the next few months and operations will also be carried on through that outlet at a greater depth.

The U. P. R. lode, one of the earliest discoveries on the western slope of Bellevue mountain, near Idaho Springs, has been cut by the Lucania tunnel, 2100 feet from the portal, and at a depth of nearly 1000 feet.——The Queen of the West mine, on Argentine Pass, has been leased to Thos. Cunningham, who will start development.——Work has been resumed on the Ramsdale claims, located on Lincoln mountain, near Georgetown, by G. W. Teagarden and A. B. Montgomery. A power plant is to be put in near the mouth of the 400-foot crosscut, together with an air compressor and machine drills.

An 8-drill compressor and steam power plant is to be put in by the Banner Con. Co. for the Rockford tunnel, near Idaho Springs. The tunnel is to be driven to the heart of Donaldson mountain and has already been run 1000 feet, about 2500 feet remaining to be driven.

Gilpin County.

The Register Call reports that the Petersen mill in Lump gulch, near Central City, has been leased by Manager Frank Augustus of the Colorado M. Co. and A. C. Dart has been placed in charge. It is equipped with fifteen slow drop stamps and has a daily capacity of twenty-five tons, is equipped with bumping tables and was last run on ores from the Gold Dirt mine, on which a very good saving was made during the three months in which tests were made with the cynanide process. The mill has been leased for the purpose of treating the ores from the Colorado tunnel property of the Colorado M. Co.——A new shaft building 20x40 feet has been put on the Daisy Extension mine on Perigo hill in the Independent district, by J. A. Gilmour of Central City, who is the owner and operator, and an 8x10 double cylinder hoister of McFarlane manufacture has been put in, together with a 35 H. P. boiler. The shaft on this property is down 125 feet and has been repaired and cleaned. A contract is to be let for sinking the main shaft another lift of 100 feet.

At Russell Gulch, Manager Nickerson of the Fairfield M. Co. is asking for bids on putting up a shaft building 45x40, to replace the one burned last month, as well as for a gear hoist 8x10 and a 60 H. P. boiler.——The Fostoria G. M. Co. is putting in machinery in the Silver Gem tunnel, near Gilson gulch, to operate its Summit group, in the Pleasant Valley district.

Development work is being carried on at the property of the Twolon Gold M. Co., known as the 2:40 mines in Willis gulch, under the management of Stephen Hoskin of Central City. Operations are being carried on in the 200 and 350-foot levels, and a few leasers are at work. ——At the Alps mine on Quartz hill, near Central City, operations are being carried on at a depth of 600 feet in the main shaft and also at a depth of 1300 feet in what is known as the submarine shaft. The property is being

worked under a lease and bond from Hal Sayr and associates by a local pool, of which James Williams is superintendent.——Leasers are at work at the Eldorado mine in Russell district, which is operated by the Eldorado M. Co. The company is arranging for the resumption of operations on their Lynn shaft, the main shaft being down 200 feet and is to be sunk deeper. S. T. Harris is in charge.

During the second week of this month the shipments of smelting and crude ores, tailings and concentrates to the Denver smelters and to outside points from Central City were seventy-two cars, or 1510 tons. The following shipments were made to Argo: Druid mine in Willis gulch, two cars; one car by Martin & Co. of the Puzzle mine on Bobtail hill, one car of enargite ores from the Powers mine, Russell district; one car from the Imperial M. & M. Co., operating in the Pine Creek district, and one car of 10-ounce ores from the East Notaway mine in Russell district, besides two cars of zinc ores from the Ivanhoe mine on Quartz hill to the Lanyan Zinc Co. of Iola, Kans. —— At a stockholders meeting of the Pewabic Con. Gold Mines Co. the following officers were elected: President, general manager and treasurer, J. C. Fleischhutz; secretary, W. A. Funk. The plans as submitted by Manager Fleischhutz for the increased development and operation of the properties have been approved. They include operation on the base of Pewabic mountain through two working shafts, the main Pewabic and the Iron. A new and complete hoisting and compressor plant is to be put on the Iron at an early date. Shipments are being made to the New York mill at Black Hawk, under lease and option by the Pawabic company.

Gunnison County.

A rich strike of gold ore is report d from the property of the Gold Vein M. Co. on North Cross mountain, near Tin Cup. C. F. Wahl of Tin Cup is superintendent.——George Brant has started work on the Copper Sulphide lode, near Bowerman. A shaft is being sunk. He is also doing work on the Gold Ridge lode.——A lease and bond have been secured by A. B. Coats and Jas. Henry on the Nettie lode, near Bowerman.——The Augusta mine, near Crested Butte, has been temporarily closed. ——Horace Miller has started work on the Hard Cash and Mexican mines on Galena mountain, near Crested Butte.

Hinsdale County.

Increased work is to be done by the Golden Fleece Con. Co., near Lake City. T. B. Stearns has charge of work.——Machine drills are to be put in at the Moro and Ajax mines of the Hanna M. & M. Co. by Manager G. H. Martin.

Larimer County.

The Pearl smelter is completed and equipped, and will begin ore reduction not later than September 15. The smelter has cost $100,000, and will begin by reducing 3000 tons per month. The works at present will make 55% copper matte, a bullion converter being probably added next year. Ore is being gathered and coke and charcoal arranged for.

Mineral County.

(Special Correspondence).— Mining in the southern part of the State is in a healthy condition. During the past year a large amount of development work has been in progress, and as a result of the development in the mines several mills are being erected for the treatment of the ore. In the Creede district there has been a scarcity of men and as a result the mines have not been able to operate full capacity. It is understood a survey is being made from Creede to Durango with the idea of making a standard gauge road to connect with the new branch of the D. & R. G. Ry. now being built south of Durango. The road from Denver to Creede is standard gauge.

Creede, Aug. 21.

Ouray County.

(Special Correspondence).—The Treasury Tunnel M. & R. Co., W. J. Hammond, Jr., manager, are preparing to add twenty more stamps to their 20-stamp mill. An electric motor for delivering ore from the mine to the mill is to be put in later on.——The Joker tunnel, which is being driven by W. C. Aston, intends putting in an electric motor to facilitate the work in the tunnel.

Red Mountain, Aug. 19.

(Special Correspondence).—In the Red Mountain district, on the Ouray side, the Barstow, Treasury and Crawford companies are doing an immense amount of work. The Barstow Co. is operating thirty stamps on ore from their mine, and the Treasury Co., under the management of W. J. Hammond, Jr., is adding twenty more stamps to their mill which now contains twenty stamps. For a time there was difficulty with some of the men at this property over wages, the men claiming they were obliged to work in a wet place while the management contended otherwise. The difficulty, which was not great, has been disposed of, and the property is being operated full capacity. Across the gulch from the Treasury is the Genessee, Guston and other properties of the Crawford Syndicate, which are being developed as rapidly as possible. They are driving the Joker tunnel, to be used as a drainage and transportation tunnel. This tunnel starts 1 mile above Ironton and is 12 feet by 14 feet outside the timbers and double tracked. The tunnel is now in 2000 feet and being driven at the rate of 9 feet per day. A crosscut is being started from the main tunnel to connect with the Guston workings, and is expected to tap the Guston at a depth of 600 feet. About 1200 feet farther the main tunnel will cut the old Yankee Girl at a depth of 800 feet. The breast of the tunnel is broken with nineteen holes, using an upper cut. An electric motor will be put in to handle the rock from the tunnel. W. C. Ashton is superintendent.

Red Mountain, Aug. 21.

Rio Grande County.

At Summitville, the Gold Crown M. Co. has taken a bond and lease on the Esmond, one of the oldest mines in the camp.——At Summer Coon, 6 miles north of Del Norte, there are strong veins carrying galena and iron. The Esther M. Co. is taking out gold, silver and lead ore, but there is no mill in the camp.——At Embargo, the Washington Gold M. & M. Co. is sinking on its Evening Star and drifting from the 170-foot level. The Golden Income Co. will begin work soon. The manager of the Tornado M. Co. of Terra Haute, Ind., has been working all summer on the Black Hawk at Embargo. On the Mesa, Hurm & Haskins are developing the Caddie, where the shaft will be sunk to the 100-foot level on an incline.

San Juan County.

(Special Correspondence).—The Ledge M. & M. Co. is being operated this year by Kramer Bros. & Carmichael and is averaging about 100 tons of lead concentrates and 50 tons of zinc concentrates per week; the zinc will run about 50%. Only a portion of the mill is being operated at present.

Silverton, Aug. 19.

(Special Correspondence).—About 16 miles north of Rockwood the Delayed M. & M. Co. is driving a tunnel 7x7 feet which gives them 120 feet depth. Some very rich assays are reported by E. L. Thompson, manager of the property. The ore carries copper, gold and silver. Where this property is located there has been but little prospecting done for a number of years. The mine is on the west side of the West Needles. Buffalo, N. Y., parties are interested. Another tunnel 900 feet in length is to be started to tap the mountain at a depth of 500 feet.——Near Animas Forks the Gold Prince Co. are developing their mine, operating their old mill and breaking ground for their new 100-stamp mill to be built at Animas Forks. The frame work will be of steel and foundations of concrete. At present 160 men are employed in preparing the foundation and excavating. O. O. McReynolds, chief engineer on the works, expects to have the mill ready to receive the machinery by Dec. 15th this year. An aerial tramway is being built from the mine to the mill. Power will be supplied from the electric plant at Rockwood, below Silverton.

Silverton, Aug. 21.

Summit County.

Near Kokomo, in Mayflower gulch, the Thomson M. & M. Co. is driving the Bird's Nest tunnel.——Ore bins are being put up on the Result mine on Gold hill, near Kokomo. M. Hyman of Denver is interested.——The tunnel of the Union Con. group on Gold hill is being driven under the management of M. Gagan.

Teller County.

The 300-foot shaft in the South Burns claim of the Acacia is to be continued to the 800-foot level by the Exposition M. & L. Co. of Cripple Creek.——The property of the Wheel of Fortune M. Co. has been sold at sheriff's sale to satisfy a judgment of $2621.54 held by Wm. Helm, who purchased the property.——Surface water around Independence has been causing considerable trouble to several properties. The Independence Con. Co. has been forced to start its pumps and is drawing between 200 and 250 gallons of water per minute.—— The Golden Cycle M. Co. has decided to put up a cyanide plant of 200 tons capacity either on the company's property at the mines on Bull hill, Cripple Creek, or at Colorado City. The bromo-cyanogen process will probably be used.——J. Emerson, who is operating under lease the Murphy shaft on the Bull hill property of the Stratton–Cripple Creek M. & D. Co., has started shipping, after having been closed down for some time on account of the surface water.——Ore bins are being built on the east end of the Rocky Mountain property on Beacon hill, Cripple Creek.

IDAHO.

Blaine County.

Superintendent Allen has prepared specifications for a concentrator at the Hillside mines, in Lee's gulch, near Hailey. The 170-foot raise in the mine to connect the tunnel with the surface has been completed, and is to be continued in depth as a shaft 200 feet below the tunnel level.——A road is being made to the Lucky Boy mine, west of Ketchum, so that ore shipments can be made.

The Boulder Con. M. Co., operating on Boulder creek, 25 miles north of Hailey, is going to drive a tunnel from the Wood river side of the Boulder range to the East fork of the Salmon. The tunnel will be over 5000 feet in length and cut the formation at a depth of 2800 feet. It will prospect, drain and develop a large extent of mineral-bearing ground.

Idaho County.

In the Thunder Mountain district it is reported that the mills of the Standard, Sunnyside and Dewey properties are closed for the present, but the mines are being developed. The ore seems to have become refractory with depth, and experiments are being made to get the values from the slimes and tailings.

Shoshone County.

V. C. Hikes, of the Geological Survey, who has been making examinations of the placer gravels through the West with the view of determining if rare metals were likely to be found in them, reports that tantalum has been found in sands from Snake river and in the Pierce district.

The Monitor mine of the Monitor Con. Copper M. Co., 5 miles west of Saltese, Mont., is shipping regularly to the Tacoma smelter. Otis Hill of Tekoa, Wash., is managing director.

Regarding mineral production of the Cœur d'Alenes, the Idaho Press says that the shipments to smelters of ore and concentrates for the first seven months of 1905 aggregated 175,000 tons.——The California will soon have its electrical equipment put in and its enlarged mill ready to treat its newly found bodies of galena, besides being in shape to secure a much higher extraction from its carbonates.— The Success Co.'s mill will be in operation probably within another week.——The Hercules mill will also be in operation in a short time.——The Snowstorm is arranging for an increased output of both first and second class ore, and numerous other properties, such as the Rex, Chesapeake and Tamarack and a half dozen mines of the North Side, will ship.

MICHIGAN.

Houghton County.

(Special Correspondence).—The Manitou and Fontenac copper mining companies, recently organized to develop and operate copper mines on the Keweenaw peninsula, are controlled by the Calumet & Hecla Co. The Calumet & Hecla has recently secured control of 60,000 acres of mineral land, originally held only for the timber on it. There are many test pits on this tract and some good prospects for copper rock. This work was done in early days, when it required a much higher grade of rock to pay a profit than now. The conditions surrounding the industry have changed and rock that now yields anything above 1%, by the use of modern machinery and large tonnages, can be made to yield a profit. Exploratory operations have been started on the properties. It was known that several lodes cross the property which the company had acquired, but their value can only be determined by extended exploration. The general character of the amygdaloidal beds yields easily to milling processes. If this state of affairs exists to any great extent, even if the percentage of copper per ton is small, the rock should be capable of showing a profit if worked on a large scale.

Houghton, Aug. 18.

Following the mineral extension of the Mineral Range R. R. to shaft C, the extreme west opening on the Mass property, the company let a contract for a permanent rock house at the shaft, construction to begin immediately. On the railroad extension the grading is completed and the laying of rails is in progress. Shaft C is 100 feet above shafts A and B. The showing of the two lodes that are being worked through the shaft are good. At the present time only one head of the stamping capacity of the mill is available, but it is possible to handle a slightly increased capacity over what is being treated at the present time. The compounding of the stamp head, which has been under discussion by the management for some time, would probably follow closely a production which the mill is unable to handle. Such an improvement, at a cost of about $10,000, would increase the capacity of the mill about 200 tons per day.

MONTANA.

Fergus County.

A suit is now on trial in the Lewiston district court, the action being brought by I. F. David, a rancher on the Judith river, against the New Mines Sapphire Syndicate, owning and operating the sapphire mines at Yogo. David claims that by reason of a waste ditch from the mines, which discharges into the river above the intake of this irrigating ditch, a vast amount of the waste has been carried upon his land, where it has formed a cake, being, according to the exhibits of squares of earth offered in court, all the way from a few inches to a foot thick. The plaintiff and his witnesses, all of whom are ranchers, assert that this deposit forms a hard cake over the soil, which speedily chokes out the crops, and it is also claimed that the deposit in the bed of the river has changed the channel below the point of discharge. The plaintiff contends that the present plan of getting rid of the waste can be changed without interfering with the operation of the mines if the defendant will convey the waste upon its own lands. The defense will claim that the waste, so far from being harmful, is really beneficial to the land, acting as a fertilizer.

Granite County.

At Royal a cyanide plant is being put in to work the tailings from the Royal mill. J. Terry of Butte has charge. Pyke & Lindquist, leasing in the mine, have twenty men at work.

Madison County.

The Pony Sentinel reports that bullion to the amount of $15,850 was shipped in one week from the mines around Pony, in addition to the shipments of concentrates and ore. In the Pony and South Boulder districts fifty stamps are dropping constantly and several cars of concentrates and shipping ore are sent to the smelter at East Helena every month. The Clipper group, discovered in 1877, and owned by the Indian G. M. Co., is leased by Elling & Morris, who have ten stamps dropping at the mill.——At the Garnet mine, of which F. C. Wood is the president, twenty stamps are dropping.—— At the properties of the Mammoth M. & P. Co., on the head of the South Boulder, near Pony, the company has ten stamps dropping.——At the Lennstrende–Buck property, between the Pony mines and those of the Boulder section, a 5-stamp mill has been put up.

Missoula County.

Work has been resumed on the Montana Standard mine, 11 miles from Thompson. Work on a flume 2 miles long has been started. This flume will take the water from Crow creek and will be utilized for power for a compressor. Work has been resumed by hand in the No. 3 crosscut tunnel, which is being driven to tap the ledge at a depth of 800 feet. As soon as the new compressor is put in, a contract to extend this tunnel 1500 feet will be let. John Murphy is the principal stockholder.

Park County.

In the Crevasse mountain district, near Jardine, the Conrad–Stanford Co. intend putting in a new stamp mill and adding concentrators to the present mill.

Silver Bow County.

In the injunction suits brought by an association of farmers against the Washoe smelter of the Amalgamated Company, the farmers are seeking to close the smelter permanently, and claim that their farms have been ruined by the smelter smoke and poisonous refuse. Before suits were brought they offered to settle for less than $1,000,000, but they now want $2,000,000. In their testimony and pleadings before the Federal court they represented that nothing will grow in the smoke district, covering many miles, but this season has been the most profitable the ranchers in that part of the State have ever known, and crops have grown so rank and plentiful as to create despair among the farmers who have been trying to settle with the company. There has been an unusual rainfall this summer.——It is reported that the Pittsmont smelter of the Pittsburg & Montana Co. is again closed down temporarily, making the eighth break down since the smelter was started. A new blower is to be put in.

NEVADA.

Lyon County.

Surveys are being made for work at the Hayward mine and Eureka mill, at Silver City. J. E. Munroe has charge of work.

Nye County.

At Liberty, 20 miles north of Tonopah, among the properties being worked are La Libertad, under the management of W. C. Wynkoop, with a 485-foot shaft, the Callington and the Cedric under Albert Weaver, the Florence Extension, with a 115-foot shaft, the Tonopah Berkeley with a 150-foot shaft, in charge of L. C. Orndorff, and the Oregon and St. Paul.

NEW MEXICO.

Santa Fe County.

A strike of molybdenite is reported 6 miles from Santa Fe, on ground belonging to the Santa Fe Water Co., by Frank Owen. A rush is being made for the district and over 400 acres have been located. The strike was made at a depth of 40 feet.

OREGON.

According to E. W. Parker, in his report to the United States Geological Survey, the total coal production of Oregon in 1904 was 111,540 short tons, valued at $243,588. The only productive coal field in Oregon is in the southwestern part of the State in Coos county, and is known as the Coos Bay field. It occupies 250 square miles, its length north and south being 30 miles and its maximum breadth at the middle 11 miles, tapering regularly toward both ends. Other coal fields have been prospected in different parts of the State, and some have been shown to contain coal of fairly good quality. Among these are the Upper Nehalem field, in Columbia county; the Lower Nehalem field, in Clatsop and Tillamook counties; the Yaquina field, in Lincoln county, and the Eckley and Shasta Costa fields, in Curry county. All of these fields lie west of the Cascade range, but none has been developed to the point of production. Another field has been located in the basin of the John Day river, east of the Cascade range, but little is known concerning it. All of the fields west of the range, with the exception of the Coos Bay, are of limited area, the largest, outside of the Coos Bay, being the Upper Nehalem, which has an area of less than 20 miles. All of the coal of these fields is lignitic in character. Transportation is confined exclusively to Coos bay and the Pacific ocean, and San Francisco is the principal market. The Coos Bay field is divided by its structure into six portions—four basins and two arches. The basins are known as the Newport, the Beaver slough, the Coquille and the South slough, and are separated by the Westport and Pulaski arches. The principal development has been in the Newport basin, so named from the Newport mine, which is the most important producer.

Baker County.

Near Greenhorn, the Snow Creek, Psyche and Diadem mines are all running again, having settled their June pay rolls. The Diadem is turning out good ore that is being treated at the Psyche mill.——The Big Johnny is having a mill test of its ore made at the Psyche mill.——The I. X. L. mill, at Greenhorn, is being put in shape to work ore from the Royal White. A mill test will also be made on ore from the Olive creek mines, near Greenhorn, for S. Tobin, who may put in a mill of his own.

Grant County.

New power drills are to be put in by the Portland M. & R. Co. at the Monumental mine at Granite. The shaft is down as far as it was intended to sink at this time. Drifts are to be started both ways and a raise made in line with shaft to the upper or mill level. There are fifteen men employed at the mine and this force will soon be doubled. Manager C J. Allen is taking a rest. S. P. Ross of Portland is in charge during his absence.

Josephine County.

A. B. Cousins, manager of the Galice Con. M. Co., operating on lower Rogue river, near Galice, states that his bedrock flume has been completed for 1800 feet from the Rogue river, with prospects of finishing dead work early this season. Washing gravel will begin a short distance beyond the present head of this work. They are cutting the flume down to 3 feet in bedrock and maintaining the width of 6 feet.

Lane County.

Blue River camp is affected by the low stage of water in its streams. The Lucky Boy has not been running full capacity lately, because of the shortage of water for the mill, and the smaller mills which have been put up the past season are also in trouble. As deep tunnels are driven, the flow of water in the basin is developing materially. At the Treasure, managed by C. H. Parks, the main tunnel has enough water for a fair sized plant, and the flow is increasing as the depth is attained. This shortage hindrance will be overcome in a year or so, and at present it is only the driest seasons that the trouble is experienced. Power, drawn from the McKenzie river, 6 miles away, never varies.

SOUTH DAKOTA.

Lawrence County.

Referring to the slimes plant to be put in by the Homestake Co. at Deadwood, C. W. Merrill reports that they have demonstrated experimentally on a practical scale that the 600 tons of slimes made daily by their mills and running from $0.50 to $1.00 per ton can be treated by cyanide at a profit.

UTAH.

Grand County.

It is reported that the McDonald Matte Furnace Co. of Toledo, Ohio, are to put up a 30-ton matte smelting furnace near Basin. C. W. Munson is manager.

Juab County.

The Raymond-Illinois, at Eureka, has been started up again with one shift, drifting on the 1500-foot level.——The May Day mine was recently closed temporarily on account of scarcity of water. Arrangements were made by Superintendent Eigan to secure water from the Uncle Sam M. Co., for which 800 feet of pipe had to be laid.

Piute County.

The capacity of the Annie Laurie mill at Kimberley is to be increased from 200 to 300 tons per day.

Salt Lake County.

The Shawmut Con. C. Co. has been organized to operate in Bingham canyon. The properties are on the north side of Carr Fork, in a large belt of lime. The management will extend the lower tunnel through the property, connecting upraises with the workings above. This will give from 800 to 1200 feet above the tunnel level. The property is equipped with a new mill designed by Manager Jackling, of the Utah C. Co., who estimates the cost of mining and concentrating the Shawmut ore at $7.29 per ton. The Shawmut Co. has a lease and option to buy the Sedalia copper mine, near Salida, Colo.

Manager H. S. Joseph of the Silver Shield M. Co. reports that a new 50-ton mill is to be built near the mouth of the main tunnel at Bingham.

Tooele County.

The Ophir Hill mill at Ophir is being enlarged by Manager E. W. Clark.

WASHINGTON.

E. W. Parker, in "Production of Coal for 1904," says that Washington's total production in 1904 was 3,137,681 short tons, valued at $5,120,931. The coal fields of Washington are confined to the western and central portions of the State. Four principal fields may be mentioned—the North Puget Sound field, including the coal mines of Skagit and Whatcom counties; the South Puget Sound field, containing the operations in Pierce and King counties; the Puget Sound basin, east of Seattle; the Roslyn field, in Kittitas county, on the eastern slope of the Cascade mountains, and the Southwestern field, embracing the counties of Lewis and Cowlitz. The coals of Washington range from lignite to bituminous coking coals and some natural coke has been observed. The bituminous coals of Washington are the only bituminous coking coals on the Pacific slope of the United States. The coking coals are found in the Wilkeson-Carbonado district, in the South Puget Sound field, in the Roslyn field and in the North Puget Sound field. The Wilkeson-Carbonado coal runs high in ash and is usually washed before coking. The lignite coals of Newcastle and Renton, in the South Puget Sound field, are generally of high grade and well suited for domestic use. Coal was first discovered in Washington in 1848, when a lignite of rather low grade was found in the Cowlitz valley. Four years later bituminous coal was discovered on Bellingham bay, Whatcom county, and the first mine in the State was opened on this bed. Shipments did not begin, however, until 1860. This mine was operated continuously from 1860 until 1878, when, because of a fire caused by spontaneous combustion, the workings were abandoned and they have not since been reopened. Shipments were not resumed from any of the mines in the northern district until thirteen years later—in 1891. Coal was discovered in King county in 1859, and mining began near the present Issaquah in 1862. Shipments to San Francisco began in 1871, since which time Washington mines have been an important source of coal supply to the San Francisco market. About the same time the Talbot and Renton mines, whicd are in King county, began shipping, and rail connection between the Renton mines and Seattle was obtained in 1877. Production in the Green river field, also in King county, began between 1880 and 1885, and the Pierce county fields, which had been opened up in 1875 and afterwards abandoned, again began shipping about the same time. The Roslyn mines, on the east side of the Cascade Range, were opened in the first half of the same decade. The Bellingham Bay mines, in the first year of their recorded production—1860—shipped out 5374 tons. In 1903, the year of maximum production, Washington's output of coal was 3,193,273 tons.

Snohomish County.

C. H. Packard of the Packard M. Co. of Monte Cristo reports that the new compressor plant has been put in and is doing satisfactory work.

Stevens County.

The Last Chance mine has resumed ore shipments to the Joplin, Mo., lead smelter and will ship regularly for several months. David Baker, superintendent of the mine, has made arrangements to have the ore hauled in wagons 8 miles to Northport.

Whatcom County.

A. W. Hawks, E. Blackman, Alonzo Low and W. Whitfield of Snohomish and W. Brown of Sylvana are at the Bonito G. M. Co.'s property in the Slate Creek district. The mines are 60 miles by trail from Bellingham and 50 miles from Brewster. Hawks, Blackman and Low will remain indefinitely and take charge of the work. Hawks, the business manager, intends to double the force in the mine and mill.

WYOMING.

Carbon County.

(Special Correspondence).—Encampment is a town of 1500 people, built up in the last five years, founded and supported principally by the Penn-Wyoming Co. and its antecedents. At the reduction works 150 men are employed. There are 30,000 pounds of copper at the smelter. At the reduction works one furnace is running night and day. They are also rebuilding a larger furnace, which is almost completed. By the system of smelting and concentrating which the Penn-Wyoming Co. employs, 90% of the copper is extracted from the ore. The Australian jig saves 80% of the ore and has a daily capacity of 800 tons of ore. Together with two 48-inch Griffith mills, twenty-four Wilfley tables and twelve Frue vanners, another 10% is saved. There is plenty of limestone in the vicinity. The company owns their own machine shop, foundry, blacksmith shop, harness shop, carpenter shop and electric lighting plant, supplying light for lighting the town as well as for their own use at the reduction works, and their own water power. The entire plant is run by water power furnished by water from a 4-foot main from a dam 4 miles above the works. The 16 miles of Leschen tramway from the mine to the smelter cost $385,000, and has a carrying capacity of about 1000 tons a day. The tramway carries 800 buckets 100 feet apart, averaging 700 pounds to the bucket. Three-fourths cord of wood furnishes power to run this tramway for one day. Considerable freight is carried over this tramway to mining companies in the immediate vicinity, netting the Penn-Wyoming Co. $1 per cwt. The cost of transporting ore over this tramway from the mine to the smelter, a distance of 16 miles, is 30 cents a ton, compared with $14 a ton when hauled by wagon. The mine of the Penn-Wyoming C. Co. employs about 100 men. The plant comprises three 80 H. P. boilers; one compressor, large enough to operate twenty-five drills; one engine, which runs the compressor, furnishing power to handle the cars for the mine; one 300-light dynamo direct connected to a 35 H. P. engine, to give light to the mine and surrounding buildings. A winze has been sunk from the lower level to a distance of 150 feet, showing ore bodies to that depth. All of the ore in the mine is handled by gravity and compressed air, thus reducing the cost to a minimum. The cost of producing the copper, including hauling to the railway at Walcott, is stated to be 6½ cents per pound.

Encampment, Aug. 17.

The Battle Lake Tunnel Site M. Co., owners of the Doane-Rambler mine at Rambler, will construct a 500-ton concentrating plant at the Doane-Rambler mine. A dam is to be constructed at the mouth of Battle lake by which it is proposed to raise the waters of that body 18 feet. The lake is surrounded on three sides by steep cliffs and the construction of the dam will create an immense body of water, furnishing an inexhaustible water power for the operation of the mine. Work will be in charge of H. F. Brown.

FOREIGN.

CANADA.

The Dominion government has appropriated $15,000 for making experiments with the electric process of smelting ores and manufacturing steel at Sault Ste. Marie, and the Con. Lake Superior Power Co. will furnish a building and dynamo capable of supplying 400 electric H. P. for four months free of charge. All kinds of ores will be experimented with. Great possibilities for Canada underlie the inauguration of a cheaper process for manufacturing pig iron and steel than is now in use. Ontario is dotted with ore bodies, the development of which is at present prevented by lack of cheap fuel. There is coal in the eastern and western parts of Canada, but the cost of conveying it to points where coke is needed for smelting purposes is prohibitive. On the other hand, there are a great many water powers throughout the provinces of Ontario and Quebec where electricity can be developed and utilized.

Ontario.

The Bruce copper mine has been purchased by the Lancaster syndicate of London, England, which has formed the Copper Mine & Smelting Co. with a capital of $1,000,000. The Bruce property is on Georgian bay, Algoma, and covers 12,840 acres. The ores are mainly chalcopyrite in quartz gangue, occurring in several parallel veins traversing diabase.

BRITISH COLUMBIA.

Boundary District.

(Special Correspondence).—At the 40-stamp Nickel Plate mill at Hedley sixty stamps are to be added by Superintendent M. K. Rogers. There are sixteen vanners in the concentrating room, to which eight are to be added, in addition to those for the new stamps.

Hedley, Aug. 18.

On the summit of Hardy mountain, 2500 feet above Grand Forks, at the American Eagle property the owners will build a tramway down the steep incline to haul ore for treatment at the Granby smelter. The mine is owned by John Holmes.——On the Betts and Hesperus mines on Hardy mountain, 4 miles from Grand Forks, a tunnel has been driven 600 feet. It has been decided by the management to add another machine drill.

At the Helen mine, on the east side of Boundary creek, near Greenwood, a new boiler, hoist and drills have been put in. A new two-compartment shaft is being sunk.——A new compressor has been put in at the Providence mine at Greenwood. Ore is being shipped regularly.

Figures for the first month of the second half of 1905 show that the ore tonnage of Boundary mines for July was somewhat in excess of the output for June. The total for seven months of 1905 shows that 527,874 tons have been shipped from the district mines so far this year. For July the following are the figures from the several mines: Granby, 54,320 tons; Mother Lode, 13,532; Mountain Rose, 330; Oro Denoro, 198; Emma, 1096; Providence, 60; E. P. U., 50; Last Chance, 20; miscellaneous, 75. July total, 69,681 tons.

East Kootenay District.

The Crow's Nest Pass Coal Co.'s employes have decided to stand out until the company pays the rates agreed to under the written agreement entered into last spring between the company and its employes. The men are all out. The present conditions at the Crow's Nest collieries will have an important and possibly serious effect on the camp if the strike is maintained for a considerable period. The Crow's Nest Pass Coal Co. has a monopoly of the fuel supply of the mines and smelters of southeastern British Columbia, including the Northport smelter. The Trail smelter is well supplied with coke, but the conditions at Northport, where the smelter is being operated at one-third its capacity, makes the situation rather serious for the Le Roi. The mines can get coal from Lethbridge, Roslyn and western Washington, but there is no coke available except from Coleman, in the Northwest Territory, and Comox, on Vancouver island.

Nelson District.

It is reported that work is to be started on a concentrator at the Molly Gibson mine, on Kokonee creek, which has been under development for the past two years, after a long shutdown, the company having repaired the tramway and mine buildings, which had been destroyed by a snowslide.

W. R. Ingalls, of New York, will head an expedition which will leave shortly to investigate the zinc deposits in British Columbia. The investigating party will meet in Nelson, B. C., about September 1. Philip

Argal, of Denver, will assist him. The points to be determined by the expert are as follows: (1) Examination of the present development of mines and approximate determination of tonnage of ore immediately available; occurrence and character of the ore and future prospects, together with cost of mining; (2) examination of present methods of milling; (3) investigation of adaptability of ores to the new methods, concentrates, magnetic, electrostatic, etc.; (4) study of conditions affecting marketing of concentrates, including question of smelting in province or elsewhere in Canada; (5) investigation of the possibility of utilization of zinc ore with silver content.

Rossland District

The tonnage of ore shipped from and crushed at the Rossland mines for the week ending August 19 was as follows:

	Week.	Year.
Le Roi	2,050	77,806
Le Roi (milled)	210	1,140
Centre Star	2,040	62,190
War Eagle	1,200	44,210
Le Roi Two	300	4,972
Le Roi Two (milled)		6,030
Jumbo	200	6,420
Spitzee		4,539
Velvet-Portland		1,977
Gopher	60	120
Homestake		30
Lily May		90
Inland Empire		30
Cascade Bonanza		30
White Bear		1,100
White Bear (milled)		2,920
Totals	6,120	213 613

The experimental concentrating mill of the Le Roi M. Co., at Rossland, has been closed down pending the installation of additional machinery. J. M. Astley is manager of the Le Roi.

Slocan District.

The remodeled concentrator at the Jackson mines, on Jackson creek, 5 miles from Whitewater, is turning out fifteen tons of zinc concentrates and two tons of lead concentrates daily. The auxiliary steam plant is to be started because of water shortage.——The Bell mine, adjoining the Jackson, has been sold to parties represented by John Keen, who will start development.

Vancouver Island.

(Special Correspondence). — During July the Tyee smelter ran eleven days and smelted 1793 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $31,472.

Duncans Station, Aug. 14.

MEXICO.

Chihuahua.

The Material Metal Co., controlled by the National Metal Co., is building a metal refinery at Nonoalco, in the Federal district, to handle high-grade ores, gold and silver bullion, sulphides, cyanide precipitates, etc. H. P. Lewis, general manager of the National Metal Co., with headquarters in Mexico City, is quoted as saying the plant will be in operation in sixty days. E. C. Doney, formerly in charge of the DeLamar Copper Works, Chrome, N. J., has been appointed superintendent of the new refinery.

Guanajuato.

It is announced in New York that the American Furnace & Securities Co. of New York has made the last payment on the purchase price, amounting to $2,500,000, to the Casa Rul M. Co. for its dumps and properties at Guanajuato. A fund of $400,000 gold has been set apart for mill construction and development work, from which reduction mills and cyanide plant have been purchased and are now on the ground at Guanajuato. These, with the pipe lines, buildings and tramways, are expected to be in readiness for operation by Jan. 1.

Guerrero.

(Special Correspondence).—The Rio del Oro Exploration Co. have commenced operations on their mineral concession of 300 square kilometers along the course of the Rio del Oro. Wm. Niven, the general manager, is directing the work of testing the large gravel deposits by sinking prospect pits to bedrock from 10 to 40 feet deep, at a cost of 30 cents Mex. per foot. The pay gravel averages from 3 to 6 feet and runs from 40 cents to $1 per cubic yard. The ground near the town of Placeres del Oro, in the valley of Potambo, shows the best values and is remarkably free from boulders. Water is abundant and the conditions quite favorable for dredging at some points.

The new gold district of Los Pozos, near the line of Michoacan, and only some 12 leagues from the Pacific coast, is attracting considerable attention at present. W. J. Neale and E. Nolte have returned after a month's trip to the region. They found the property guarded by soldiers, as some of the buscones had been carrying off the free gold ore which crops on the surface. After presenting their permit from the Mexican Government they made a thorough examination of the Antioquia mine. The chief feature of this property is the cropping of ore 45 metres long 12 metres wide and 8 metres high, which has been named the Bonanza Block. It is a mass of white quartz. Arrangements are being made to develop this valuable deposit. S. L. Butler has denounced some adjoining claims under the name of Los Pozos.

Placeres del Oro, Aug. 9.

Tamaulipas.

The Mexican Petroleum Co. is to begin drilling for oil again at Ebano. The drilling was stopped several months ago because no market could be found for the oil; but now that the Mexican Central and other railroads have made contracts for fuel oil for use in locomotives, it is thought that the petroleum company sees a market for its product. The drilling is to be commenced Oct. 1.

Zacatecas.

It is reported that R. S. Towne has closed down his mines in the Sombrerete district, thus throwing 5000 men out of employment. The 200 ore wagons, used to haul the ore from the mines to the Mexican Central to Fresnillo and Gutierres station, have been sold to mining companies in the State of Coahuila. Towne is said to have become disgusted with the Mexican Central for not building a railroad to that portion of the Sombrerete district and closed down to force the building of the branch road. The Central has had a concession for a road from Fresnillo through the Sombrerete district since 1899 and recently got the federal government to renew it at a cost of $10,500. The Towne interests own the San Luis Potosi smelter, the railroad to Sierra Mojada and other mines.

Books Received.

The United States Geological Survey has issued a second edition of J. E. Spurr's "Descriptive Geology of Nevada South of the Fortieth Parallel and Adjacent Portions of California," Bulletin 208.

In the series of reports of progress of stream measurements during 1904, the United States Geological Survey has issued Bulletin No. 125 on the "Hudson, Passaic, Raritan and Delaware River Drainages," and No. 130 on "Hudson Bay, Minnesota, Wapsipinicon, Iowa, Des Moines and Missouri River Drainages."

As an extract from the "Mineral Resources of the United States for 1904," the United States Geological Survey has issued "The Production of Coal in 1904," by Ed. W. Parker. The total coal production of 1904 was 352,310,427 short tons, with a spot value of $444,816,288, a decrease from 1903 of 5,045,989 short tons.

"Le District Aurifere de Cripple Creek et ses Recents Developpements dans la Zone Profunde" is the title of an article published by Etienne A. Ritter in the Annales des Mines and printed separately in pamphlet form. This is the first technical description of the Cripple Creek district published in the French language.

Professional Paper No. 38 of the United States Geological Survey, "Economic Geology of the Bingham Mining District, Utah," by J. M. Boutwell, with "A Section of Areal Geology" by Arthur Keith and an "Introduction on General Geology" by S. F. Emmons. This forms a comprehensive and masterly treatise on the geology of the region described.

In Bulletin No. 257 of the United States Geological Survey, T. W. Stanton and J. B. Hatcher describe the "Geology and Paleontology of the Judith River Beds" of northern Montana, with a chapter on the fossil plants, by F. H. Knowlton. The conclusion is reached that the Judith river beds are older than the Laramie and identical with the Belly river beds of Canada.

The excellent work of the United States Geological Survey in Alaska will undoubtedly do much to open up the country and make the outside world acquainted with the true conditions there. In Bulletin No. 251, L. M. Prindle describes "The Gold Placers of the Forty-Mile Birch Creek and Fairbanks Regions, Alaska," and in No. 247, F. H. Moffit writes of "The Fairhaven Gold Placers, Seward Peninsula, Alaska." These give the geography, geology and practical mining conditions of the district.

Commercial Paragraphs.

THE new briquetting plant of the Western Fuel Co. of San Francisco, Cal., is working steadily. Most of the output is for Spreckels Co.'s tug boats, and will be used soon also on the Pacific Mail liners.

THE Crocker-Wheeler Co. is in receipt of an order for a 200 K. V. A., three-phase, 60 cycle, engine type alternating current generator for the Ivorydale, Ohio, lighting and power plant of the Proctor & Gamble Co., a duplicate of the first Crocker-Wheeler alternator ever built, which was installed ten months ago in the Atlanta plant of the Proctor & Gamble Co.

THE Ottumwa Iron Works, Ottumwa, Iowa, report recent shipments of two carloads of mining machinery to Ocotlan, Mexico, and one sectionalized double hoisting engine to a gold mine in northern Mexico; two carloads of mine machinery to Littleton, Ill., one carload to Crecus, N. M., and one carload to Butte, Mont. The Ottumwa Iron Works further report contracts for two carloads to Robard, Ky.; one large double Corliss cylinder, 18x36 inches, with double independent friction drums, for a copper mine at Bisbee, Ariz.; two carloads of haulage engines for a concrete stone company of Chicago, Ill., and one carload for northern Idaho. The company will enlarge its business and put new lines on the market.

THE Wood Drill Works, Paterson, N. J., writes: "The greatest engineering feat of its kind ever known in the world was completed at ten minutes after four Saturday afternoon, July 22, 1905, at Henderson's Point, at the end of Seavey's island in Portsmouth harbor. Fifty tons of dynamite was exploded to blow up the rim of the point. The ground was broken August, 1902, and for three years Wood drills were working ceaselessly night and day drilling holes for excavating the rock at that point. During that period of time over 500,000 tons of rock was blasted and cleared away, nearly all of it below high water mark. The point has always been a manace to navigation for years and the Government finally decided that Henderson's Point should be no more. The river is now 400 feet wider at its narrowest point and 35 feet deep at low water. The contract price for the work was $749,000."

THE Calumet & Arizona M. Co. of Bisbee, Ariz., is installing a Sullivan Corliss cross-compound steam two-stage air compressor, with a total piston displacement of 3660 cubic feet, which, on account of the altitude at which the compressor operates, is figured to be equivalent to an actual delivered capacity of 2700 cubic feet of free air per minute, against a terminal pressure of 100 pounds per square inch while running at 83 revolutions per minute. This machine is expected to attain a high efficiency, being designed to run condensing, and to operate when carrying its most economical load on 15.2 pounds dry steam per 1 H. P. per hour. The steam cylinders are 17 inches and 34 inches and air cylinders 20 inches and 34 inches in diameter, with a common stroke of 42 inches. Rolling inlet valves, controlled by independent eccentrics, are used on both the high and low pressure air cylinders. Rolling discharge valves are also used on the low pressure air cylinder. In addition to these a number of automatic poppet discharge valves are used on the same cylinder. The high pressure air cylinder is equipped with a full set of removable automatic poppet discharge valves, which act in a direction parallel with the steam piston rod. An interesting feature is the automatic oiling system, which lubricates all the working parts regularly and without the attention of the engineer. The machine will be used for operating rock drills and other pneumatic tools about the mines. The company already has three Class WB-2 Sullivan straight line compressors, giving a total air supply of about 5700 cubic feet per minute.

Personal.

W. H. BREVORT of New York City is at San Francisco, Cal.

FRANK EARLE is consulting engineer Azurite M. Co., Dillon, Wyo.

ROBERT MAY has charge Banner M. Co., near Silver City, Idaho.

M. T. CHESTNUT of Webster Groves, Mo., is in Silverton, Colo.

ROBT. W. DAVIS, JR., is manager Old Hundred mine, Silverton, Colo.

D. R. REED, Ouray, Colo., has returned there from California and Nevada.

W. C. GREENE has left San Francisco, Cal., for Cananea, Sonora, Mexico.

H. A. MOORE of Idaho Springs, Colo., is developing a coal mine at Bellingham, Wash.

ALFRED BRILE has been engaged as superintendent Anchoria mine, near Dillon, Wyo.

W. C. THOMAS has returned to the Montreal & Boston Co.'s property at Rossland, B. C.

J. L. HARPER, manager Belcher M. Co., Republic, Wash., has returned from a trip East.

HOWELL HINDS of Cleveland, Ohio, is in Silverton, Colo., looking after his mining interests.

H. H. NICHOLSON, manager Standard Con. mine, Sumpter, Or., has returned to Denver, Colo.

L. MAURICE COCKERELL is now manager Mezquital Gold Mines, Mezquital del Oro, Zacatecas, Mexico.

HERBERT HAAS is at the Kamloops Mines, Ltd., smelter at Kamloops, B. C., on professional business.

GORDON HARDY, formerly manager Dolores M. Co., Chihuahua, Mexico, has resigned and gone to Japan.

SAMUEL NEWHOUSE is attending the directors' meeting of the Montreal & Boston M. Co., at Nelson, B. C.

F. H. JOHNSTON has succeeded G. W. Root as superintendent New York-Grass Valley mine at Grass Valley, Cal.

W. A. FRAZER has resumed his work as superintendent Rigby reduction plant at Mayer, Yavapai county, Ariz.

LEONARD D. SIVYER, a mining engineer and geologist of Los Angeles, Cal., is at Mayer, Ariz., on professional business.

EDWIN FERNALD of Detroit, Mich., has been appointed manager New York-Grass Valley mine at Grass Valley, Cal.

JOHN LAWLER, owner of the Hillside mine, west of Prescott, Ariz., has been in San Francisco and at the Portland Exposition.

W. H. ROELSMA has resigned from the Condor Water & Power Co. to take the management of the Alice mine, near Gold Hill, Oregon.

G. W. ROOT has resigned as superintendent New York-Grass Valley mine at Grass Valley, Cal., to devote his time to private interests.

J. T. CAVE, president Coast Line Copper Co., has returned to Pasadena, Cal., from a visit to the company's mines in Sonora, Mexico.

E. G. DEWALD is now the Pacific coast representative Platt Iron Works, Dayton, Ohio, with headquarters at 11-13 First St., San Francisco, Cal.

R. P. FRANCK, formerly of Benson, Arizona, has been appointed mining engineer for La Cia Minera del Picacho at Boacoachi, Sonora, Mexico.

RICHARD B. STANFORD has resigned as manager Ranch mine, Columbia, Cal., and goes as manager Siempre Viva mines, Nicaragua, C. A.

W. J. CURTIS has had charge of the work of the Keystone Copper Co., near Tapalpa, Jalisco, Mexico, during Manager Theo. Briedenbach's visit to Philadelphia.

WM. H. SHOCKLEY has been exploring copper deposits near Tokar, Sudan, Africa, and on Sept. 1 goes reconnoitering a gold dredging proposition in the Urals.

R. B. LAMB, superintendent Penn-Wyoming C. Co.'s concentrator at Encampment, Wyo., who has been seriously ill for a month past, has recovered sufficiently to resume his duties at the mill.

A. S. ADDITON has returned to San Francisco, Cal., from Boston and New York, where he went on business connected with the McKeen mine of the Helena G. M. Co., near Callahans, Siskiyou county, Cal., and which he recently examined.

Trade Treatises.

Circular No. 1108 of the Westinghouse Electric & Manufacturing Co. of Pittsburg, Pa., describes Westinghouse regulating and reversing controllers for alternating and direct current motors.

Crane Co. of Chicago, Ill., have issued a valuable treatise on "Flanged Pipe Joints." It describes joints used for various temperatures and pressures in attaching flanges to wrought pipe, including screwed, lap, weld, rolled, shrunk and riveted joints.

Bulletin No. 60, "Small Motors," from the Crocker-Wheeler Co., Ampere, N. J., illustrates one of their specialties, motors for small power service. On page 13 is technical data intended to be valuable to users of electric motors and generators of any make.

Latest Market Reports.

SAN FRANCISCO, August 25, 1905.

METALS.

SILVER.—Per oz., Troy: London, 28⅜d (standard ounce, 925 fine); New York, bar silver, 61½c, refined (1000 fine); San Francisco, 61½c; Mexican dollars, 47c, San Francisco; 46¾c, New York.

COPPER.—New York: Standard, $16.00; Lake, 1 to 3 casks, $16.00@16.25; Electrolytic, 1 to 3 casks, $16.00; Casting, 1 to 3 casks, $15.50 @ 15.87½. San Francisco: $16.50. Mill copper plates, $17.50; bars, 18@24c. London: £70 15s spot per ton.

The copper market remains firm, with a slightly increased price for the several grades of metal—Lake, electrolytic and casting. The demand appears to wholly absorb the output, and any event which may in any way suspend or retard the present output will undoubtedly result in an increase in price of the metal. While certain large dealers in the metal may be able to manipulate the market, the present healthy condition of the copper mining industry, and of the industries of the country, point to no lower price than at present quoted for some time to come. The visible supply on August 1, as reported by James Lewis & Son of Liverpool, was 17,411 tons, nearly 1000 tons less than the first of the previous month.

Following are the figures of the German consumption of copper for the months from January to June, 1905, as compared with the same period of time for 1904 and 1903:

	1905.	1904.	1903.
Imports, tons	52,886	56,316	43,688
Exports, tons	6,299	4,063	5,380
Consumption, tons	46,587	52,253	38,308

Out of the above, 44,656 tons were imported from the United States.

LEAD.—New York, $4.70; Salt Lake City, $3.50; St. Louis, $4.52½; San Francisco, $3.70, carload lots; 4¼c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £14 ℔ long ton.

SPELTER.—New York, $5.75; St. Louis, $5.65; London, £24 17s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $33.15@33.50; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 35½c; less, 35½c; bar tin, ℔ lb., 35@37½c. London, £145.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $41.00@$41.50, large lots; London, £7 7s 6d; San Francisco, local, $38.50@39.00 ℔ flask of 75 lbs.; Denver, $42.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.00c; San Francisco, Plumbers', 100-lb. lots, 19.00c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 33@37c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c. Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.85; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$21.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¼c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.25 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $2.15@2.65 ℔ bbl.; California, carload lots, $1.90 f. o. b. at works; small lots, $2.20 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

OILS.—Linseed, boiled, bbl., 64c; cs., 69c; raw, bbl., 62c; cs., 67c; Lucol oil, boiled, bbl., 56c; cs., 61c; raw, bbl., 54c; cs., 59c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¾c; less than 500 lbs., 8c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.25.

URANIUM.—Oxide, ℔ lb., $3.50.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR WEEK ENDING AUGUST 8, 1905.

796,696.—CLASP—F O. Brockhaus, Port Angeles, Wash.
796,888.—PACK SADDLE—C H. Baker, Republic, Wash.
796,805.—CENTERING FRAME—P. R. Burton, Bakersfield, Cal.
796,901.—SAW—H. Dool, Northfork, Cal.
796,711.—SHIRT—C. J. Ferguson, Pendleton, Or.
796,572.—LUMBER DRESSER—J. F. Finnegan, Igerna, Cal.
796,631.—JAR CLOSURE—F. O. Fischer, San Leandro, Cal.
796,905.—HOG CATCHER—D. P. Funk, Monroe, Wash.
796,636.—JOURNAL BOX—F. Gottfried, S. F.
796,909.—PUMP—E. A. Hardison, Bakersfield, Cal.
796,643.—TANK LUG—E. N. Harmon, Belvedere, Cal.
796,967.—THILL IRON—C. Heilrath, Sacramento, Cal.
796,645.—SQUARE—J. Herche, S. F.
796,971.—HEATER—Houze & Hurrie, Stockton, Cal.
796,727.—ELASTIC FLOOR—C. R. Hunt, Sacramento, Cal.
796,735.—FURNACE—F. Klein, San Jose, Cal.
796,521.—BARBER'S CHAIR—W. Lupton, Lodi, Cal.
796,590.—IRRIGATING APPARATUS—J. H. Martin, Riverside, Cal.
796,592.—HOE—H. Matthiesen, Livermore, Cal.
796,753.—TREATING ORES—J. B. Parks, Spokane, Wash.
796,754.—TREATING ORES—J. B. Parks, Spokane, Wash.
796,674.—FAUCET—E. A. Rider, Stockton, Cal.
796,677.—CAP FOR TUNING PINS—I. B. Rosencrantz, S. F.
796,538.—DRESSING FISH—E. A. Smith, Seattle, Wash
796,613.—TOBACCO PIPE—N. B. Stone, Outlook, Wash.
796,540.—METER—J. Sutherland, Seattle, Wash.
796,541.—HOIST—W. A. Tompkins, Portland, Or.
796,948.—FISHING ROD—J. B Tuttle, Claremont, Cal.
796,477.—THRESHER—R. V. Wallace, Alki, Wash.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS UNITED STATES and FOREIGN PATENT AGENCY, the following are worthy of special mention:

DISK PLOW ATTACHMENT.—No. 797,177. August 15, 1905. W. S. Cook, San Jose, Cal. The main object of this invention is to increase the tread of the plow so as to render the plows very steady in their operation and prevent undue oscillations and movements of the frame. The device consists of a plow beam or frame, a bracket adapted to be bolted to said frame, a horizontal journal box carried by the bracket, a crank axle having long and short arms each turnably fitted to the journal box, and a land wheel fitting and turnable upon either arm of the axle when the other is in the journal box. A lever is fulcrumed upon the journaled arm of the axle having its short arm bolted to the crank portion of the axle, and there is a segment concentric with the journal box having peripheral notches and a pawl carried by the long arm of the lever adapted to engage said notches

DUMP WAGON.—No. 797,164. August 15, 1905. R. E. H. Wurdisch, San Francisco, Cal This invention relates to a wheeled vehicle having a body adapted to carry loose material and connections by which said body may be so disposed as to discharge its load and to again be returned to its normal position. It consists of a main wheel frame, a supplemental frame hinged at the rear, a vehicle body freely movable upon said frames, a winding drum mechanism by which the supplemental frame is raised into an inclined position, means for allowing the body to move rearwardly on said frame to a dumping position and to return the body to its normal position, a tail gate hinged to the upper part of the body and a lever mechanism by which said gate is opened to discharge the contents.

SECTIONAL CENTERBOARD FOR VESSELS.—No. 797,146. August 15, 1905. Viggo L. Ogidinssen, San Francisco, Cal. The objects of this invention are to provide a centerboard which will not require the cutting in two of the vessel along the keel, as is now customary, and which weakens the vessel considerably; to avoid having the large heavy casings in the hold, as at present, and which add to the weight of the vessel and take up so much room as to be a continual detriment in loading and unloading; to add to the efficiency of the used surface of the centerboard to prevent a vessel making lee-way, (with ordinary centerboards only half of their surfaces is available for that purpose) and finally to distribute the strain from the centerboard more evenly over the vessel's keel and body. The various parts are adapted to produce the required result.

MINING SLUICE.—No. 797,168. August 15, 1905. Pierre Bouery, Weaverville, Cal. This invention is particularly applicable to such sluices as are employed to save valuable and precious metals, while allowing the rocks, boulders and heavy valueless material to escape. It consists in a sluice having bottom, sides and transversely disposed riffles, rails mounted thereon with connecting bolts, interspacing bolt protecting blocks, rails fixed along the sides of the sluice and resting upon the riffle rails and living blocks fixed to the sides of the sluice above said longitudinally disposed rails; and other details of construction.

Common Sense

teaches us that **RUBBER** against an article creates friction. In fact, we wear rubber soles—use rubber on steps, etc., to prevent slipping—to create friction.

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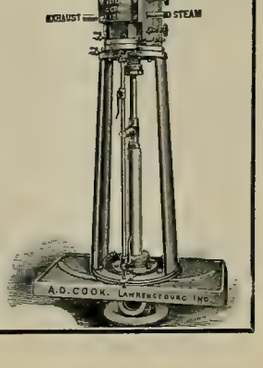


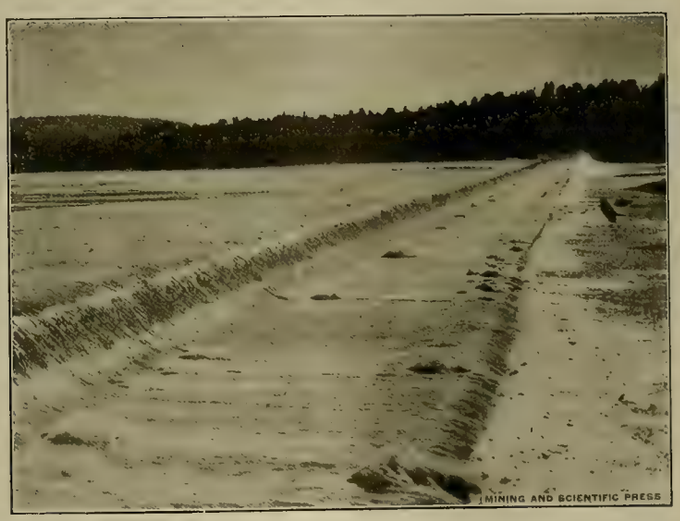
MINING AND SCIENTIFIC PRESS

Whole No. 2352.—VOLUME XCI. Number 10. SAN FRANCISCO, CAL., SATURDAY, SEPTEMBER 2, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Bank of Hydraulic Mine in Nevada County, Cal., Showing the Great Depth of Excavation.

Barrier No. 1, Yuba River, Showing Method of Construction.

Barrier No. 1, Yuba River, Completed Ready to Turn the River Over the Dam.



Barrier No. 1 Completed. The Spurts of Water are from the Heads of Piles Not Sawed off Accurately.

Top View of a Log Crib Dam Before Mining was Commenced.

Log Crib Dam, With Spillway, Plumas County, California.

Some of the Engineering Features of the Control of the Debris of Hydraulic Mining in California.

(See Page 152.)

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UNDOUBTEDLY the best results are secured where technically educated men are placed in charge of mining and metallurgical operations, provided the men are otherwise fitted for such positions. Some men go through the college course without giving their studies the necessary thought. They are superficial, and manage to get through in some way, but such men rarely make a success of their chosen profession. It is those who go into the university with one determination uppermost in mind — to make the most of the opportunities presented; to endeavor to understand and to make practical application of the knowledge thus gained. All cannot step from the graduation stage into the position of superintendent or manager. A few, by reason of personal influence of family or friends, may, but the majority find this impossible — nor is it best. There is a period of apprenticeship which must be first served to fit the student for the higher duties and responsibilities of life. There is much of detail to be learned which can only be accomplished by direct application and continued contact with the work, and with the men. There are menial jobs to be done, and one must do them if he is to become a competent judge of the performances of others. The college is but the preparatory school — the beginning of knowledge — not its ending.

The Question of Power for Mines.

A paramount question in the equipment of new mines is what kind of power shall be adopted. This question should be answered by the economic conditions presenting themselves at each particular mine. Undoubtedly the most satisfactory power is that developed by free water—that is a water power, or privilege, owned by the mine. Such a power, if constant in amount, is flexible, in that it may be applied to hoists, compressors, electric dynamos, to mills, and to every description of machinery requiring motive force. The compressed air or the electricity may be economically carried to considerable distances from the generating station and utilized in many ways, in operating drills, running hoists, and variously otherwise. True, steam may be applied in similar manner to all of these various uses, and so also may electricity, as a primary power, but electricity must either be bought from a distributing company or generated by the mine's own power plant. Steam requires a considerable outlay of capital and is a source of constant expense when operating. The water power plant may be far more expensive in first cost, but more economical in operation unless the water must be brought from a distributing company at such a price as to increase the cost. The power question should always be determined in the same manner as any other concerning mine equipment and operation —by careful consideration of all the features having a bearing upon economical result and a selection made accordingly. Occasionally a mine is seen equipped with both steam and water power plants, both of which are in operation at the same time. The conditions are unusual where this becomes necessary, but it is no uncommon thing to find mines equipped with water power plants, with steam as auxiliary, to be used in the event of failure from any cause of the water plant. The breaking of a reservoir, ditch, pipe line or flume may close down a mine for some time if no steam plant is available. Many mines have installed electric plants, buying power from distributing electric companies, but it is always wise to keep the steam or hydraulic plant in readiness in the event of the failure of the electric power. In some mining districts the electric companies have endeavored to entrench themselves the more strongly by buying up the pre-existing water companies and informing the operating mining companies, which have for years been buying water from the ditch companies, that "all the water is now required for the electric plant, and electric power must be substituted for water power." Where the change does not work an apparent disadvantage to the mining companies, there is seldom a serious objection to this change; but, in the event of the failure of electric power, the mines are closed down for a greater or less time until power can be again delivered to them. The right to a continued use of the original water under these circumstances is a matter for the courts to decide. Such irregularities are annoying, but they also occur with private as well as distributing companies. There are so many phases of the power problem, under ordinary circumstances, that the matter should receive very serious consideration and be investigated from every point before being definitely decided. Even when steam is decided upon, the various classes of fuel should be considered with reference to their relative value. In most cases there is a choice between wood, coal and petroleum, and also gasoline or distillate engines, as a means of power. Each must be fully inquired into, as well as the relative efficiency and cost per horse power month, of each of the sources of power available. The matter is not usually a difficult one to decide, but it requires some careful thought.

THE ending of the bitterly fought war in the Orient is likely to result in an expansion of the mining industry in the countries most affected, particularly in China and Korea, where there are known to be extensive undeveloped mineral resources. Japan, too, it is assured, will take immediate steps to enlarge the scope of the mining already being done and to apply the most approved American methods and machinery for the time being, at least. Just how far America and Americans will be benefited by the new regime is difficult to predict, as to Japan, but in both China and Korea, where there are already extensive American interests, additional concessions will be sought and new development undertaken. The mineral resources of the Celestial empire are varied and extensive, and the adoption of American methods, with the native cheap labor, will make propositions of unusually low grade available and profitable.

The Reward of Perseverance.

The success attending the efforts to successfully treat a constantly lower grade of slimes at the Homestake plant at Lead City, South Dakota, is an instance of perseverance and intelligent scientific experimentation rewarded. The Homestake ores are low grade, and the slimes created in the stamping of these ores are of infinitesimal fineness. These, after the several metallurgical operations through which they pass, still contain from 50 cents to $1 per ton in gold. These slimes it is now proposed to treat by a new process, as previously mentioned herein, and a new plant is to be built at Deadwood, where the slimes from all of the several mills of the Homestake Co. may be conducted by gravity, thus reducing the cost incident to the operation of two plants. C. W. Merrill has spent several years in the treatment of Homestake tailings by the cyanide process, and has succeeded in treating at a profit a constantly lower grade of material. It should not be understood that the Homestake tailings and slimes are constantly growing of less value with the passing of the years, but the percentage of extraction has been increased and the cost per ton of operating has been reduced from year to year, until this final result seems to have been accomplished. Whether still further improvements will be made beyond this latest achievement remains to be seen. All of the ores now being successfully treated by the cyanide process in its various modifications in the Black Hills gave much difficulty in the earlier days, but for most part these difficulties have been overcome and the most rebellious ores, with the exception of a single kind—the so-called unoxidized or blue telluride ores—now yield a high percentage of their values at relatively low cost. Chlorination, cyanidation and smelting have each been helpful in the solution of these vexing metallurgical problems. In the southern Black Hills, however, are still some rather annoying and perplexing metallurgical problems. In that region are some mines in which the gold is largely associated with arsenic, and it is these ores which have proven difficult of treatment. The Keystone, Holy Terror and Extreme mines each have had this sort of trouble, and were it not for the unusually high grade of these ores at the mines mentioned, they would probably have proven too unattractive to capital. The Holy Terror early in its history attracted attention by the high grade of its output. Nothing stimulates endeavor to overcome difficulties like abundant reward if success be attained, and the good grade of the base ores generally in the hills will continue to make them a subject for the attention of expert metallurgists until the several problems of their reduction have been solved.

ELSEWHERE appears a report of a lecture recently delivered at the Academy of Sciences in San Francisco, Cal., by a captain in the Corps of United States Engineers, a member of the California Debris Commission, a body that is vested with considerable power and grave responsibility. Seldom does this journal praise or censure, but it is only their just due to say that the members of the California State Debris Commission, from its inception in 1893 to the present hour, have shown a zeal and singleness of intelligent purpose that entitles them to the thanks and commendation of all whose interests are affected by their acts. The task assigned them from the start was wholly without precedent; the conditions were all new and untried, the appropriations inadequate, the expectations both sanguine and immediate. That progress has been slow, and at times unsatisfactory, is to have been expected. Even the ægis of United States authority is not always sufficient to immediately overcome such a stupendous problem as that given the United States engineers in California to solve. With the resources at their command, they have done much, and it is believed that with the experience gained, advance in the solution of the problem will be more rapid.

CONCENTRATES.

THE cost of operating a mine depends much on the character and size of the mine: much on the situation and not a little on the management.

FLUMES are sometimes built on a grade cut into the hillside like a narrow road, and the flume then covered with earth. This is done sometimes in cold countries to prevent freezing.

ASSESSMENT work may be done on a patented claim for the benefit of a contiguous unpatented claim, provided such work is actually a benefit to such jointly owned unpatented claims.

CONCRETE, properly made, cannot, after having firmly set, be picked down. It is as firm as rock and must be blasted. The proportions of materials used in mixing concrete vary, according to the purposes for which the concrete is to be used.

BELL CORDS should always be placed in the shaft within the reach of the men riding on the cage or skip. Nothing in the equipment of a mine requires more careful attention than the bell signal service, for on it the lives of the men depend.

A HEAVY iron gossan does not necessarily indicate a valuable deposit of copper ore below. There is usually, though not always, some indication of copper in the gossan if there be any below. This indication appears in the form of copper carbonates and oxides.

OF primary importance is the size of vein, value of the ore and the method of recovering the mineral, and the cost per ton of the entire operation of mining and treatment. These questions are usually of greater importance than the character of the ore deposit.

WHERE stamp stems cannot be readily driven out of the boss head by blows of the sledge on the wedge, small charges of dynamite may start the stem. This method is usually successful, but should be used with caution, as there is an element of danger in employing it.

THE relocator of an abandoned mine cannot claim the work performed nor improvements made by the former owner when applying for a patent. The new tenant must comply with all requirements of the law, the same as though the ground had never been located.

IF rock drills be tempered very high—straw color in very hard ground—they are likely to chip off at the corners, and sometimes, unless the temper be evenly drawn, the entire bit snaps off. A color between bronze and dark blue is rather better in the hardest ground.

IN Mexico, where it is believed that placers exist at considerable depth below the surface, and no surface discovery is possible, the law gives the miner one year in which he has the exclusive right to prospect his claim by shaft or otherwise, to make the necessary discovery.

THE depth of a gravel channel covered by soil, heavy deposits of gravel or by a lava cap, may usually be determined by boring. Information gained in this manner may save many thousands of dollars, which not infrequently results from running a tunnel too low, the depth of the channel being only guessed at.

LARGE BOULDERS in drift mines are often a source of much annoyance and expense. When directly in the way it is usually the better plan to work around them, though in main drifts and gangways they are sometimes blasted out, the result being a straight drift and uninterrupted grade. Often considerable gold is found to have lodged under boulders of large size.

MINING and milling of gold ore has been done in California, according to official report, for less than 50 cents per ton, at the Dalmatia mine, near Kelsey, El Dorado county. (See Tenth Annual Report of the State Mineralogist, pages 174–175.) Two miners did all the work in the mine under contract, at a cost of 7½ cents per ton. Transportation and milling brought the cost up to about 50 cents per ton.

SUSPENDED earthy slimes may be prevented from entering the zinc precipitation boxes of cyanide plants by placing a filter of cocoanut matting in layers in the head box. The particles of precipitate which may be suspended in the water flowing through the boxes, which are disturbed from time to time through various causes, may be caught on a similar filter placed after the last zinc compartment.

WHERE a crankpin was tightly held by reason of having been shrunk in, the pin was removed, when it became necessary, by drilling a hole through the center of the pin from end to end, tapped each end to fit a ¾-inch pipe thread, and screwing a piece of pipe in the same with cold-water hose attached to one end of the pipe. After heating the crank and pin to a cherry red by means of a portable forge, the water was turned on, cooling the pin, which shrunk sooner than the more massive crank, and the pin was withdrawn by the attached pipe.

INVESTIGATION of the sources of the diamonds found in North Carolina is to be made. Diamonds are found in the glacial drift of Wisconsin and in some of the ancient river channels of California, but the source of any diamonds found in the United States has never as yet been discovered. A species of flexible sandstone, said to accompany the diamonds of Brazil, S. A., is also found in some of California's ancient rivers.

A WATER SUPPLY of fifty gallons per minute is an insufficient quantity to operate an overshot wheel of large diameter, and the power derivable from this quantity of water on a small wheel is not commercially valuable. It would be more economical to employ some form of gas engine if a larger supply of water is not available. Overshot wheels are not advisable with a constant supply of less than 15 cubic feet per second.

IT will pay in almost every case to pump water to a quartz mill, rather than transport the ore a long distance to the water. In California there are several mines where the water is pumped from 1 to 14 miles and raised from 100 to over 500 feet. The cost varies with the size of the plant, etc., but is seldom over 20 cents per ton of ore treated. The water may, in most cases, be settled after passing the mill, and pumped back for reuse.

TOO MUCH CARE cannot be given the locating of a mining claim. The locator should endeavor to comply as fully as possible with the requirements of the law—all this for protective purposes—for if the claim prove to be rich a careless disregard of the legal requirements may result in the loss of the claim to the discoverer, or serious and expensive legal complications. The laws are simple and easily understood, and should be followed to the letter.

GOLD ore which does not show free gold upon panning may still yield a fair percentage of its value to amalgamation. The fact that the gold is extremely fine does not always render the ore refractory nor make it incapable of amalgamation. It will probably be necessary to crush ore of this character, through a fine screen, in order to free the particles of gold. Such ore may also prove amenable to the cyanide process, if there are no base materials present, which prevent successful treatment by that method.

COPPER in solution in the water flowing from copper mines can be precipitated by passing the water through sluice boxes having a low grade and filled with scrap iron, tin scrap, etc., the copper displacing the iron. The tin has no effect on the copper, and small flakes of the tin may sometimes be seen in the precipitates. The acidulated water decomposes the thin sheet of iron which lies between the film of tin on either side of it, and the tin scales off, usually in flakes so small as to be unobserved. Occasionally, where tin cans have been used as a precipitating agent, the gummy substance or varnish with which the can has been covered, causes good sized patches of the tin to adhere, when the tin may be readily seen.

IT is a common feature of large quartz veins to be divided into a series of floors by cracks, which extend from wall to wall, usually at right angles to the dip. The distance between the floors is variable in different veins and also in the same vein. Near the surface these cracks are sometimes several inches wide, the space on the floors or between the blocks being filled or partly filled by granulated quartz, quartz crystals, clay, iron oxide and other minerals, and sometimes also gold. The reason for the separation (particularly noticeable in granite formation) is probably due to the decomposition of the granite, which has resulted in an increase in bulk, causing the vein to be drawn out and the several blocks thus separated.

QUICKSANDS, through which it became necessary to sink, have been hardened by injecting hydraulic cement into the bed of sand. This has been successfully accomplished by driving pipes into the quicksand at varying distances of 4 to 8 feet and attaching a pump to each alternate pipe, leaving the remaining pipes open. When pumping began, a circulation was established between all the pipes of the series. When sufficient sand had been removed, a cement grout was pumped in for some time and the open pipes were capped and the pumping continued, which forced the grout into the sand. The pipes were drawn a foot or more and the operation repeated. The cement sets, causing the ground to become hard enough to be mined out. Flows of water may also be retarded in ditch work or other excavations in wet materials. This scheme can only be operated under favorable conditions.

MUCH of the success of concentrating machines depends upon a proper distribution of the feed at the head of the belt or table. It does not pay to overload a concentrator nor to keep a certain class of the material at an intermediate point, where it neither passes over with the valuable material nor off at the lower end with the tailings. This class of material accumulates to the disadvantage of all the remainder of the pulp being treated. The fact that this middle product does occur proves conclusively the necessity of hydraulic classification before attempting to concentrate on machines of any kind. For the best work the pulp must be first classified, and then the feed and fresh water supply must be regulated and maintained at a stated rate, and the machines must run steadily at a given number of vibrations, for after once having been properly adjusted to given conditions, if these conditions, or any of them change, poor work is the immediate result.

A GOLDFIELD, NEV., MINER has offered the following ingenious theory to account for the rich accumulations of gold found in that district at and near the surface: "The ore occurs on the knolls and not in the depressions, which may be explained by the fact that the ores are more siliceous, and being harder, are better able to resist erosion than the normal rock, which being softer is eroded more rapidly, producing hollows. The soil and superficial rocks of the Goldfield region are impregnated with manganese, sodium chloride, calcium sulphate, fluorite, etc. The decomposition of the sulphides of the veins supplied sulphuric acid which, acting upon the sodium chloride in the presence of the black oxide of manganese, liberated chlorine, and being a solvent of gold, dissolved it, and reprecipitated the metal at favorable places, through the medium of surface waters, thus accounting for the remarkable instances of secondary enrichment found there."

CONTRACTS for shaft sinking, drifting and for other mining work are commonly undertaken by miners, and not infrequently to their advantage. The contractors never put up bonds to guarantee the fulfillment of the contract, for the reason that there are so many unknown conditions and possibilities that he cannot afford to assume the risk. Contracts of this character are not altogether one-sided in their operation. The miner may base his price on hard ground at the beginning of the contract and the ground may become softer or otherwise easier to work, which results in the contractor making more than he anticipated; but if the ground becomes so hard he cannot fulfill his contract without considerable loss, he usually gives up the job. Most contracts stipulate that 25% of the contract price on work completed shall be withheld until the completion of the entire contract; so if the miner throws up his contract he forfeits one-fourth of the amount of money he has earned.

THE selection of a mining method without an opportunity to examine the situation is not an easy matter, but in the case where the vein is described as being 8 feet wide between firm and fairly well-defined walls, with a dip of over 60°, it would seem that the proper method would be the driving of a heading about 15 feet high along the ore shoot, the full width of the vein. This should be substantially timbered with posts and cap sets, and heavy lagging of 6-inch poles laid on the caps. This will bring the floor of the stope within 6 to 7 feet of the back—a good working height for hand or machine drilling. Some shoveling may be saved and lagging protected by running this heading in two sections, the uppermost one several feet in advance; then, if the timbering be kept well up to the lower face, much of the rock blasted from the upper face will fall upon the lagging. Loading chutes should be provided every 30 feet along the length of the stope and unless good air is mechanically provided for the stope a raise should be run to the level above, and in the event of the ore shoot proving to be a long one—200 feet or more—it would be wise to have a raise at either end, and, if in excess of 300 feet, a raise at every 150 feet. When the workings have been arranged as suggested, stoping operations may begin by shooting the rock down upon the lagging, with lightly loaded holes at first, until the poles are protected from heavy blasting. The large rocks must be broken up to pass the chute doors, and only enough ore drawn away to make proper room for the men to work in the stopes without either cramping them for space or allowing the back to get too high for convenient work. A cribbed manhole should be carried up with the ore at one end, both ends, or at intermediate points, according to the length of the stope. The chutes require no cribs, provided no great amount of waste is shot down with the ore. As stoping progresses upward, only about one-third of the ore is drawn off. When approaching the level above the back may be shot down or left intact, according to requirements, and at the discretion of the superintendent. In this system no timber is required except that used in the sill floor sets and in the manways. The ore supports the walls, and as it is eventually drawn off, if any slabs fall or the walls collapse, no particular harm is done. The stope may be entered at any time, and, as the ore settles by reason of being drawn away below, any slabs of wall rock which appear threatening may be removed and broken up, or allowed to remain on the ore. When the accumulated waste of this description reaches the chute it may be rejected and either sent out of the mine, piled up in walls, or allowed to remain in the stopes. In some instances even the timbers may be removed and reused, if still in good condition. In some veins it might be advisable to put up raises every 30 feet along the drift, for a height of 10 feet, placing the chutes directly below the raises. The stope may then be opened out about 10 feet above the back of the gangway, and the work of stoping carried on as described above. This will leave several sections 10 feet thick and the width of the vein to remove after the stope is all mined out, and will save the cost of timbers, framing and placing the same, and also the cost of considerable shoveling at the start.

"Control of Hydraulic Mining Debris in California by the Federal Government."*

Announcement that an address on the above subject would be given by Capt. Wm. W. Harts, U. S. Corps of Engineers, in the Academy of Science building, in San Francisco, Cal., on the evening of Aug. 21, filled the auditorium to hear one of the California Debris Commission give an authentic account of what had been done and what was proposed to do in the great work of such interest to the hydraulic miners of California since the inauguration of the project in 1893.

The lecture was an interesting one and worthy of the source. Seldom is so good an opportunity afforded to learn from a prominent U. S. engineer regarding the history and details of the work in the supervision of which he is engaged, and Capt. Harts' address is a notable contribution to the sum total of knowledge on this important subject.

The first portion of his lecture was devoted to a history of the mining debris problem in California, the situation that gave rise to the creation of a California Debris Commission, and the scope and intent of that body's powers. This was followed by a description of the mining region assigned to the control of the Commission, and estimates of the amount of detritus lodged in the streams, and the duties of the Commission under the federal law. Following this, in speaking of the manner of work done, Capt. Harts furnished considerable further data hitherto unpublished. In the matter of individual dams, he said that various kinds of dams had been tried—those of stone, of earth, brush and rock, log-crib filled with rock, and many others. After twelve years of experience, it has been found that the usual small mine, where impounding dams can be used, will need one of two general types—either log-crib dams or brush dams.

There are special cases, of course, where other kinds of dams are needed; but these two types are most common for the smaller mines, and printed specifications for these dams, with a cut explaining their construction, have been prepared by the Commission.

The log crib is the more common type. It consists of a cob-house crib, with the logs of which it is made notched and bolted together. It is filled with quarried rock and chinked against leakage. This type of dam is seldom built over 40 feet high, this being the limit of safety placed by the Commission for the usual case. These dams are very satisfactory for their purpose when well made. As long as they are kept wet they are practically permanent, and in those locations where the logs rot, due to being dry part of the time, the rock being well bedded in gravel will resist erosion long after the logs have failed to bind the dam together.

The brush dam is less used, as it is permitted usually only when the water flow over the dam is small, or when the river is diverted through a spillway at one end, and only when the slope of the canyon above is slight. These brush dams are not permitted over 20 feet in total height.

In this way the debris from hydraulic mining has been regulated so that very little is added now to the old supply. These restrictive measures have unfortunately been too much to permit the resumption of hydraulic mining on the large scale it formerly was accustomed to; but, on the other hand, they have permitted many mines to operate that otherwise would have to remain idle.

There is now mined nearly a million cubic yards each year which is stored in the canyons and ravines behind debris dams especially constructed for the purpose.

Another side of the Commission's duty is the study of the rivers of the Sacramento and San Joaquin river systems with a view to the preparation of plans for the treatment of these streams and their tributaries, so that the injurious mining detritus may be kept out of the navigable rivers and the streams restored to their former condition of navigability as far as might be needed.

The first step after preventing the operation of mines when debris is not properly impounded was the treatment of the larger tributaries to prevent the enormous quantities now in their beds from reaching the navigable streams.

In 1881 the State of California built a brush dam in the Yuba and one in the Bear river, with a view to impounding debris up to the crest of the dams. They were only a few feet high and were constructed of brush, gravel and sand bags. They were founded on the unstable gravel bed of the river. Neither dam withstood the first high water. Both streams have variable discharges, the Yuba varying from about 500 cubic feet per second in the summer and autumn to about 80,000 to 90,000 cubic feet per second during floods. The Bear river varies from about 10 cubic feet per second during the summer low water to an estimated flood discharge of about 20,000 second feet.

With these flood volumes it is evident that any dam to hold, if built on the treacherous gravel of the river bed, must be of considerable strength.

GENERAL PRINCIPLES OF IMPROVEMENT.—In undertaking the formulation of a plan for these rivers, the engineer officers adopted a general line of work that was believed to be applicable. It consisted of three divisions:

1. Building moderately high dams in the foothills where the rivers emerge into the valleys and where the value of land is not great. These dams being located where the slopes in the river bed are high, were so placed with a view to sorting the heavy material that will stand on high slopes from the fine material that will not, thus storing this heavy material where it will be impounded cheapest.

2. Embankments and basins lower down in the river, forming settling pools, where the slopes are flatter and where practically all of the finer material can be deposited by bringing the flowing water almost, if not entirely, to rest at all except high stages of the river.

3. Training walls in the remainder of the lower river, to confine the flow in selected channels, so that the large quantities of debris now in the river beds, outside these walls, should not be overflowed, and thus could lie undisturbed indefinitely.

After investigating various other plans, it was believed that the application of these principles would hold back all of the debris that could be impounded and would offer the best solution of the problem.

YUBA RIVER.—It was decided to commence with the Yuba river, as this stream has suffered more from mining debris than any other in California, and if the difficulties here could be surmounted, the methods found best adapted for the purpose would likely be more easily applied to the other streams.

After a study of several years and after extended surveys in which numerous borings were made, a plan was adopted by the Commission and submitted to Congress in 1900. The details of this plan were elaborated by Hubert Vischer, assistant engineer, under the direction of the Commission. They have since been modified from time to time as the progress of the work rendered necessary. The estimated cost was $800,000, of which the State of California, under the provisions of the Caminetti Act, agreed to pay one-half. This project was adopted by Congress and funds appropriated therefor.

The project provided for:

1. Barriers across the river just below Smartsville, to prevent the addition of coarse detritus from the upper reaches.

2. A cut at Daguerre point through which to divert the river at high stages, with embankments forming a settling basin for impounding fine material during the remainder of the year.

3. Training walls 2000 feet apart, extending from Daguerre point to the Feather river, to confine the flow to a selected channel.

BARRIERS.—The barriers were to be a system of weirs extending across the river, where the banks are high enough to afford large impounding capacity, the first located a few miles below Smartsville. This first barrier was the only one estimated for in the present project, but it was to be supplemented by others as soon as it was filled, the others to be located and built in the future when necessary.

A dam of brush, rock and gravel was first proposed, with a row of Wakefield sheet piling 20 feet deep to protect the toe. It was found impracticable to drive the sheet piling on account of the coarse and heavy material of the river bed, and this type was therefore abandoned after several hundred feet of it had been placed with much difficulty. This portion built afterward washed out during a flood in the winter of 1903–4.

A modified brush barrier was then tried by the Commission. It was a "cob-house" construction of brush fascines, forming pens 5 feet square, with an elevation of 4 feet above the river bed. These pens were filled with heavy rock. An apron 20 feet wide was made of a mattress of brush fascines fastened together with cables. This dam was destroyed by the first high water. The large amount of drift carried by this freshet broke apart the fascines and the dam soon disintegrated.

The design next tried was much stronger. It was anchored to the river bed with piles, the dam, 6 feet high above the river bed, being comprised of rock fill held in place with concrete blocks weighing about 10 tons, molded in place over the rock fill, and connected together with wire cables imbedded in the concrete. Leakage was checked by timber bulkheads. A broad apron, 20 feet wide with a 6-foot extension, diminished the scour at the toe, that otherwise would have undermined the dam. A sloping upstream face prevented damage from drift.

It is thus seen that most of the weaknesses of the previous dams had been remedied in the new type. This dam has just passed successfully through its first high-water season and is the first to withstand a single freshet in the lower Yuba river.

The dam consists of four rows of piles, the two upper intervals between rows being 10 feet, and the interval between the third and fourth rows being 18 feet.

Piles were 6-feet centers in the uppermost row, 12-feet centers in the two middle rows, and 3-feet centers in the lowest row. Every 12 feet the piles in a tier up and down stream were connected at their upper ends with 1-inch galvanized wire cable. A timber bulkhead 3 inches thick was spiked to the upstream and another to the downstream row of piles, and was carried as deep as the water in the river would permit.

Between the first two rows of piles was placed a fill of rock which was brought up to a subgrade, so that when covered by the concrete blocks, 1½ feet thick, the height of the barrier would be 6 feet above the average level of the river bed. Concrete blocks about 10 feet square and 1½ feet thick were built in place over all this fill, connecting by means of a rollerway with an apron 20 feet wide resting on the river bed below the dam.

The upstream slope was protected with an inclined layer of large rock laid in Portland cement

Brush and Rock Dam on Yuba River, Cal., Later Destroyed by High Water.

Down Stream Face of a Log Crib Dam.

*See illustrations on front page.

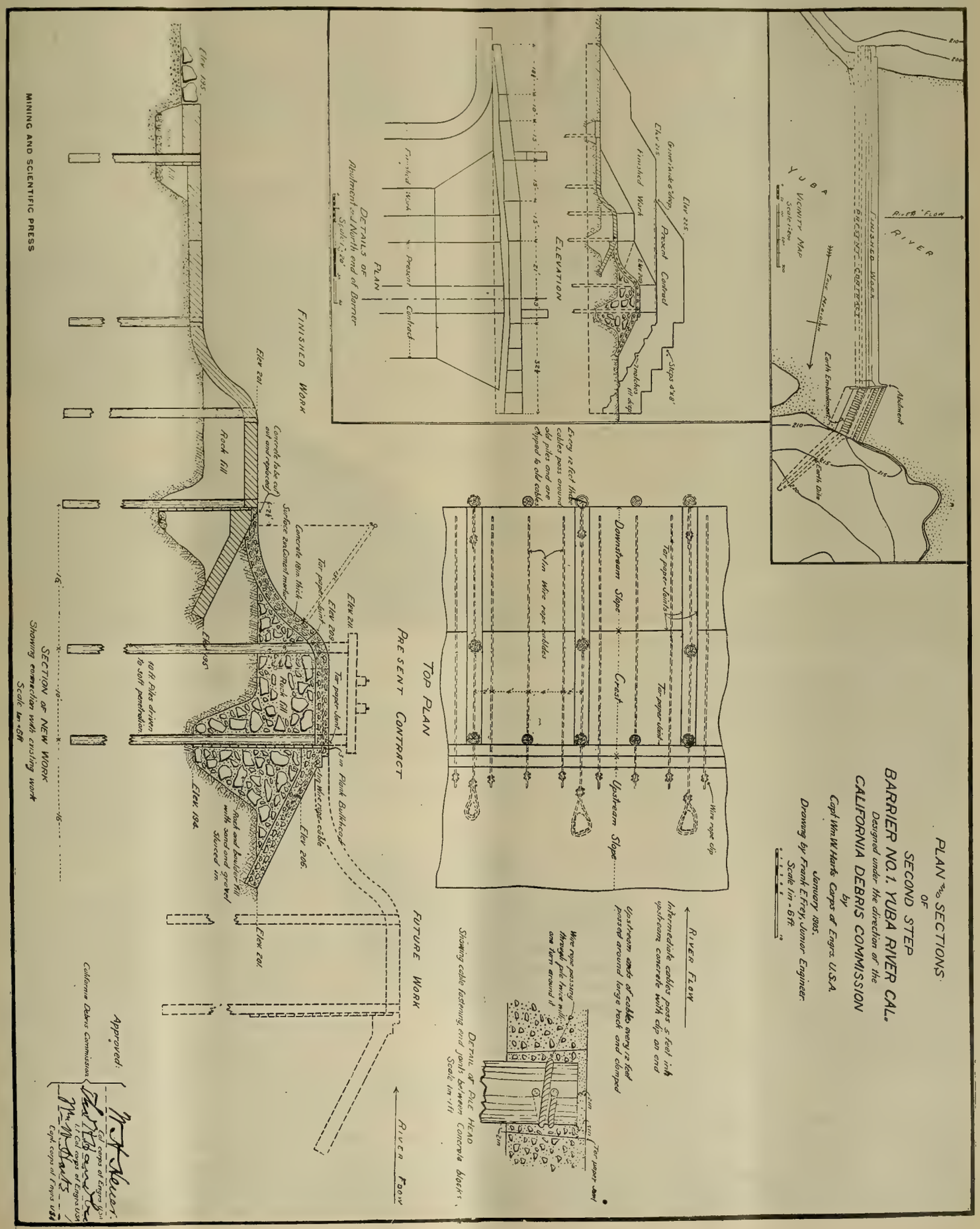
mortar. The concrete slabs of the top surface of the dam and those of the apron were separated from each other by tar-paper joints, and, to prevent dislocation by the river currents, were connected in the direction of the stream flow with 1-inch galvanized wire cables, 3 feet apart, imbedded in the concrete. The cables connecting the piles referred to above were also imbedded in a narrow strip of concrete 18 inches square, which helps bind the heads of the piles together in each tier and separates the large blocks.

Excepting these narrow strips, the concrete slabs rest on the river bottom only and are not supported on the piles. They are jointed so that they are free to move vertically, the cables acting as a hinge.

This, it was designed, would permit the concrete blocks to follow down any considerable scour under the apron, should it occur, and thus prevent any serious damage to the dam due to back-lash.

The weak place in all over-fall dams on poor foundations is, of course, the toe. The rollerway and apron it was hoped would protect the river bed from excessive and dangerous scour. In addition, an extension or lip of masonry 6 feet wide was placed below the apron to carry the water farther away from the toe, and if underscoured it would break up, fall in the hole and offer protection against further action. In addition, for about 600 feet the dam at the south end, where the scour was believed to be strongest, was further protected by large rock or rip-rap placed at random.

The south end of the dam was joined to the bedrock of the river bank, but at the north end a concrete abutment was built, founded on piles, to act as a retaining wall for the earth embankment which was later built to connect the dam with the shore. The north shore is composed of compactly cemented



gravel, through which it was originally planned to have a spillway constructed to carry the river at all stages except flood. During construction the entire river was permitted to pass between this abutment and the north shore before building the embankment, so that the concrete dam could be constructed entire on the dry river bed. When it came time to close this gap through which the river flowed, it was found to be an undertaking far greater than was anticipated, as there were about 1200 to 1300 cubic feet per second flowing around the end of the dam. This flow had to be lifted upwards of 8 feet over the completed structure.

The first pilework placed to close this gap failed with the pressure of water, and through the serious scour in the bottom which took place while trying to close the opening. Later more piles were placed in the opening, and by the liberal use of brush and sand bags the gap was finally closed.

Much assistance was afforded by an auxiliary dam or levee in the river ¼ mile upstream, hastily built to divert the flow over the dam and away from the cut. Over 20,000 sand bags were used in closing this gap, as no rock was available. As soon as closed the gap was filled with an earth embankment. The experience with the north bank near the end of the dam has decided the Commission to change the location of the spillway from the north end to the south bank, where the cut will be in rock.

This spillway will be 400 feet wide on the lip and 4 feet deep, taking a flow of 13,600 second-feet before the dam comes into use, so that the river will be carried around the south end of the dam at all stages except for a short time each year at flood stages. This will make the dam when completed practically permanent and easily maintained.

The first step of the permanent dam having been completed as above described, it is now proposed to build in accordance with the project a similar step 8 feet higher, lying upstream of the present work and connecting with it. Contracts are already let and work has been commenced on this second step.

In the same way it is expected to put a step 8 feet high on the dam each working season. In this way the ultimate height of the dam will be reached by successive steps. This method was found advisable, as the amount of work possible in the river bed during the low-water season is limited and time must be given the river to fill each step with gravel.

The first step, already built, has been filled with gravel to its crest since the first heavy freshet, and gravel as large as pigeons eggs have been rolled over the top of the dam for several months.

It is thus plainly seen that the dam as a whole is a gravel fill dam sluiced into place by the river itself, the downstream slope of which is composed of a layer of concrete blocks having a general inclination of about 1 vertical to 3½ horizontal. The concrete overlies a rock fill held in place by a framework of anchor piles and timber bulkheads.

The first piling were driven by the United States, because it was not believed advisable to contract for this work at first, as the risk was considerable and it was freely predicted by some engineers that no piles could be driven in the Yuba river bed at that place.

This work, however, was carried to completion without notable difficulties, 888 piles being driven with an ordinary land driver equipped with a 20 H. P. Lidgerwood engine and a 3500-pound hammer working in 45-foot gins. The driving was difficult, each pile requiring from 150 to 250 blows. The piles cost from 19 to 23 cents per foot delivered in Marysville, and 10 cents per foot to haul to the site of the work, 17 miles farther. This made each pile cost about $12. The driving cost $5.02 per pile, making the cost of each pile in place about $17. Including experiments with water jet and accidents, the cost was $19.74.

This price was considered high at the time, but the work under the contractor thus far this spring on the second step, it is believed, has exceeded this price. Under contract, the new piling has cost 31½ cents per foot per pile delivered at the site of the work, making each pile cost $12.60. The contract price for driving is $7.60, making each pile under contract cost $20.20 in place.

Portland cement costs $2.785 delivered at the site of the work. Concrete was mixed by hand and was made from gravel and sand taken from the river bed and screened. It was mixed in the proportions of 1 cement, 2 sand, 2 gravel and 4 cobbles passing a 2-inch ring.

The work on the first step, including the abutment, cost as follows, prices including placing:

Excavation, 6,470 cubic yards at 30 cents	$ 1,941 00
Lumber, 61,655 feet, board measure, at $40	2,466 20
Loose brush, 95 cords at $3 50	332 50
Large rock, 2,411.75 tons at $2	4,823 50
Large rock in cement, 1,621.367 cubic yards at $7	11,349 15
Small rock fill, 4,251 tons at $1	4,251 00
Cable, 30,300 linear feet at 18 cents	5,454 00
Concrete, 3,754 2 cubic yards at $7.50	28,156 50
Extra work	1,300 10
Total	$60,073 95

The entire dam, including piles and excluding abutment and embankment, cost in round numbers $78,613, or about $63 per linear foot.

DAGUERRE POINT SECTION.—The plans for the treatment of the intermediate section of the Yuba river involve the construction of high embankments across the river in a V-shape, with the apex upstream, the ends connecting, one with Daguerre point on the north, and the other with a high knoll on the south bank.

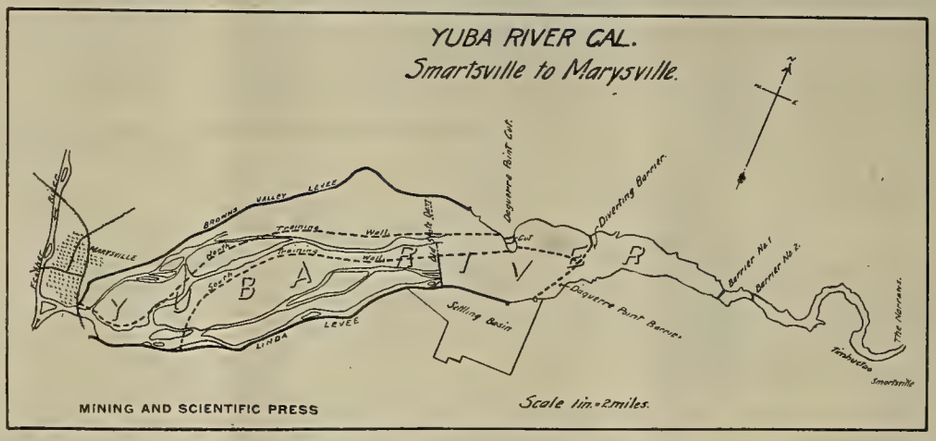
A diverting barrier connects the apex of the V with the north shore, diverting to the south all water below the elevation of its crest. Through Daguerre point is being cut a channel 600 feet wide and 25 feet deep, through which all the river flow at high stages will pass.

On the south bank, regulating works will admit all the water diverted by the diverting barrier below a limit of about 6000 to 7000 second feet, passing it into a natural depression of about 2 square miles and lying adjacent to the river on the south. These works will exclude all flow above what is considered safe, compelling the excess to pass to the north over the diverting barrier and through the cut.

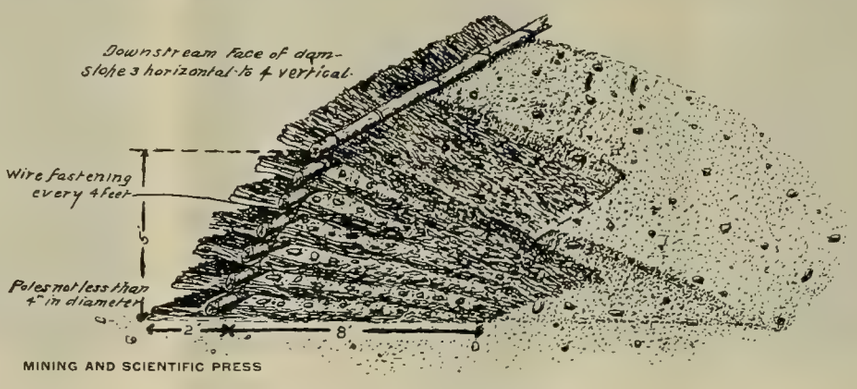
This plan is simply taking advantage of the natural regimen of the river.

All rivers have their sections of active erosion, usually where slopes and velocities are highest, their sections of transportation where slopes and velocities are sufficient to carry sediment but not to scour, sections of sedimentation where the reduced velocities permit the sediment to fall and form deposits, and the section of discharge.

The construction of the embankments and the use of a large settling basin only increase the natural area of the section of sedimentation. The river is passed into an area where the velocities are checked, although not entirely overcome, so that practically all their load of sediment is dropped. The water passing back into the river at the lower end of the basin is practically clear. At stages of the river occurring for a short time only each year, where the flow of water through the settling basin would be more than could be settled, the regulating devices will exclude the excess, causing it to pass into the cut. This will happen only in such high stages that the velocities are thought to be sufficient to carry whatever fine sediment is in suspension into the Feather and Sacramento rivers, which, being in flood at the same time, will carry the sediment into the tidal currents of the bay and thence into the ocean. The solution of the extreme high water part of the problem is not thoroughly satisfactory, in view of the fact that adequate levees are not yet built on the Sacramento to control its flow; but as the periods of such high water are short, the damage, if any should result, will be limited and will vanish when the Sacramento is regulated—a vast problem now receiving attention.



Sketch Map of Yuba River Near Marysville.



Method of Constructing Brush Restraining Dam.

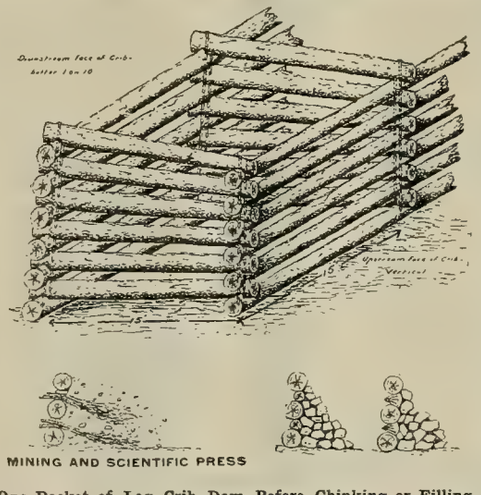
Work in the vicinity of Daguerre Point has been in progress for considerably over a year. Of something over 700,000 cubic yards excavation, about 504,000 cubic yards have already been removed.

A steam shovel having a 1½ cubic yard dipper is used, the excavated material being removed by two trains of about ten cars each to the dump at the north side of the entrance. An average of 30,000 cubic yards per month is required under the contract, which should be completed by the close of the calendar year. The contract price of excavation is 23½ cents per cubic yard of earth and 90 cents per cubic yard of rock removed. The total cost of this cut will be something over $160,000.

It was originally intended that the United States should build the embankments across this part of the river; but before operations could be begun it was found that a gold dredging company had secured extensive mining rights in the vicinity that promised to conflict decidedly with the plans of the Government. It was also learned that the company, in the exercise of its rights, proposed to dredge for gold in the river bed just where the original settling basin had been located. After considerable controversy, an amicable agreement was reached by which the Commission was enabled to obtain a larger settling basin on the south side of the river in exchange for the first adopted location; certain deeds to property were secured which were essential to the project, and the company also agreed to build the embankments necessary free of cost to the United States and give them back their originally located settling basin when it had been mined.

These terms were distinctly advantageous to the United States and made a considerable saving in the cost of the work.

Under this agreement about 2000 linear feet of embankment, about 30 feet high and about 300 feet wide on the base, have already been built near the apex of the V. These embankments are made while mining by stacking the dredged material in a mound



One Pocket of Log Crib Dam Before Chinking or Filling.

behind the dredger as it digs ahead through the river bed.

It is expected to have the cut through Daguerre Point completed by the end of 1905 and the embankment connecting Daguerre Point with the south shore by the end of 1906.

TRAINING WALLS.—In the section of the river between Daguerre Point and Marysville the project calls for training walls to confine the channel to one location. Whether these walls shall be high dikes or levees throughout to positively control the river even at high water, or whether lower and partially permeable dikes, partly built of living brush and thus to act only as guiding walls, shall be adopted, has not been fully decided for the lower sections. The result of the first high sections now being built near Daguerre Point will likely determine this question when their action at high water is learned.

Already considerable has been accomplished beside obtaining rights of way from the owners. Securing these rights was a first consideration and has been exceptionally hard in some places on account of the gold dredging fever, which has made each owner believe that he has a valuable mining property. The necessary rights have, however, been all secured, with some minor exceptions.

In addition, agreements have been made with two gold dredging companies to build free of cost to the United States the south training wall from Daguerre Point west for a total length of about 2 miles, and dredgers are now being built for this work as an incidental to their gold dredging operations.

Contract has been made for the north wall along a parallel line for a total length of about 2 miles. This work will be commenced this summer and completed within a year by scraping. The contract price is 12.4 cents per cubic yard in place for about 200,000 cubic yards. This wall, with the south training wall, to be built without cost, will control the floods of the Yuba river for their length of 2 miles, confining the river to the 2000-foot space between the walls. They will be 11 feet or over in height and will not be overtopped.

It is, of course, too soon to prophesy what success will attend this work; but the encouraging start made and the good results obtained as far as work has proceeded are certainly encouraging.

BEAR RIVER.—As stated before, the Yuba river was the first to be studied and the first to be taken up for treatment. The Commission are now planning to take up the work on Bear river, and a survey is authorized and is now being arranged on which to base plans for the future improvement of this stream.

Should the Bear river work be approved by Congress and by the State of California, and funds provided, the work will be extended to the American river and other sediment-bearing streams until the entire problem is solved.

Captain Harts illustrated his lecture by photographs projected on a large screen in front of his audience, graphically portraying the salient points of his discourse. The accompanying illustrations and those on the front page aid in furnishing an intelligent understanding of the present phase of this great work. For opportunity to use them the MINING AND SCIENTIFIC PRESS takes pleasure in acknowledging the courtesy of Wm. M. Harts, Capt. Corps of Engineers, U. S. A., and Mr. Otto Von Geldern, vice-president Academy of Sciences, in furnishing the photographs from which they were engraved.

Spitting and Snuffing of Fuses.

In view of the increasing number of fatal explosions in mines at Bendigo, Victoria, the relative merits of the methods of "spitting" and "snuffing" of holes have been discussed at some length and the Mining Managers' Association have seriously considered the matter, says the Australian Mining Standard. The practice in vogue is to charge several holes at one time, and either "spit" or "snuff" the fuse. The former system is to merely ignite the ends of the fuse, while "snuffing" consists of placing a small piece of lighted candle, called a "snuff," under the fuse, thus requiring the outer covering of the fuse to be burned through before the powder catches. In coal mining this is called "smift" or "snift," and consists of a bit of touch paper, touch wood, etc., attached by a bit of clay or grease to the outside end of the train of "gunpowder" when blasting. It appears that six fatal accidents have occurred in the Bendigo district within the past five years from "missed" holes. At the recent inquest on the bodies of the miners who were killed at the Virginia mine, Bendigo, Mr. Abrahams, Inspector of Mines, made strong objections to the practice of "spitting" holes. The representatives of the A. M. A. held different views on the methods of firing. Miners of forty years' experience contended that "snuffing" was the only safe way; others of less experience maintained that "where a man could get away easily 'spitting' was equally as safe as 'snuffing.'" Eventually, however, the following recommendations were adopted: "(1) That the safest method of firing is by using snuffs to fire all holes; (2) that four holes be the maximum amount fired, and not more than three holes when they are dependent one upon another in any one stope or place; (3) that not less than 6 inches lead of fuse shall be given to each hole fired; (4) that these recommendations be forwarded to the Minister of Mines, and also to the Mining Managers' Association." W. Curtis took exception to these proposals, and said that, in view of the fact that the fuse used in the Bendigo mines was about the best in the world, a far greater number of holes than that recommended could be safely fired. At the meeting of the Mining Managers' Association, J. Veale said that he had found the practice of "spitting" holes preferable to "snuffing." Mr. Rodgers said that he had frequently reprimanded miners for firing too many holes at one time, and they had replied that they were saving time. The Association decided to take no action in the matter. It is generally recognized that most of the accidents have been due to the carelessness of the miners themselves, for they have been known to carry pieces of dynamite about in their waistcoat pockets down below. Only last week a tributor at Bendigo had his house blown to pieces through using it as a magazine, there being twenty sticks of nitro powder, dynamite caps and fuse stored in a box in one of the rooms. Referring to the risks which miners accept, W. Abrahams says, in his annual report for 1904: "In the three fatal accidents, two men were killed while boring into the bottom of old holes with rock drills. This shows how careless miners are; in either case there was no necessity to bore into the old holes, and until miners exercise more care there will be accidents. Another man lost his life using an old rope, absolutely rotten, for a swing stage to repair a small alluvial shaft. These lives were carelessly thrown away."

International Atomic Weights.

The following from the Journal of the London Chemical Society is the list of atomic weights as issued by the International Committee with their report for 1905:

		O=16	H=1
Aluminum	Al	27.1	26.9
Antimony	Sb	120.2	119.3
Argon	A	39.9	39.6
Arsenic	As	75	74.4
Barium	Ba	137.4	136.4
Bismuth	Bi	208.5	206.9
Boron	B	11	19.9
Bromine	Br	79.96	79.36
Cadmium	Cd	112.4	111.6
Cæsium	Cs	132.9	131.9
Calcium	Ca	40.1	39.7
Carbon	C	12	11.91
Cerium	Ce	140.25	139.2
Chlorine	Cl	35.45	35.18
Chromium	Cr	52.1	51.7
Cobalt	Co	59	58.55
Columbium	Cb	94	93.3
Copper	Cu	63.6	63.1
Erbium	Er	166	164.7
Fluorine	F	19	18.9
Gadolinium	Gd	156	154.8
Gallium	Ga	70	69.5
Germanium	Ge	72.5	72
Glucinum	Gl	9.1	9.03
Gold	Au	197.2	195.7
Helium	He	4	4
Hydrogen	H	1.008	1
Indium	In	115	114.1
Iodine	I	126.97	126.01
Iridium	Ir	193	191.5
Iron	Fe	55.9	55.5
Krypton	Kr	81.8	81.2
Lanthanum	La	138.9	137.9
Lead	Pb	206.9	205.35
Lithium	Li	7 03	6.98
Magnesium	Mg	24.36	24 18
Manganese	Mn	55	54 6
Mercury	Hg	200	198.5
Molybdenum	Mo	96	95.3
Neodymium	Nd	143.6	142.5
Neon	Ne	20	19.9
Nickel	Ni	58.7	58.3
Nitrogen	N	14.04	13.93
Osmium	Os	191	189.6
Oxygen	O	16	15.88
Palladium	Pd	106.5	105.7
Phosphorus	P	31	30.77
Platinum	Pt	194.8	193.3
Potassium	K	39.15	38.85
Praseodymium	Pr	140.5	139.4
Radium	Rd	225	223.3
Rhodium	Rh	103	102.2
Rubidium	Rb	85.5	84.9
Ruthenium	Ru	101.7	100.9
Samarium	Sm	150.3	149.2
Scandium	Sc	44.1	43.8
Selenium	Se	79.2	78.6
Silicon	Si	28 4	28.2
Silver	Ag	107.93	107.11
Sodium	Na	23.05	22.88
Strontium	Sr	87.6	86.94
Sulphur	S	32.06	31.82
Tantalum	Ta	183	181.6
Tellurium	Te	127.6	126.6
Terbium	Tb	160	158.8
Thallium	Tl	204 1	202.6
Thorium	Th	232.5	230.8
Thulium	Tm	171	169.7
Tin	Sn	119	118.1
Titanium	Ti	48 1	47.7
Tungsten	W	184	182.6
Uranium	U	238.5	236.7
Vanadium	V	51.2	50.8
Xenon	Xe	128	127
Ytterbium	Yb	173	171.7
Yttrium	Yt	89	88.3
Zinc	Zn	65.4	64.9
Zirconium	Zr	90.6	89.9

Responsibilities of Australian Mine Managers.

Written for the MINING AND SCIENTIFIC PRESS by R. B. LAMB.

The law regulating mining operations in Australia is very strict in all States of the Commonwealth. Although the Eastern States do not labor under the stringent legal disabilities of the West, the laws in relation to the operation of underground workings and surface equipment are almost uniform throughout the continent. Inspectors of mines are appointed by examination, the successful applicant holding the position for life, if he strictly carries out his official duties. His power is fixed by the Mines Regulation Act, and he is directly responsible to the Minister of Mines for the time being, to whom he reports. He makes regular visits to all mines throughout his district, and during his stay on the mine he practically is the general manager of the mine, any workman or employe being compelled to answer his questions or carry out his directions. His jurisdiction underground is very great. Stopes, etc., which he considers unsafe must be secured. He may direct that all mining elsewhere in that mine shall cease until the part has been secured to his satisfaction. Any order he may give in regard to hand rails, covers over winzes, etc., must be promptly carried out. Should the manager fail to comply, the inspector prosecutes before the warden's court to enforce his directions. In the matter of explosives the law is very rigid. Should the inspector see explosives in a stope, or in or around a mine, outside of a magazine, not in the regulation canister, the manager is liable to be heavily fined. The surface equipment must be rendered safe as the law directs. Belts, etc., must have hand rails. Should the manager fail to provide these things, the plant would be closed down until it is accomplished. Boilers are inspected twice yearly, and may be condemned if considered unsafe, or the steam pressure lowered. Should a manager work a condemned boiler, he is heavily fined and the plant may be closed down. Should a fatal accident happen from a condemned boiler, the manager is guilty of manslaughter. In Western Australia, in addition to the inspector of mines, inspectors of boilers and machinery are appointed, whose duties consist of testing and examining all boilers and machinery, and the same cannot be started without their certificate. In no part of Australia can any plant be started to operate until passed by the inspector.

Cages and wire ropes are regularly tested by the inspector and may be condemned by him when considered unsafe, and they cannot be worked when condemned.

In Western Australia wire ropes are not allowed to become covered with thick grease; every strand in the rope must be visible to the eye. The inspector can direct the testing of ropes or cages at any time, and the manager in all cases is bound to carry out his orders. The disinfection and sanitation of the mine are thoroughly looked into by him, and the manager must see to it that any recommendations or orders are promptly carried out as he directs. Certificated men only can be employed on hoists, boilers and stationary engines. The manager must see their certificates. Should a fatal accident happen with an uncertificated man at the hoist, the manager is guilty of manslaughter. Work at mines is not permitted on Sundays, except in special instances, such as on pumps, necessary repairs, etc., to do which a permit from the inspector is necessary. The Australian law is uniformly strict in the matter of accidents, either underground or on the surface.

Should an accident happen, fatal or otherwise, no matter how trivial, the inspector must be immediately notified. In case of fatal accident, the place where it occurred must not on any account be disturbed. If underground, no work must be done until he orders it. If on the plant, it must remain stationary until after his examination The inquiry into serious or fatal accidents is very rigid, and in Western Australia a fatal accident renders the manager guilty of manslaughter. In east Australia, if any part of the Mines Act has not been carried out, a fatal accident would mean that the manager is guilty of manslaughter. In all cases of fatal accidents the manager must appear before a jury and must, if any negligence has been shown, stand trial for manslaughter. He may further be sued under statute law by relatives of the injured or dead person for damages, which, if negligence has been shown, will be awarded. In cases of serious accidents the manager, if regulations have not been carried out, will be heavily fined and may be further sued by the injured man for damages.

In all cases of accident the manager must promptly secure medical attendance and relief for the sufferers, regardless of cost.

Should any workman or others report to the inspector any non-observance of the mining regulation on the part of the mine manager, the inspector must immediately examine the same in company with the manager.

Two or more miners, if they consider the mine unsafe to work in, may report the same to the man-

ager, who is bound to notify the inspector and have him examine the same.

Should any miner report an unsafe place to the manager, and an accident occur, the manager is guilty of an offense against the Act and punished accordingly.

In Western Australia compulsory arbitration is in force, and both workman and manager are bound by its awards. The workmen cannot strike, or they commit an offense against the Act and are punished. Neither can the manager go outside the award, or he commits an offense against the Act. Australian mine managers, therefore, are compelled to operate their mines in accordance with the mining Act, and any failure to do so renders them liable to severe penalties.

The Ventilation of Mines.

NUMBER III.

MEANS SUGGESTED FOR IMPROVEMENT OF VENTILATION.—In this State the main problem is the bettering of the ventilation of the metalliferous mines, especially those which are large and deep. As regards the collieries we need add very little to what has been said in a preceding section, the need being for the application of well-known practices rather than for any new or less usual expedients. The provision of better designed and more powerful fans, and more attention to keeping stoppings, air doors, and brattices in good order, and to carrying the brattices well up to the faces of the bords, are all that is necessary to make the ventilation as nearly perfect as possible, except that in long headings, slants, and inclines driven for exploration purposes ahead of the main work, the same devices must be used as in long drives and crosscuts in metalliferous mines, in order to carry air to the working faces. The blasting being as a rule much lighter than in our gold mines, it is usually possible in the collieries to thoroughly ventilate such workings by the use of bratticing; in other cases ventilating pipes may be preferable. In some parts of the Collie mines also, the ventilation would be much improved by greater attention to draining the traveling ways, so as to prevent them from becoming exceedingly muddy and filthy, as at present, as the trampled dirt, especially on the horse roads, is often very foul-smelling.

In the metalliferous mines the practicable means of improving the ventilation may be divided into—(1) Connections between workings to bring about circulation of the air; (2) Appliances for systematizing and regulating the air currents; and (3) Devices for mechanically ventilating the whole or any portions of the mines.

Connections Between Workings: The best means of securing thorough natural ventilation is without doubt the use of two (or more) separate shafts, one of which is an upcast and the other a downcast. When the workings of adjoining mines can be connected, the same effect may be secured, the air passing down one shaft and up the other. In the shallower portions of mines it is usual for at least two shafts to exist, but as they get deeper the workings are apt to become concentrated more and more round a single shaft. The sinking of a second ventilating shaft of equal depth to the main working shaft would often be so expensive as to be quite out of the question, and in deep mines it is only when there is a very large quantity of mineral to be raised and the workings are very extensive that it is possible to provide two main shafts. The adoption of the colliery rule that all mines must have two shafts is, therefore, quite impracticable in a great many metalliferous mines. It is generally quite practicable, however, to have a second connection from the lowest workings to the surface through winzes and worked-out ground, and where these openings are of sufficient area and are kept sufficiently clear to constitute a good air passage, they have the same effect as a second shaft in bringing about good ventilation. Care should be taken in all mines that such air passages are made of sufficient size in the first place, and are kept open constantly afterwards. It very often happens in this State, as elsewhere, that they are much too small, and also that they are used as ore and mullock passes, so often becoming blocked. In every important mine there should be at least one air way, in addition to the shaft, of large size, maintained quite unobstructed from top to bottom of the workings, and kept for ventilation and traveling purposes only. In sections of mines where the ventilation is defective, care should similarly be taken to have one or several clear air passages from level to level. The system of using "rearings" when filling stopes with mullock, so as to leave a space between the filling and the unbroken reef, is very commendable from the ventilation point of view, besides being an excellent practice, for other well-known reasons.

The construction of winzes to enable the ground to be blocked out, and the formation of ore passes as the stoping proceeds, usually cause the ventilation to improve very much as the mines become better opened up, but during the development period, before the connections are completed, it may be very defective. To remedy this by connecting at the earliest possible moment is, then, the only practicable course if natural ventilation is relied on entirely, and in the meanwhile the men may suffer considerably. To minimize this, the levels should not be too far apart, and connections between them should be as frequent as the nature of the mine permits. This is readily enough attained when the levels are in good ore, but when they are passing through poor or valueless portions of the lodes it is impracticable to insist on frequent connections. The distance between levels is governed by several considerations, such as size, value, and underlay of the ore bodies, their length and relative position, and the hardness of the rock to be driven through. It may be most judicious and economical to drive the levels 60, 80, or 100 feet apart vertically, or it might pay best to have them 150, 200, or even 250 feet apart. So also in one case the levels might be connected by winzes or rises every 100 feet apart, while in another, owing to small size of the lode, or poorness of the ore, it might be necessary to have them a long distance from one another. It is therefore impossible to lay down any hard and fast rules regulating the permissible distance apart of levels and winzes, and great discretion must be allowed to mine owners in deciding what they had best do. In some cases it may be necessary to carry down a main shaft several hundred feet before again opening out, in order to pass through an unprofitable zone in the lode, and the question of connections then becomes a very serious one. It may then be better to install some mechanical means of ventilating the lower workings, instead of attempting to maintain natural ventilation. We are of opinion, however, that even in these extreme cases, if the ore developments are at all extensive and valuable, it will usually be economical to make a winze to secure another air way independent of the main shaft. Besides being advantageous for ventilation purposes, a connection separate from the shaft, which can be used as a traveling way, is a great safeguard for the workmen in the not impossible event of the main shaft being wrecked by explosion, accident, or fire. The sinking of winzes is, of course, also a well recognized means of prospecting the ground, and valuable from that point of view. In order to have the connections available at the earliest possible date, we would recommend that the sinking of winzes should, whenever practicable, be carried out simultaneously with the sinking of the main shaft, and the driving therefrom, so that the drive may connect early with the bottom of the winze.

The ventilation of deep mines from a single timber-lined shaft is attended with many difficulties, it being nearly impossible to line the compartment so closely as to prevent leakage from the downcast into the upcast one. At the chambers where the levels join the shaft, also, it is very difficult to prevent short circuiting of the air. It is obvious that unless the downcast current is led into the level and the upcast one out of it quite separately from one another, no considerable circulation can be relied upon. By putting a door on one or other compartment of the shaft and leading the air from or into it by a large box under or over the plat, which in turn communicates with an air way formed in the level by bratticing or boxing, it is possible to keep the ingoing and returning air currents separate from one another, but the method is rather cumbrous, the air boxes are difficult to maintain free from leakages, and, if the door is placed on one of the winding compartments, the constant opening and shutting of it when using the cage interferes very much with the air currents. It is best to have the winding compartments both upcasts or both downcasts, and to make the pump or ladder shaft the other air way, as a door on it need rarely be opened; but the state of wetness or dryness of each compartment often has a great deal to do with its being an upcast or a downcast, and without the aid of an artificially produced draught it is frequently not possible to insure that the air will travel in the direction it is wanted to go. The pump shaft may be closed at the top, only leaving room for the rods to work through the cover, and connected with a tower or stack on surface of height sufficient to cause a constant draught. Sometimes a fire is used in the bottom of a stack to increase its natural draught. An exhaust fan at surface would obviously be an even better solution of the problem.

When the pump shaft is used as a downcast and the winding compartments as the upcast, a convenient way of leading the air into each level is by the old and well known method of a deep covered drain under the plat and floor of the level, by which the intake air may be carried right up to the ends of the drives. These air sollars, to be effective, must not be too small, and the method involves a good deal of expense in extra excavation and in the close planking required to cover the drains. They are, however, much less liable to be destroyed than boxes along the sides of the drives or sollars along the roof. Many of our witnesses mentioned the floor sollar system with approval, as having been successfully used elsewhere, especially in Victoria, but we did not see an instance of its use in any of the mines visited. The system of taking out leading stopes along the backs of the levels, and at the same time timbering the levels so as to divide the air way, was also very properly regarded as commendable in cases where circumstances rendered it applicable, the air travelling in along the level and back through the stope. In all the cases examined by us, however, where one shaft was the only entrance and exit for the air going into a level, no trouble was taken to separate the currents, and the circulation was confined to an almost imperceptible flow of the cooler air inwards along the floor, and a corresponding return current along the back of the level. The ventilation was generally poor in consequence, and the air from the rock drills was greatly relied on to keep the faces in a workable condition, and to blow out the smoke. Haste should always, therefore, be made to obtain connection with higher levels by winze sinking and rising, which, when completed, furnishes a separate air way to the surface, and does away with the need for having both ingoing and outgoing air passing in opposite directions through the same shaft or drive. Ventilation from a single shaft alone is, therefore, rarely expected to be more than temporary. An instance of somewhat extensive workings was, however, seen in Bayley's mine at Coolgardie, where there is no opening, except the main shaft, between the 600 and 800 foot levels. The three lowest levels are connected by winzes, but no attempt was made at the highest of the three to confine the return air to the upcast compartment of the shaft, and there was nothing to prevent it going down the downcast shaft again back into the workings. The generally bad state of the air in these levels, disclosed by Mr. Mann's analyses, and very appreciable to visitors by a sensation of great heat and stuffiness, was doubtless due to the same air being circulated over and over again. In this instance it seemed to us easily possible to allow only the downcast air from surface to go into the bottom level, to cut off its return to the shaft at the next higher one so as to compel it to go up to the next one, and to lead the whole of the return air into the upcast by the use of a fairly simple system of doors.

The question of connections between different mines to aid the ventilation is one that has a good many aspects. There is no doubt that they bring about a great improvement in the mine which happens to be the downcast, and often also in the one which is the upcast, but there are cases where the latter may be detrimentally affected by receiving the smoke and vitiated air from the first. A mine which is itself well ventilated may reasonably object to becoming the upcast for its neighbor. It is therefore a question how far it is fair in such a case to force on a mine, which does not desire it, a connection which will benefit only its neighbor.

Cases were mentioned to us by witnesses who had been at Charters Towers of men in some of the upcast mines being much incommoded by the smoke from mines below them. There are also instances at Kalgoorlie, and more than once the connections have been closed by the mines who were receiving their neighbor's smoke. There are now a great many of the principal mines at Kalgoorlie connected one with another, and the general result has been undoubtedly a great benefit in the ventilation on the whole, but it is unquestionable that there have been occasional cases of hardship inflicted thereby. The benefits so far outweigh the disadvantages, however, that we are of opinion that connection should be permitted whenever a reasonable case is made out for it, and so long as the neighboring mine cannot show strong grounds for objecting. In case of such objection the mine benefited might reasonably be required to go to the expense of diverting its fumes through the neighbor's workings so as to keep them away from the latter's men. This could often be done by leading them through rises and the ends of stoped ground so that the ventilation of the working faces would not be interfered with. When a boundary between two owners crosses a payable lode a winze or pass on the intersection, made at the joint expense of both, would be one of the best solutions of not only ventilation difficulties, but some others also which do not concern the present question. The decision as to when connection between mines may be made compulsory, in the event of amicable arrangement between the owners being impossible, and as to the terms on which it may be made, can hardly be the subject of fixed regulations, the circumstances of each case demanding separate inquiry and adjudication. An independent board to consider and settle such disputes seems to us the best solution of the problem. The guiding principle should be, according to the theory of mine tenure in this state, that, the mines being the property of the Crown, it may demand that the lessees work in such a way as will be for the general advantage of the public estate, and consequently may insist on the connections being made if the mining industry in the district is thereby benefited. At the same time the recipient of immediate benefit should do the utmost possible to protect his neighbor from any evil consequences of the connection, and compensate him for actual damage.

(TO BE CONTINUED.)

IN mine examination the expert is constantly devising means for the detection of salting his samples, should this have been done, and many and ingenious are the ways by which he attempts to determine this important point, but it should always be remembered that it is even of greater importance to prevent being salted. This is far more difficult than the detection of the fraud after it has been accomplished. There are several reliable methods by means of which salting can be detected, but to absolutely prevent it requires constant vigilance at every step in the process.

Cyaniding Silver-Gold Ores of the Palmarejo Mine, Chihuahua, Mexico.*

NUMBER VI.

Written by T. H. OXNAM.

Each agitation vat was originally provided with a 6-inch discharge opening at the center of the bottom casting. This opening was bushed down to 4 inches and was provided with a nipple and a straightway valve. The first few vats were discharged from the bottom by this means, but a great deal of trouble was experienced, due to the fact that though all the slimes entering the agitation vats were passed through a grizzly having 1.25-inch openings, the bottom valve would frequently become choked with small rocks and other solid material which seemed to become unavoidably mixed in with the first slime treated. This bottom discharge was therefore discontinued and a hole was bored in the bottom staves, about 10 inches from the bottom casting, and a 3.5-inch iron service cock was secured to the vat by means of a short nipple and iron flanges. The vats are discharged through this valve into a wooden launder which conveys the material to the corresponding decantation vat. This launder is provided with rows of 6-inch wire nails, which serve to remove any small pebbles or other foreign matter.

The four decantation vats, made of 3-inch redwood throughout, are of the same dimensions as the agitation vats, with the exception that they are provided with conical bottoms, slanting at 20°. Each one is connected with an ordinary 3-inch centrifugal pump. Fig. 7 shows in detail the connection of the pump

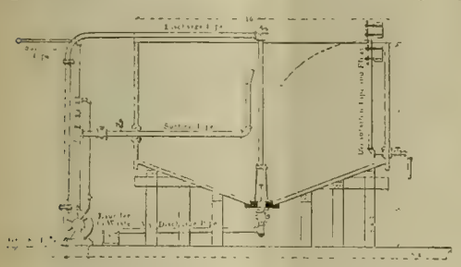


Fig. 7.—Decantation Vat and Pump Connections.

with the vat, which is practically identical with that of the agitation vats and pumps. The vat is discharged through a 3.5-inch bottom discharge vat and pipe into the residue launder, from which the discharged material flows to the river. Removal of the clear solution is effected by means of a 2-inch decantation pipe and float. This pipe enters the side of the vat, about 6 inches above the bottom staves, and is provided with two loosely threaded elbows, which permit of the free raising and lowering of the portion within the vat. The float proper is made of two ordinary 5 gallon oil cans, soldered water tight and painted with paraffine paint. The rate of decantation is controlled by means of a 2-inch valve just outside of the vat.

It frequently happens that the solution drawn from the decantation vats is not perfectly clear and two filter boxes are provided (see Figs. 4 and 5) for the, at least part, clarification of such solution before it enters the solution tanks at the head of the zinc boxes. Each compartment of these filter boxes is provided with a discharge valve, by means of which the sediment deposited from the solution can be washed into a discharge launder and run to waste. In practice, however, it is found that these boxes are not sufficiently large to carry all the solution and, therefore, that portion coming from two of the decantation vats is run directly to the solution tanks.

The solution tanks at the head of the zinc boxes are two in number—one being used for the weak and the other for the strong solution. They are made of 2-inch redwood throughout and are each 11 feet 8 inches in diameter and 7 feet 7 inches deep, inside measurements, having a capacity of 25 tons. Each solution tank is provided with a 2-inch floating hose, by means of which the clearest solution in the tanks is always supplied to the zinc boxes. A 3-inch opening in the bottom of each of these solution tanks provided with a valve permits of the periodic discharge of the accumulated settled slimes into a waste launder.

Fig. 8 shows the timber foundations supporting the decantation vats, the conical bottoms resting on the three beveled rings shown. The supports for the agitation vats are built in the same manner, the supporting rings, however, being placed to line at 45° instead of at 20°. Fig. 9 shows the decantation vats in course of erection.

There are four sets of zinc boxes, each set being composed of six round individual boxes or compartments, each compartment being 28 inches in diameter and 2 feet deep, and having an available zinc capacity of approximately 5 cubic feet. One of the boxes is used solely for strong solution and two for weak solution, the fourth being so connected up that either weak or strong solution may be run through it. The solution leaving the zinc boxes passes to three sump tanks, made of 2-inch redwood throughout, each 11 feet 8 inches in diameter and 9 feet 7 inches deep, inside measurements, and of a capacity of 32 tons of solution. Two of these tanks are connected together and serve as a weak solution sump, the other being used for the strong solution.

Fig. 10 gives a good view of the plant shortly before its completion and shows its general arrangement. Fig. 11 gives a nearer view of three of the agitation vats and shows the tops of two of the decantation vats. The 4-inch centrifugal pump connected with No. 1 agitation vat is seen partially connected up. Protruding from the top of the decantation vat, a little below the center of the picture, is seen the end of one of the 2-inch decantation pipes.

METHOD OF TREATMENT.—The accumulated slimes, after having been allowed to dry in the slime pits as much as practicable, are conveyed to the agitation vats in ordinary half-ton ore cars by means of the small, friction-geared hoist already mentioned. Each agitation vat is provided with an iron grizzly, measuring 3 feet 3 inches by 9 feet, and having 1.25-inch openings, which is suspended over the vat, to one side of the center. The content of the car is dumped onto this grizzly and the portion that does not pass through of its own weight is trampled, or otherwise forced through, by one or two boys. For some time the material treated averaged from 20% to 25% of moisture, and in this condition was rather lumpy and extremely cohesive. During this period the agitation was very unsatisfactory and the percentage of extraction was consequently lower. A great deal of difficulty was experienced in discharging the vats, as the unagitated portion of the charge would remain in the pointed bottom of the vat as a tough, putty-like mass, after all the liquid portion had been discharged, and could only be washed out by means of a stream of solution or water under pressure. In such cases the most effective procedure was to attach a 2-inch hose to one of the valves on the solution line and sluice the material out under pressure furnished by the pump, into the launder leading to the corresponding decantation vat. The experience so far seems to have demonstrated that the best condition of the material, in order to obtain the most satisfactory results under the present practice, is to have the major portion of it, when dumped on the grizzly, run through of its own weight. In this state the slimes will usually carry from 30% to 35% of moisture. It is desirable that the percentage of moisture contained in the slimes when charged shall be as low as possible, compatible with satisfactory agitation, since it is obvious that the greater the percentage of moisture contained in the slimes the greater will be the mechanical consumption of cyanide resulting from the loss of cyanide present in the solution contained in the pulp as finally discharged, when the treatment is finished. It is true that a certain quantity of water must be added to counterbalance the loss of solution due to the fact that the discharged pulp carries a higher percentage of moisture than the slimes charged. It is true, however, that any addition of water that may thus be rendered necessary is most advantageously added to the charge in the form of a final wash of water. It seems that the complete drying of the slimes by some cheap, appropriate process, followed by the powdering of the dried slimes before charging them into the agitation vats, should be productive of improved commercial results. The net dry tonnage of slimes constituting a charge varies, but thus far a charge equivalent to about 15 tons of dry slimes gives more satisfactory results than does a heavier one. Before commencing to charge the slimes, about 35 tons of solution from the strong solution sump, usually of a strength between 0.12% and 0.15% of KCN, is pumped into the vat and the attached centrifugal pump started. From 75 to 100 pounds of slaked lime are then added and the charging of the slimes commenced. After the required quantity of slimes has been added, a sample of the material passing through the pump is taken, filtered and the clear solution titrated. The necessary quantity of cyanide to bring the solution up to the proper strength is then added. Experiments have been made with various strengths of solution in the agitation vats, the results thus far showing the use of 0.2% solution to give more satisfactory results than the use of a weaker solution. The cyanide is placed in perforated buckets or cans and suspended in the charge. It is found, however, that unless the receptacles containing the cyanide be frequently agitated about in the charge, the cyanide dissolves exceedingly slowly. It has been found on different occasions, when this point has been overlooked for any reason, that cyanide broken up in pieces about the size of 6-inch cubes and suspended in the charge at about 6 P. M. had not entirely dissolved by 6 A. M. of the next morning. The lesser the proportion of solution to solid matter present, the more noticeable is this tendency of the cyanide to dissolve very slowly. It is also noticed in this connection that the thicker the charge the slower is the action of the cyanide on the silver and gold contained in the slimes. During the agitation it is found best to keep the screen at the end of the suction pipe just as near the surface of the charge as possible, without allowing the entrance of air. By so doing, the material passing through the pump always contains a minimum quantity of solids, and the wear on the pump is consequently lessened. In addition to this, the movement or circulation within the charge is then the greatest, since the suction and discharge points are then the farthest separated. It is quite probable that a considerable portion of the heaviest and coarsest part of the material treated does not pass through the pump at all, as owing to its greater weight it may never be raised to the height of the suction screen. The agitation of the mass seems to depend chiefly on the fact that the discharge issuing from the drop pipe

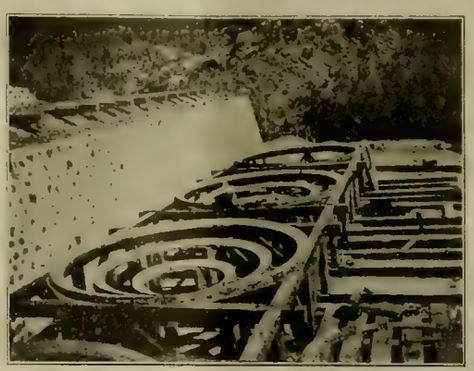


Fig. 8.—Timber Foundations Supporting Decantation Vats of Slime Plant.

Fig. 9.—Decantation Vats of Slime Plant in Course of Construction.

Fig. 10.—General Arrangement of Slime Plant, Palmarejo, Mexico.

Fig. 11.—Agitation Vats and Tops of the Decantation Vats.

*Trans. Amer. Inst. Min. Engrs.

tends to keep the point of the conical bottom free from any settled deposit of slimes, and the thickened material constituting the lower portion of the charge keeps constantly sliding down the inclined sides towards the bottom point. The product issuing from the discharge pipe, being drawn from the surface of the charge, must pass upwards through the entire mass above before it can again pass through the pump.

The percentage of solid matter contained in the material passing through the agitation pumps is determined from samples taken through the bibb-nosed pet-cock tapping the discharge pipe a few inches above the pump shell. The results usually show this percentage to be a little less than the percentage of solids contained in the charge as a whole. The average of a number of these samples shows that the pulp ordinarily passing through the pumps will carry about 25%, by weight, of solids.

A thorough oxygenation of the mass is found to be an essential feature, and becomes more necessary as the proportion of solid matter to solution present increases. At the commencement of operations, the small air cock, e (Fig. 5), was used to permit the continuous admittance of air to the suction pipe of the pump. This practice, however, was soon abandoned, because the agitation was seriously affected by it. The entrance of air into the suction pipe had a detrimental influence on the capacity of the pump, and though the reduction in capacity was not very marked—due to the fact that, owing to the manner in which the pumps are connected up with the vats, the suction side of the pump is, of course, continually under pressure from the pulp in the vat, and no suction on the part of the pump is necessary—nevertheless the effect was found to be injurious to the best agitation. Perhaps the chief trouble was due to the rapid rise to the surface of the imprisoned air immediately on being expelled from the discharge pipe, following closely the sides of the central drop pipe. The air bubbles, breaking on reaching the surface of the charge, caused a splendid surface movement that was easily mistaken for the thorough agitation of the entire mass. The current of pulp expelled from the discharge pipe appeared to follow the line of least resistance established by the rising bubbles of air, also rising towards the surface along the central drop pipe, without effecting a proper scouring of the bottom point of the vat. The present practice is to allow the entrance of a smaller quantity of air into the mass, through the small air cock l (Fig. 6), and the effect on the agitation is very much less detrimental. In addition to this, a certain small quantity of air will be drawn into the pump almost continuously through the stuffing boxes, which are seldom kept absolutely tight. The quantity of air added in this way is so small that it affects the agitation but little, if any.

For experimental purposes, one agitation vat was so connected that the suction of the pump drew directly from the bottom of the vat, while the discharge pipe entered through the side of the vat at a point about 6 feet from the top and terminated in a movable curved pipe which imparted a circular motion to the discharging pulp. Owing, doubtless, to the physical condition of the slimes charged, this method of pump connection was a failure, since the tendency to clog the suction at the bottom of the vat was very marked, and the charges so agitated never completely discharged from the vat of their own accord, but always left a more or less quantity of unagitated material remaining, which had to be subsequently sluiced out.

Ordinarily a charge is agitated in the vats from 40 to 44 hours, after which it is discharged into the corresponding decantation vat, where it is usually given a two days' treatment. Should the charge from the agitation vat not fill the decantation vat, enough precipitated solution is pumped up from the strong solution sump to fill it, and after agitation for half an hour, the charge is allowed to settle. Should the addition of this extra solution be unnecessary, the charge is not agitated, but allowed to settle as long as practicable, the clear supernatant solution being meanwhile decanted off. After the first settling and decantation, the vat is pumped full of weak, precipitated solution, which is usually of a strength approximating 0.1% of KCN per ton, and the charge is agitated for from 1.5 to 2 hours by means of the 3-inch centrifugal pump connected with the vat, about 25 pounds of slaked lime being added during the agitation. The pump is then stopped and an additional quantity of slaked lime, usually about 10 pounds, is sprinkled evenly over the top of the charge. After settling a few hours, the decantation pipe is lowered and the settling and decanting of clear solution continued as long as practicable. As many washes and decantations as possible within the time limit of the treatment are given in this manner. When permissible, the last wash given is of clear water, though in order to avoid too great an accumulation of stock solution a few of the charges have to be washed entirely with weak solution.

(TO BE CONTINUED.)

THE distance between levels of a mine should be determined by the size of the vein, or ore body, and its dip. If flat, below 35°, the levels should not be more than 60 to 75 feet apart. If steeply inclined they may be from 100 to 250 feet apart.

Placer Mining in Alaska.*

NUMBER IV.

TRACKS AND INCLINES. — The track and incline working at No. 8, Anvil Creek, Nome district, is fairly representative of open-cut work by this system. (See Fig. 7.) A special feature of the plant, however, is the removal of the overburden, in all 7 feet of muck and 5 feet of barren gravel, by hydraulicking. Seven hundred miner's inches are used through a giant, under a pressure of 200 feet obtained by pumping. After the barren ground has been removed the remaining gravel, averaging about 6 feet in depth, is shoveled into cars, pushed to the foot of an incline, elevated, and washed. The tailings are impounded on the claim, being scraped from the end of the sluices by two-horse scrapers.

At the time of observation six cars were in use, though this number can be varied to suit the conditions in hand. Two men are employed with each car. They take turns in shoving the car to the incline, one remaining at the bank with pick. The cars at this plant were of a capacity of 22½ cubic feet, though larger ones might be found more economical. From 250 to 300 cars are run up each ten-hour shift.

The material is lifted 30 feet to the mud box and there dumped by hand. A man is continually employed for this duty. He also watches large bowlders and prevents jamming in the flume. However, very few large stones are allowed to pass through, for in the work of excavation the larger rocks are piled at one side of the track.

One man is employed at the hoisting winch and does his own firing. Three 114-pound sacks of coal are consumed each shift. A 15 H. P. boiler is used with vertical engine, and a ⅜-inch cable hauls the cars.

The dump box is 24 feet long, 4 feet wide, and 3 feet high, and has a grade of 1 inch to 1 foot. Following this are 240 feet of boxes with a grade of ¾ inch to 1 foot. The boxes are 16 inches wide and 14 inches high, and are supplied with cast-iron grate riffles. These are 16 inches square and can be used either as Hungarian or longitudinal riffles. In washing, 125 miner's inches are used, all obtained by gravity from a claim above. After being used the water is caught in a retaining dam, settled, and carried by flume to a lower claim, where it is sold. Two two-horse scrapers are used to keep tailings clear, and all gravel is impounded by a brush dam upon the claim.

A little gold is caught in the entire string, though by far the greater proportion is retained in the mud box and that following. In the mud box a perforated iron sheet laid over the riffles aids the moving of material and prevents clogging. In the center of this sheet is placed a heavy iron plate which receives the heavy fall from the cars and saves the bottom of the mud box.

Bedrock on this claim is mica schist, though in places the pay is underlain by a stiff clay. The gold sinks in the broken schist about 2 feet, but not at all in the clay.

A bedrock drain, 250 feet long, has been cut nearly level, which is joined by small drains from various parts of the pit. Only about 15 miner's inches of water were running from the drain at the time of observation. Men are paid $5 a day, with board.

The advantages of the car-and-incline system are not especially pronounced. The method of stripping used in the above-described plant, or at any plant where water under pressure is available, can hardly be improved upon. Where the overburden is thawed or where frost is encountered only in spots, as in the claim under discussion, hydraulicking has been found the most economical and efficient means of removing material. The car system, however, has little of solid economic advantage to recommend it. In order to increase capacity more men must be employed to shovel. In this system an undue proportion of time is consumed in tramming the cars to the top of the incline. A mechanical system, such as derricking or steam scraping, has many advantages over the track-and-incline. In the Klondike, so far as could be learned, the track-and-incline system does not make so economical a showing as other methods of working open cut, although the opportunity for comparison of efficiency was limited.

THE STEAM SHOVEL.—When the ground exceeds 12 feet in depth and is unfrozen, certain conditions justify the installation of a mechanical excavator of large capacity, say 1000 cubic yards or more in twenty-four hours. It will seldom be found advisable to install so large and cumbersome a machine as the steam shovel in the creek diggings of Alaska, for the ground is rarely deep enough to justify the expense of installation. On bench diggings, however, where the pit can be drained by gravity, the steam shovel has a value which has probably been underestimated. The fact that water under pressure is difficult or impossible to obtain for the hydraulicking of benches raises the question whether these bench gravels cannot be excavated by other means. The value of the steam shovel lies in the fact that it performs for the earth worker that portion of his work which would otherwise be most expensive.

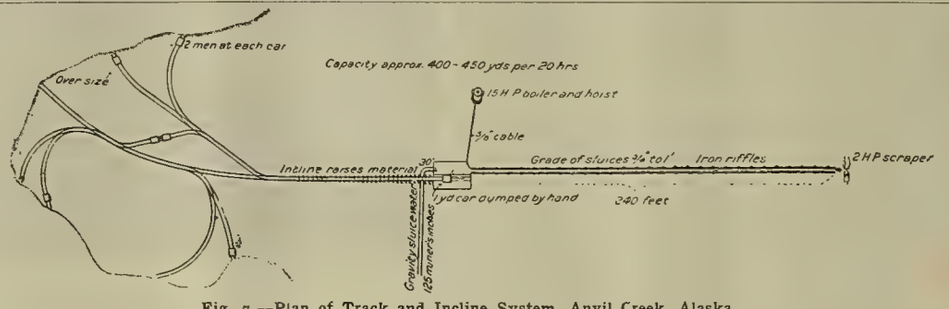

2 men at each car
Capacity approx. 400 - 450 yds per 20 hrs
Over size
15 H P boiler and hoist
⅜" cable
Grade of sluices ¾" to 1'
Iron riffles
2 H P scraper
Incline raises material 30'
1 yd car dumped by hand
240 feet
Gravity sluice made of 125 miner's inches

Fig. 7.—Plan of Track and Incline System, Anvil Creek, Alaska.

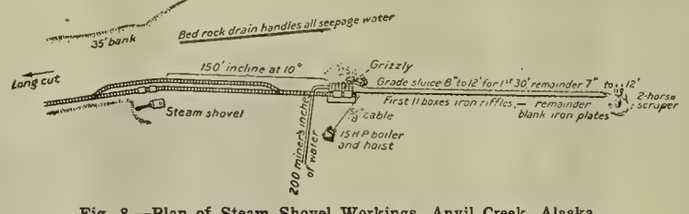

35' bank
Bed rock drain handles all seepage water
150' incline at 10°
Grizzly
Grade sluice 8" to 12" for 1st 30', remainder 7" to 12'
Lang cut
Steam shovel
First 11 boxes iron riffles,— remainder blank iron plates
2-horse scraper
⅜" cable
15 H P boiler and hoist
200 miner's inches of water

Fig 8.—Plan of Steam Shovel Workings, Anvil Creek, Alaska.

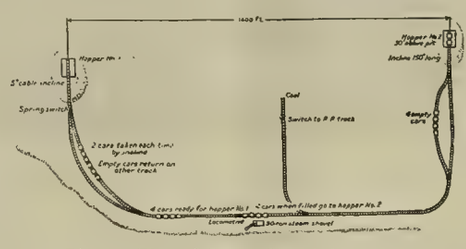


Fig. 9.—Plan of Steam Shovel Operations

The ground which the shovel is to move must possess certain favorable conditions. In the first place, it must be entirely free from permanent frost when the dipper lip of the excavator attacks it. If the ground holds a certain amount of permanent frost and this can be thawed by ground sluicing the muck off at a period far enough ahead, the shovel may still have a profitable field, but its operations are likely to be more expensive. Heavy gravel and bowlders are easily handled by the mechanical excavator. It is safe to say that no quality or state of the Alaska gravels makes them unfit to be dug by the dipper except the frozen condition.

The bedrock must be of sufficient softness to allow the dipper lip to dig far enough into it to recover all the gold; otherwise a gang of men will have to follow the shovel to clean bedrock, and a large part of the value of the shovel will be lost. In one attempt to operate with a steam shovel in the interior of Alaska it was found that as many men had to be employed in cleaning the bedrock as in the remainder of the plant.

A prime essential to success, as has been proved by experience, is that the washing plant shall be isolated, the gravel being conveyed from the dipper to the sluice by some form of tramming. If cars are used, they should be large—2 yards capacity, or even larger. Under ideal conditions the dipper will dump into cars which run by gravity to the hopper of the washing plant, the water being brought to the sluice also by gravity. The full cars would in this case carry the empties back to the pit. It is rarely possible, however, to find an auriferous gravel de-

*Bulletin 263 U. S. Geological Survey.

posit in which such eminently fit conditions exist for work. The tramming, even when it must be up an incline to a height of 35 feet above the pit floor, adds proportionately little to the expense, as will be seen by figures following. It is a common fault in all steam shovel operations that the shovel is ahead of the car discharge. A partly idle steam shovel, however, is not so serious a fault as idle men, since the shovel draws no pay.

As to capacity, it is likely that a 2-yard shovel, fitted with extra long boom and 1¼-yard dipper, will be found most economical. A 25-foot bank can be dug and caved. If the sluice and tramming capacity is 700 cubic yards a day, the shovel will easily supply the material if no frost is encountered.

The work done by a shovel on Anvil creek is considered satisfactory, though its installation is experimental, and a larger one is planned. The 25-ton shovel (¾-yard dipper) is working on an 18-foot face. It has not reached the bottom of the gravel, and must make another cut 7 feet lower vertically before all the pay is extracted. It is said that from July 23 to September 1, 1904, 25,000 cars of 1¼ cubic yards capacity were dug and moved to the sluice boxes at a working cost of 12 cents a yard. The low bench is sufficiently above the level of the present creek to permit the pit to be drained, the seepage water being handled by bedrock drain. The workings were visited a second time three weeks after the present cut was made. A complete section of the bank to bedrock is given below:

	Feet.
Muck	3
Fine gravel and sand	5
Fine subangular gravel	5
Large subangular schist and limestone fragments, stained with iron oxide, with a few bowlders up to 3 feet in diameter	15

The upper 3 feet of muck was ground sluiced; the remainder was moved by the steam shovel.

This frozen ground illustrates the peculiarly trying conditions with which the Alaska placer miner has frequently to deal. None of the ground encountered in 1904 was frozen. In the early part of the season of 1903, however, on account of the light snowfall during the preceding winter, the sides of a cut operated on were frozen to a depth of 8 feet and to a distance of 15 feet into the bank. This was annual and not permanent frost. Had the attempt been made to work the ground at that time with the shovel the operations would have been greatly delayed. In this plant, after the shovel had worked to a considerable distance from the bottom of the incline, the 1¼-yard cars, three in number, were trammed to the bottom of the incline by horses and hoisted to sluice by a 15 H. P. hoist. The tramming may be more cheaply accomplished, where there are several years' work ahead, by a small locomotive in the pit running to the bottom of the incline or, under favorable conditions, directly to the washing plant. Fig. 8 shows a plan of the operation under discussion.

The tramming system illustrated by Fig. 9, used at Galesburg, Ill., in a shale pit, is considered highly economical in steam shovel work. As may be seen, the locomotive occupies a position intermediate between the two trains of cars, which deliver two ways to the bottom of two inclines leading to the hoppers of the clay machines at each end of the pit. In placer operations, if conditions admit of dividing the water to two washing plants, this system is to be recommended, as it allows of rapid delivery of the cars from the shovel. In this plant the locomotive keeps twenty cars going, each of two yards capacity, tramming them alternately in trains of six and four, two ways to the ends of the pit, whence they are hauled two at a time to the hoppers. When empty they run down and are switched automatically to the empty tracks. The 90-ton shovel, of 5-yard dipper capacity but fitted with 2-yard dipper, is ahead of the capacity of the clay machines, but must be used, owing to the difficulty of digging the firm shale which composes the bank. The actual yardage moved, working nine hours a day, is 670, or at the rate of 1488 yards in twenty hours. It is estimated that this is less than one-half the amount that could be handled were the shovel digging loose gravel. As it now works, the shovel is digging only one-third the time.

(TO BE CONTINUED.)

The Transvaal Gold Mines.

NUMBER III—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by THEO. F. VAN WAGENEN, E. M.

Management expenses are abnormally high, mainly because the English Company Act compels a very elaborate system of accounting and auditing in all public corporations, and also because the written and unwritten laws and customs of the country have induced a very coventionalized way of doing business, the net result of which is that the staff of officials and clerks in every line of activity, and particularly in that of mining, is unreasonably large. This is well recognized in both London and at the goldfields, and efforts are being made to bring about changes, but the system is so deeply rooted, and English conservatism is so great, that it will be some time before improvements can be secured.

In spite of these drawbacks, production will not only continue but will increase. For the goldfield is a genuinely meritorious one, is of enormous extent, and the capital has been raised to develop and equip a very large part of it. These factors may be considered as definitely settled. The mines will be worked as long, at least, as actual costs can be recovered from them, and in many cases, if necessary, at a loss, in the hope of a change in the results. The output of metal from the camp will amount to nearly $90,000,000 during the current year, and will grow at the rate of not less than 5% per annum for many years to come. This means that between now and 1913 (for example) the Transvaal will add over $1,100,000,000 worth of gold to the existing world's stock of the metal, and will then be producing at the rate of nearly $140,000,000 per annum. By 1920 the annual output will have almost reached the enormous figure of $200,000,000, and its contribution of new gold since the close of the year 1904 will exceed a value of $2,300,000,000. As the existing stock at the present time in the shape of coin and bars is figured by statisticians at not over $11,000,000,000, the Transvaal alone, if these anticipations are realized, will be responsible for an addition of more than 20% during the next fifteen years, to say nothing of the increments that will come from the other gold fields of the world, and which will at least amount to twice as much or more. Just what is going to happen in international trade and commerce through this enormous expansion in the next few years in the mass of the only legal money metal, is hard to say.

The Transvaal is an ideal mining region in many respects, and particularly that part of it known as the Rand. There the altitude is over 6000 feet, and the climate superb. The American, accustomed to the extremes of temperature in all parts of his country, will revel in the very moderate range which the thermometer shows in Johannesburg. In June and July thin ice forms at night in exposed places, and in December and January it is uncomfortably hot in the sun during the middle of the day. But that is all. In no possible sense can the climate be considered even as sub-tropical, or one in which the white man cannot labor with the same continuity and vigor as in Europe and the United States.

At the end of 1904 there were 285 mining companies operating on the Rand whose combined capitalization amounted to $412,337,357. The gross output of gold in the district for the year was $76,523,481, and the dividends declared and paid totaled about $25,000,000, two-thirds of which came from the outcrop mines and the remainder from the first series of "Deeps." Thus, considering the whole field, a net profit of 6% on the gross capital was obtained. This is not a bad result, but of course is much below what a gold mining adventure is expected to yield, considering the assumed extra hazardous nature of the business. But further investigation displays the fact that only forty of the companies paid dividends in 1904, while the other 245, either because they had not yet reached the producing era or were not capable of it, yielded nothing at all to their shareholders. If we apportion the entire capitalization pro rata among all the corporations—which will be at least fair in the present calculation, for the most of the paying ones are the outcrop mines with comparatively small capitals—it appears that about $50,000,000 of the investment is paying about 50% per annum to its holders, while the remaining $362,000,000 is as yet unproductive. This is really a very fine showing, for of course most of the non-productive mines are in the developing era and are simply spending the capital that has been raised for their equipment and, one by one, will in the majority of cases and in due time reach the stage of production and profit.

It is necessary to admit, if one gives the great camp a fair and impartial study, that nearly all of the developing mines have good business prospects for becoming large producers and dividend payers. In all cases before shaft sinking has begun the ground has been well tested with the diamond drill, the reef has been located at a number of points and its value has been ascertained. There is much more certitude in operating on the Rand banket than is usually the case in the business of gold mining. And in any event, even if dividends do not quite come up to expectation, production will continue, so that the business world is bound to experience the stimulus of the new gold that will be poured into the channels of trade. Personally, however, my view is that the Rand will meet the expectations of all but the very wildest of the optimists.

It is a fact that the reef slowly but steadily loses its dip as it is followed downward into the earth, and there is every reason to believe that it ultimately becomes horizontal and even may show an upward trend. But it is not thought that it comes to the surface again, for the indications of extensive faulting of the formation to the northward are too numerous and positive to allow of such an outcome. As to the depth to which mining upon it can be prosecuted, there appears to be no insurmountable physical or mechanical obstacles short of 10,000 feet vertical, though unless the present range of costs in the items of labor and management are materially reduced, the ore from such depths, and a considerable way this side of it, assuming no decrease in the grade, will not pay for its extraction.

Market Place, Johannesburg, S. A

Headframe, Crown Reef Mine, Johannesburg, S. A.

THE PROSPECTOR.

The brown sugar-like mineral in the ore from the Mount Hope mine, El Dorado county, Cal., is quartz, which occurs in the form of rounded, sand-like grains.

The dark-colored rock samples from Cochrane, Ariz., are diabase, but considerably altered.

The mineral sample from Placerville, Cal., is platinum and iridium. These metals usually occur together in regions of serpentine rocks and peridotites.

The rocks from Keeler, Cal., are: No. 1, rhyolite; No. 2, rhyolite tuff; No. 3, mica schist; No. 4, limestone. The green mineral is chrysocolla (a silicate of copper).

The rock sample from Cochrane, Ariz., is a much altered dike rock. The rock now consists chiefly of quartz, kaolinized feldspar, chlorite and talc, with microscopic flakes of secondary mica. It was probably a granitic or dioritic rock originally. It is sheared and so much altered as to make positive identification impossible.

Gold Dredging in California.*

NUMBER III.

BUCKETS.—The buckets at Folsom, Oroville and Yuba vary in size from 3 cubic feet capacity up to 8½ cubic feet, and it is proposed now to build a dredger at Folsom with buckets of 13 cubic feet capacity. They vary considerably in shape, and in the material used, but some of the best are those that are made with a cast nickel steel bottom piece, with sheet steel hood and manganese steel lips, and reinforced cutting edges. If a comparison could be made as to the breakage and consequent extra cost between the earlier buckets made and those now being turned out, a great advance would be shown, and greater advances are possible. This is a matter for the consideration of the manufacturers and the engineers in charge of the plants.

As to the difference in cost of operating under favorable and similar conditions with the different sized buckets, it may be said that the cost for labor is nearly the same for the small as for the large dredger, and much smaller per cubic yard for the larger; that there is a proportionately smaller cost for power and for repairs. Management and all other expenses are reduced in the larger dredgers, provided, of course, that in their construction there is given, by the strengthening of the parts, as little loss by breakdowns. Then, it may be said, that the larger buckets will handle larger bowlders and so decrease the breakage in the bucket line. The parts being heavier, it is possible to dig harder ground. The increased yardage handled will mean a decrease in the interest cost on the original investment. As against this, it may be said that the first cost is much larger, and that better equipped repair shops are required.

The weakest portions of the bucket bottom are the eyes and the parts coming in contact with the manganese or nickel steel wearing plates of the upper and lower tumblers. As these wear there is an increase in danger of breakage, and it is to the manufacturers that we must look for remedies in this respect, by the addition of more metal to add strength and compensate for wear, by improvement in the character of the steel used, and by changes in the faces of the tumblers in order to give better bearing and reduce the strain. Simpler and stronger parts of the best materials must be used to remedy the present evils.

SPUDS AND HEAD LINES.—To keep the dredger in place, move it about, and hold it against the bank, there are two methods in use: (1) Two spuds, one of steel, and one of wood at the stern of the boat—the wooden spud being used when the steel spud is lifted and it is desired to "walk" the boat ahead. At the forward end of the boat are two steel-wire rope lines fastened to the shore to move the boat to right and left through an arc of a circle, and two at the stern. (2) Instead of spuds and lines, five lines are used—two at the stern, two forward, and one ahead to hold the boat against the bank.

In the lighter and softer ground in New Zealand, the guy method seems to be preferred, but in Oroville both methods are in vogue.

Where the surface of the ground is level, and the ground to be dug is soft and shallow, some of the dredger owners prefer the lines. An uneven surface of the ground, hard gravel or deep gravel makes the spuds preferable. Most of the largest operators in Oroville equip boats with both, but use the head line only in emergencies. When using guys only, the digging must be done only from the bottom; while with the spuds the bank may be cut in terraces, and this is sometimes preferable in deep ground.

In deep ground when cutting the bank by digging from the bottom up in terraces, or down, there is less danger of injury to the bucket line and cleaner lifting of all gravel if spuds are used. This means that there would be less loss of pay gravel caved down behind where the digger is working, and less loss of time and consequent less loss of capacity in yardage. However, several operators state that with a head line instead of spuds in digging deep ground, the dredger may be moved more quickly in case of heavy caving of the bank, and so save accidents. Then, again, the use of the head line gives an easier and more even distribution of the tailings, and, it is claimed, makes the sand pump unnecessary.

THE STACKER.—There are two types of stackers in use in California—one the ordinary belt conveyor, and the other an endless chain of buckets. Usually, the Bucyrus dredgers, and other makes except the Risdon, are equipped with belt conveyors, while the Risdon is equipped with bucket conveyors. The belt conveyor will not work at a higher grade than 18% or 20%, while the bucket conveyor works usually at 35°. The belt of the former must be renewed every six or nine months. This makes the cost of "repairs" considerably more than for the bucket conveyor. However, to offset this, there is considerably less loss of time with the belt conveyor from this cause, for practically the only wearing part is the belt, and when this wears out, a new one can be put in in a few hours. Some of the tables of loss of time and cost of repairs of conveyor give figures so that comparisons can be made, but hardly enough data have been kept to figure closely on the differences.

In New Zealand a number of dredgers equipped with centrifugal stackers are in use. It is claimed for them that the original cost is less, that the weight saves several tons on the boats, that the cost of repairs is less, and that the efficiency is as great as for the belt and bucket conveyors. However, none have been built in California and no definite data are at hand.

SAND PUMPS.—In order to prevent the filling up of the basin in which the dredger floats and consequent interference with its flotation, in many cases in Oroville it has been found necessary to pump the fine tailings that come from the sluice box up to the top of the rock pile made by the stacker. As this requires considerable power, it is discarded wherever possible. In deep ground with deep water, it is not required.

SCREENS, SLUICES, ETC.—The conditions that are most important to be considered in order to determine the kind of appliances to use in saving the values are: (1) Size of particles of gold; (2) Shape of the particles, whether nuggety or flaky; (3) Presence of clay; (4) Will the gold amalgamate readily? (5) Amount of black sand; (6) Amount of platinum; (7) Hardness of gravel.

Screens: Two kinds of screens are used in California—the shaking and the revolving. The purpose is to disintegrate the gravel and clay in order to permit the fine material, the values and water to pass through the holes along the length of the screen to the gold-saving tables or sluices below, and convey all coarse material to the stackers, to be carried to the dump piles. As to screens, two main questions must be determined: (a) Whether to use a revolving or a shaking screen; (b) Size of holes in the screen.

As to (a) the hardness of the gravel and the presence or absence of clay are main determining features. If the gravel is a clean wash, comparatively free from clay, such as that at Oroville and Folsom, the shaking screen is generally preferred to the revolving screen, mainly because the first cost and the cost of repairs are less. However, there are cases, even in these districts, when some hard pieces of gravel are not disintegrated and the values lost. In case there is any clay present, it will adhere to the gravel or pieces of bedrock, especially if blocky, or will "ball up" and so carry off the gold. In a shaking screen, boulders and larger pieces of bedrock will not be turned over so that the water jets will have free play. This is the case especially in such bedrock as most of that along the Yukon, which is often blocky, and carries much gold in clayey seams down to a depth of from 1 to 6 feet. Where the gravel is hard it has little opportunity to disintegrate in the length of the shaking screen. A revolving screen with flanges and rods across the screen will turn the material over and over, subjecting all sides of it to the force of the water from the jets, and will afford a sort of milling process by which the boulders and smaller stones are lifted up and thrown down on the lumps of gravel and clay.

Under the favorable conditions existing in the Sacramento valley districts the shaking screen is preferred for the following reasons: (1) The effective

A Modern California Gold Dredger.

*Bulletin 36, California State Mining Bureau.

screening surface is larger; (2) It is easier kept in repair, because the plates are small and conveniently replaced; (3) The gravel drops over a larger surface on the plates below, and so comes the better in contact with the quicksilver. Then the water from the jets playing down on the screen plays over a wider and thinner surface.

In some cases a combination of the revolving and shaking screens would be preferred. In this way two screenings could be had.

The revolving screen varies in diameter from 3½ feet and in length up to 24 feet. The shaking screen for a 5-foot bucket dredger is in some of the later dredgers built in two parts — the first part 7 feet wide and 16 feet long, and the second, or lower part, 7¾ feet wide and 16 feet long. This enables, of course, a much larger sluicing table space to be employed below the shaking screen.

The size of the holes in the screens will be determined by the size of the largest particles of gold. At Oroville and other districts in the Sacramento valley, where all the gold is fine, $\frac{5}{16}$ and $\frac{3}{8}$-inch holes are generally used. Where there is both coarse and fine gold it must be remembered that with the larger holes coarse material will have to be sluiced, a greater depth of water will be required in the sluices, and there will be a consequent greater loss of fine gold. To obviate this, it is suggested that smaller holes be used in the upper part of the screen and larger holes in the lower part, and that the finer and coarser material be run into separate sluices. It would not be necessary to have the larger holes in more than 4 feet, or even less, of the length of the screen.

Sluices: On the dredgers in the Sacramento valley districts, such as Oroville, Yuba and Folsom, the gold is saved on what are called gold-saving tables and a sluice running out astern of the dredgers where the tailings are dumped into the water. The area of these tables is for a 5-foot dredger with shaking screen about 750 square feet and for the sluices about 300 square feet, and somewhat less with revolving screens. This area is somewhat less for the smaller dredgers and more for dredgers of larger capacity. As it is, generally speaking, all the surface possible is made, and it is limited, of course, to the size of the boat. There can be no question but that much of the finer gold is lost. How much this may be has not been determined, for, no matter how careful the rocking and panning of the drill samples, the finest gold is not saved.

It may be said that if some of the finest gold saved at Oroville were shaken up in a bottle of clear water it will take two hours' time to settle again. Therefore, neither panning, nor rocking, nor any of the present gold-saving devices can save all the gold. One of the best informed men at Oroville, who has been in the industry since the beginning, says that, with the improvements that may in time be made in the gold-saving appliances, it would be possible to save more gold in the dredgers than could be shown by the most careful and exact sampling with pans and rockers.

In most cases at Oroville and Folsom the tailings are sampled in order to determine how much gold is being lost. But this sampling is of no value except to show that the sluice boxes and tables save a large per cent of what could be found by panning or rocking. In other words, very little is found in the tailings, and in most cases practically none at all, by panning or rocking.

The quantity of fine gold which goes off in the water should be determined by test, and if it amounts to as much as seems probable, there should be devised a scheme, in connection with the sand pump, for an auxiliary saving appliance that would enable a larger proportion of the finest gold to settle. The amount of extra power that would be required and the cost of extra equipment need not be much. Of course, the larger the dredger, the greater the opportunity to save larger proportions of the gold now being lost.

(TO BE CONTINUED.)

Proposed Prize Competition.

The international labor office, of Basel, Switzerland, has invited an international prize competition for the prevention of lead poisoning and want to make the fact known to every one engaged in mining, milling, smelting and refining lead. The competition is proposed subject to certain conditions. Among the prizes offered are one prize of $1200 for the best treatise on the prevention of lead poisoning in the operation of mining and milling lead ores or ores containing lead and one prize of $2400 for the best treatise on the prevention of lead poisoning in smelting and refining works.

The papers may be written either in English, French, or German. Already printed books cannot be taken into consideration by the jury. The ready manuscripts must be put in an envelope bearing only a motto, and lodged with the international labor office at Basel on or before December 31, 1905. The full name and address of the author should be stated under a separate sealed cover bearing on its outside the same motto as above. Contributions arriving later than December 31, 1905, will be excluded from the competition.

A Noted Mexican Gold Mine.

The Rosario mine at Guadalupe y Calvo is in the southwestern corner of the State of Chihuahua, Mex. The great gold-bearing veins of the district occur in andesite. The Rosario is one of the largest gold veins in the world, and is from 60 to 150 feet or more in width. The hanging wall has been eroded to considerable depth below the outcrop, so that the vein forms a great wall facing the valley. The topography and general appearance of the mine on the surface is well illustrated in the accompanying engraving.

The Rosario Mine, at Guadalupe y Calvo, Chihuahua, Mexico.

The main open cut on this great vein is nearly 2000 feet in length, and about 130 feet wide. There have been four large shoots of payable ore worked. These were separated by masses of low-grade quartz. This latter material has been piled up in large dumps about the vicinity of the mine. This low-grade ore has lain on these dumps for many years and has mostly been sorted and picked over by the villagers, but, notwithstanding this, it is said that what now remains contains payable values in gold when worked by the cyanide process, assaying about one-half ounce of gold per ton. The natives say the vein was discovered in 1835 by an Indian, who made its whereabouts known to miners working at El Refugio mine, about 30 miles to the southward.

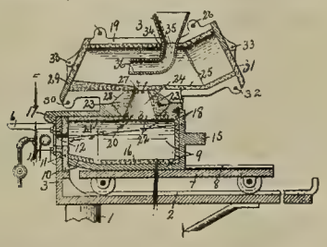
When the extent and value of the Rosario and the surrounding district became known, a stampede to the new district resulted and in a very short time 2000 people had settled about the mine. The Rosario has had many owners and the yield became so large at one period that the Government built a mint at Guadalupe y Calvo. The great vein is credited with a production of over $40,000,000. It is now owned and operated by American capital, and is again an active producer.

Mining and Metallurgical Patents.

PATENTS ISSUED AUGUST 15, 1905.

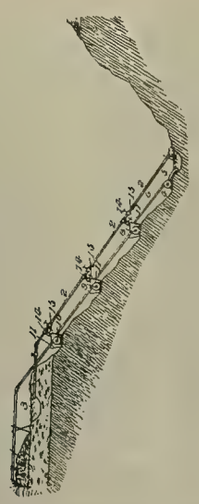
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

REVERBERATORY FURNACE.—No. 797,352; A. M. Gaylord, Auburn, N. Y.



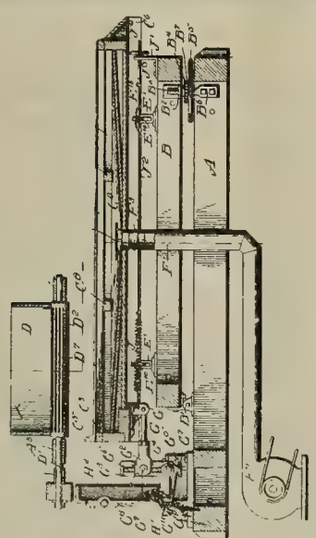
Furnace comprising two chambers, one above the other, and connected by vertical passage, lower chamber having fuel inlet and upper chamber having inlet for material to be melted, upper chamber having opposite ends provided with closures, each of which is horizontally divided to form lower and upper sections, which are hinged together at meeting edges, whereby upper section may be swung downwardly upon lower section.

MINING APPARATUS.—No. 797,068; A. McDougall, Duluth, Minn.



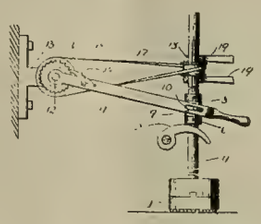
Mining apparatus comprising pump, pipe delivering water to and mixing it with ore or other material, inlet of pump in communication with mixed water and material, outlet of pump delivering mixed water and material to dump pile, reservoir in which water is collected by seepage from dump pile, aforesaid pipe in communication with and receiving supply from reservoir.

DRY CONCENTRATING TABLE.—No. 797,239; H. M. Sutton, W. L. Steele and E. G. Steele, Dallas, Tex.



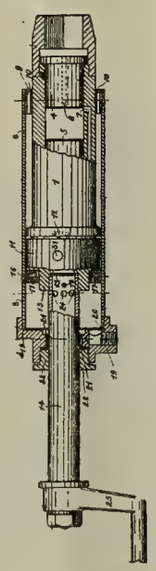
Combination of inclined pervious floor, having surface provided with longitudinally disposed riffles, means for maintaining successive zones of separated material, and means for maintaining beneath floor uniform upward pressure of air through pervious floor and material upon it.

STAMP MILL.—No. 797,202; C. J. Hodge, Houghton, Mich.



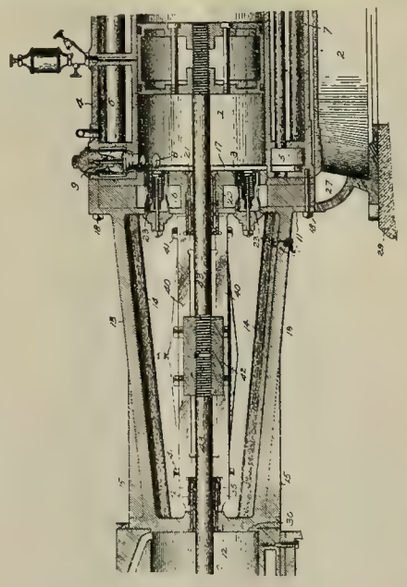
In stamp mill, combination of stamp shoe having flat lower surface provided with continuous corrugations extending throughout length of shoe, flat surface arranged in horizontal plane, upon which shoe is adapted to stamp and means for raising and lowering shoe bodily away from latter surface and imparting rotary step-by-step movement thereto while it is entirely clear or elevated from surface upon which it stamps.

ROCK DRILL OR ROCK DRILLING MACHINE.—No. 797,111; H. Hellman and L. C. Bayles, Johannesburg, Transvaal.



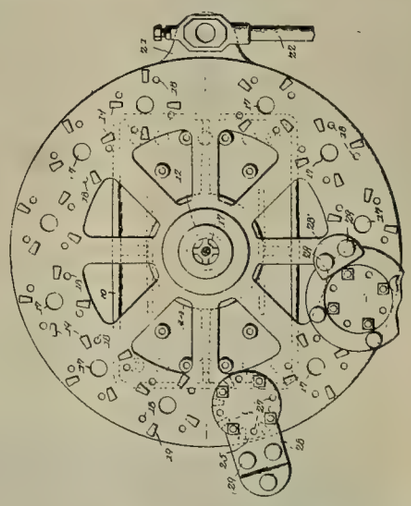
In rock drilling machine or engine, in combination, power cylinder carrying percussive apparatus and drilling bit or boring tool, casing surrounding cylinder, packing located at rear of cylinder forming air-tight joint with interior of casing, pipe attached to rear end of cylinder formed with holes placing casing in communication with interior of cylinder, cover fitted on rear end of casing formed with inlet through which actuating fluid enters casing, cover serving as guide or support for pipe, and means for rotating power cylinder and bit or tool.

COMBINED FRONT CYLINDER HEAD AND CROSS HEAD SUPPORTING FRAME FOR STEAM AND POWER AIR COMPRESSORS.—No. 797,519; J. G. Leyner, Denver, Colo.



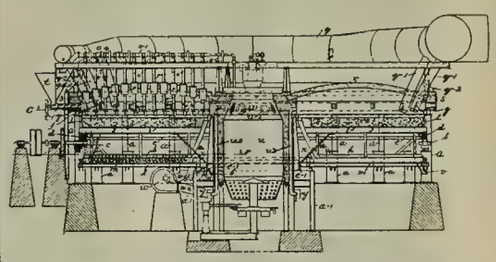
Device of character described consisting of integral casting comprising pair of suitably constructed and oppositely arranged cylinder heads which are connected by brace bars, holes through cylinder heads in axial alignment with each other, and lugs upon opposite sides of each cylinder head, and guideways connecting lugs on one cylinder head with those on other cylinder head.

OIL WELL PUMPING RIG.—No. 797,421; S. F. Field, Findlay, Ohio.



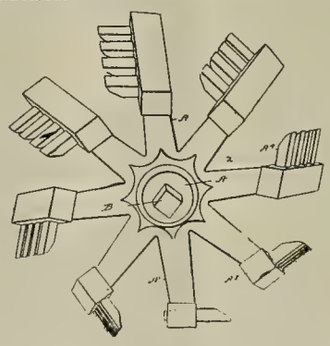
In oil well pumping rig for transmission of power from central source to plurality of pumps, crank disk having annular series of pin-receiving openings, set of lugs grouped around each opening, lugs of each set being correspondingly disposed throughout entire series of sets, crank disk being further provided with plurality of equidistantly spaced bolt-receiving openings grouped around each pin-receiving opening, wristpin-carrying block having central pin adapted to any one of pin-receiving openings, and being provided with recesses for reception of lugs, recesses being equidistantly spaced to permit circumferential adjustment of block, and bolts for securing block in adjusted position.

ORE ROASTING FURNACE.—No. 797,003; H. C. Holthoff, Milwaukee, Wis.



In ore roasting furnace combination of central combustion chamber, roasting chamber having annular floor or hearth communicating on inner side with upper part of combustion chamber through rapidly disposed openings or passages distributed around it, exit pipe or flue connected with outer part of roasting chamber by branches distributed around it, and means for gradually moving ore across floor or hearth.

SUCTION DREDGER.—No. 797,109; M. C. Harris, San Francisco.

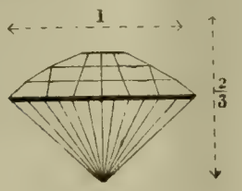


Cutter head for suction dredgers, consisting of hub; arms radiating therefrom; socket heads on arms approximately parallel with line of driving shaft, and converging to inclosure, series of rolling elements, plurality of obstructing and deflecting elements arranged upon surface of central inclosure, against which rolling elements are adapted to impinge, and pivoted member operable by hand for diverting rolling elements into different receiving pens.

Something of the Diamond Industry.

The greater number of diamonds mined are sent to Antwerp, Belgium, for cutting and valuation. British Consul General Hertslet has contributed some interesting information concerning the cutting of a diamond to the London Mining Journal, from which the following is taken:

The cutting of a brilliant is undoubtedly the process which best shows forth the lights and reflections contained in a diamond. A perfectly formed brilliant should have the proportions in depth from the upper surface or summit to the lower point called the pyramid or pavilion of two-thirds of the diameter of the stone at the belt or middle, as is shown in the illustration. The diagram, however, refers to the correct dimensions of a brilliant only, and must not be taken as illustrating the correct formation of the cut facets of a diamond.



The Brilliant Diamond.

The summit or crown of a brilliant should have thirty-two facets, and in addition one large central facet called the table. From the side of the pyramid it should have twenty-four facets and one small facet at the lower point called in this country the "collette," making in all fifty-eight facets, and not, as has been sometimes stated, sixty-four facets. These facets should be calculated, divided, and regularly cut in such a manner that those cut on the pavilion of a diamond may reflect the light on to the facets cut on the summit, and vice versa, thus showing forth in as high a degree as possible the sparkle and glitter of the gem.

All diamonds are cut in a series of stars, one being formed over the other. On looking through the flat surface or table of a properly cut brilliant the "colette" or lowest point should appear to be directly in the center of the table. In the regular cutting of these facets depends the whole beauty of the diamond, and in their formation lies the secret and difficulty of the diamond trade.

The rose is a more usual form of cutting diamonds of less value and thinner formation, and is cut with one large facet at the base and twenty-four triangular facets on the summit. The thicker stones cut in this manner with twenty-four facets are called on the continent "roses couronnees." Those which are only cut with twelve or six facets are known by the name of "roses d'Anvers," and form one of the chief specialties of Antwerp. They are not, however, cut in this manner unless the stones are of insufficient thickness to allow of their being cut in the form of "roses couronnees."

In addition to the two regular modes of diamond cutting described above, which are almost universally adopted, there are several other ways, but long experience has proved that the brilliant and the rose, or regular formation, show forth the sparkle and light contained in the diamond in a greater degree of brilliancy than other methods of cutting.

The quality and value of a diamond may be roughly determined by examining it against the light. In a stone of inferior value there appear to be many lines or scratches, whereas the more perfect stone is recognized by its purity and lack of marks in the grain, and also by its regularity of formation.

CAISSON DISEASE was the subject of a suit for damages and a legal decision relating to employers' liability in London recently, says the Engineering News. A workman had been employed in compressed air work on the tunnel being built for the Charing Cross, Euston & Hampstead Railway. The pressure in the work is normally fifteen pounds, but at times it was increased to twenty-five pounds. After working in the tunnel for eight months the workman became ill with what was claimed to be caisson disease or "bends." He sued his employers for damages, claiming that the attack was an accident resulting from his employment. The defendants contended that the disease, if caisson disease, was of gradual development and not a sudden happening, hence could not be classed as an accident. The court held that the plaintiff had not suffered from an accident which would entitle him to compensation, and nonsuited him.

IN setting up a wooden tank, lay the bottom on the prepared sills first and then set up the staves in their regular order. Usually the manufacturers number each stave and bottom piece, as the tanks are set up by the makers. The bottom hoops are put on first, and the hoops are also tightened from the bottom upwards.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Although mica has been found in commercial sizes in about one-third of the States and Territories, it has been mined the past year only in North Carolina, New Hampshire, Colorado, New Mexico, California, Georgia, South Dakota and Idaho, which are named in the order of their importance as mica producers. The total quantity of sheet or plate mica produced in this country during 1904, as computed by J. H. Pratt of the United States Geological Survey, was 668,358 pounds, valued at $109,462, an increase of 48,758 pounds in quantity but a decrease of $8,626 in value, as compared with a production of 619,600 pounds, valued at $118,088, in 1903. It appears that in 1903 and 1904 the production was nearly 300,000 pounds greater than in 1901 and 1902. This large increase in the production of sheet mica during the last two years is due to the very large quantity of small sized disks and rectangular sheets of mica that have been prepared for electrical purposes. The production of scrap mica during 1904 amounted to 1096 short tons, valued at $10,854, as against 695 short tons, valued at $6460, in 1903. During 1903, however, there were also reported 964 short tons, valued at $18,580, which were sold in the rough blocks as produced. This probably made at least 800 tons of scrap mica, so that the actual production of scrap mica in 1903 was greater than in 1904. Of the 1904 production, 610,121 pounds of sheet mica, valued at $100,724, and 200 short tons of scrap mica, valued at $2000, were produced in North Carolina. This was over nine-tenths of the total production of the United States in 1904.

The total production of gypsum in the United States during 1904 is estimated by G. P. Grimsley, in a recent United States Geological Survey report, as 940,917 short tons, valued at $2,784,325. Of this quantity 56,137 tons were crude rock, 70,167 tons land plaster, 274,672 tons plaster of Paris and 390,668 tons wall plaster. Gypsum is quarried and calcined in the following seventeen States and Territories, named in order of their importance as producers: Michigan, New York, Iowa, Texas, Oklahoma, Ohio, Kansas, Wyoming, Colorado, Utah, Virginia, California, South Dakota, Nevada, Montana, Oregon and New Mexico. A number of new calcining gypsum plants have been established in Iowa, Oklahoma, Colorado, California and Oregon.

ALASKA.

It is understood that smelting operations are to be commenced in October at the smelter of the Alaska S. & R. Co., erected for that company by Paul Johnson at Hadley, Prince of Wales island, southeastern Alaska.

United States Assayer Fred Wing, in charge of the Seattle assay office, states that his estimate of the gold output of Nome for the season of 1904 was $10,000,000. This amount will be the record for Nome and will exceed the output of last year by $3,000,000. Mr. Wing bases his estimate on the amount of gold which has been sent out of Nome so far this year and on the private advices which he has received from assayers and others. The large amount of machinery and ditching material which has been placed in operation at Nome and other localities on the Seward peninsula this year is responsible for the increase in the gold output.

In describing the Fairhaven gold placers, Seward Peninsula, Alaska, in a recent report of the United States Geological Survey, F. H. Moffit says that the total production of the Kotzebue gold field for the three years during which mining operations have been carried on is probably not far from $415,000. Of this amount Candle creek alone has turned out over three-fourths. The gold field immediately south of Kotzebue sound is divided naturally into three minor fields, defined by the watersheds separating the drainage basins of Inmachuk, Kugruk and Kiwalik rivers. The streams in the Inmachuk river valley, including the south fork, or Pinnell river, which up to the present time have been gold producers, are few in number and as yet only partly developed. Old Glory and Hannum creeks, with two or three small tributaries, are the chief ones besides the Inmachuk and the lower part of Pinnell river. Hannum creek joins Inmachuk river 2½ miles west of Record. The stream, which is about 9 miles long, occupies a deep canyon-like valley, which in a few places expands for stretches of ½ mile or less into a level floor 600 to 800 feet in width. The valley is cut into a series of schists and shales interstratified with occasional thin limestone beds, and is surrounded by a capping of lava of no great thickness. The schists and slates of the valley slopes are generally covered by the debris from the overlying lava, so that outcrops are not plentiful. The gold is unevenly distributed over the bedrock, and on only one claim had anything like a continuous pay streak been exposed. Here the valuable gravel deposits had a thickness of from 6 inches to 4 feet and a width approaching 100 feet. Besides the gold, the heavy concentrates from the sluice boxes show a large number of rounded and polished pebbles of hematite, some pyrite, and a small quantity of galena. Black sand is not found with the gold, since magnetite occurs in very small quantity. Gray sand or finely ground pyrite appears constantly in the pan, and larger pieces up to 2 or more inches in diameter are not infrequent. The best gold values are taken from the bedrock, which is usually a blue clay resulting from the decomposition of the underlying schists. The gold is heavy and black and is said to assay $18 to the ounce when cleaned. Nuggets worth $2.50 are not uncommon, but no very large ones have yet been found. Not more than eight or nine of the forty-five claims which have been staked on Hannum creek, and extend from the mouth of the stream at No. 20 below Discovery to the source at No. 25 above Discovery, were being worked at any time during the season of 1903. No development work of consequence has been undertaken below Discovery at the mouth of Collins creek nor above the mouth of Cunningham creek. Between these points the gold is coarser and the grade of the stream sufficient to permit the use of bedrock drains, so that pumps are not required. Toward the mouth of Hannum creek the grade decreases noticeably and the gold becomes finer and brighter in character. Although there is said to be sufficient water at all times for sluicing purposes, the work so far done can hardly be considered sufficient to determine the future of the creek. The largest tributary to Hannum creek is Cunningham creek, 2 miles long, which joins the larger stream 7 miles from its mouth. Like Hannum creek it flows over a schist bedrock. The valley is narrow and V-shaped and its sides are capped through much of their length by the shattered outcrops of the lava flow. The gravels are schist and vein quartz, with a small percentage of limestone at the lower end. The Cunningham gold is coarser than that of Hannum creek, but has never been found in large amount. Collins creek joins Hannum creek at Discovery, but has not yet been much prospected. The presence of valuable gold fields south of Kotzebue sound was first demonstrated on the creek known as Old Glory. This stream rises in the limestone area northwest of Asses Ears, follows an east-northeast direction for 6 miles, and reaches Pinnell river 1½ mile south of the new mining camp of Record. The lower 4 miles of this course is directly across the bedding and cleavage of the schists, which occur to the east of the limestone area just mentioned. Quartz lenses and stringers appear in all the schist outcrops, and angular blocks of vein quartz strewn along the hilltops have now and then furnished locations for quartz ledge claims. The cleavage dips quite constantly toward the northeast, so that the waters, in carving out the valley, impinged against the upturned edges of the inclined schist slabs, which acted like the riffles in a sluice box in concentrating the gold. This relation of stream course to cleavage may account also for the presence of the broad, rounded basins, or "pot holes," as they are called by the miners, which occur in the bedrock of the channel and are a source of some difficulty in the operation of mining. Both pyrite and hematite are found in the sluice boxes. As assays showing tin are reported, a careful examination of tailings from the sluice boxes was made at two or three places where work was being carried on, to establish, if possible, the truth of this report. None was found, but later information was received from Cabell Whitehead, of the Alaska Banking & Safe Deposit Co., that 27 ounces of metallic tin were obtained from gold brought to the bank from Old Glory creek, the metal occurring in the form of fine cassiterite grains, which, because of their weight, remained in the pan with the gold. The gold from Old Glory is heavy and black; it occurs irregularly on bedrock along the channel, but at no place on the stream can a well defined pay streak be shown. The smaller "pot holes" are said to be quite rich and to carry the best values on the rim, the larger basins returning a smaller profit to the miners. These pot holes are more difficult to work than are the other gravels, since it is necessary to shut out the water from the main channel and to keep the holes pumped out, and such work is not required where a bedrock drain can be used, as is generally the case. Drains and ditches for sluicing purposes are occasionally made by simply removing the moss and allowing the water to melt its own channel through the ice bed beneath. There is plenty of water for the requirements of the sluice boxes at all times with the exception of a week or two at the end of the season, during which there has been less than the usual amount of rain. Nelson Gulch leads down from a broad, low saddle in the divide between Old Glory and Inmachuk. Not much sluicing has been done on Nelson gulch since the early part of the season (1903), owing to the scarcity of water. It was expected, however, that this difficulty would be removed by the completion of a ditch more than a mile long which was being dug to bring water from a higher level on Old Glory. The gold is brighter than that of Old Glory, is rough and angular, and contains considerable quartz, and evidently has not traveled far from its original source. With the magnet a few grains of black sand may be found associated with a much larger amount of pyrite and some ruby sand. American creek is the largest tributary of Old Glory and heads up toward the north side of the Asses Ears. The gold is brighter than the other gold of the vicinity, but has never been found in quantity to encourage the prospector much. Candle creek of the Kotzebue field has given rise to the largest mining camp in the northern part of the Seward peninsula, and has yielded more than three times as much as the combined output of all the other creeks. From headwaters to the mouth, a distance of 16 miles, every foot of the ground has been staked, though not prospected, and some sixty-six claims have been recorded at Candle. Candle creek heads in the main divide between the north and south drainages of the peninsula. It follows a course nearly north-northeast and joins Kiwalik river at Candle, 6 miles above the head of Spafarief bay and 9 miles south of the sand spit on which the town of Kiwalik is situated. The stream occupies a broad, shallow valley, with sides sloping so gently that water does not drain off as readily as in the other valleys of the field, and in consequence traveling is more difficult. The lava rim is not so conspicuous here as on Inmachuk and Kugruk rivers, but its presence is made known by fragments in the gravel and on the hill slopes and by occasional outcrops. Exposures of the schist are rare, except where uncovered by the miners. Thin limestone beds are not unusual in the schists, and a small area of light-colored gneissoid rock is found on Potato creek. No pay streak is known on Candle creek, and the gold is, as the miners say, "spotted" or irregularly distributed on the bed. The presence of rich gravels just below the mouths of the tributaries from the west leads to the general belief among the miners that the gold comes from the country west of Candle creek, and in consequence only on that side have the bench claims had much attention. Black sand is unknown in the clean ups; pyrite and a few small pieces of rutile which occasionally have been mistaken by the miners for tin ore are heavy minerals associated with the gold; it is not considered a favorable sign when the iron stones fail.

Work on this creek has been carried on under many difficulties. Although more easily reached than many of the other Alaskan fields, the short season, combined with the high freight rates and great cost of fuel and supplies, has had the effect of retarding considerably the development of the region. In addition to these disadvantages, the cost of mining is increased by the low grade of the stream and the necessary use of the pump, and on some claims by lack of water for sluicing during a large part of a season already too short.

ARIZONA.

Cochise County.

(Special Correspondence).—Monazite is being shipped from Johnson, in the Dragoon mountains. It is found associated with the wolframite which Owen Smith and others has been shipping.

Johnson, Aug. 28.

Gila County.

High-grade sulphide ore is said to have been struck in the property of the Con. M. & D. Co., 7 miles west of Globe. The shaft is to be sunk to a depth of 150 feet.

Graham County.

At the Polaris mine, near Clifton, L. F. Sweeting is getting ready to resume development work.

Mohave County.

Thomas Murphy, R. J. Penberthy and George Ayers have taken a lease on the American Flag mine, 15 miles east of Kingman, and have begun work. The mine is opened by tunnel to a depth of 700 feet. —— The Vivian M. Co. has been incorporated, with J. A. Graves of Los Angeles as president and Thomas Ewing general manager. The properties are in the San Francisco district, near Vivian. A new mill will soon be put in, as well as a new hoist, air compressor and machine drills.

CALIFORNIA.

According to a recent report of the United States Geological Survey, Spain (long the world's leading producer of quicksilver) is now second to the United States. The output of quicksilver in the United States during 1904 was 34,570 flasks, valued at $1,503,795. Up to June 1, 1904, these flasks held 76½ pounds each; since then they have contained 75 pounds each. The production of 1904 was a decrease from that of 1903, which amounted to 35,620 flasks, valued at $1,544,934. All the quicksilver produced in this country comes from Texas and California. The production of quicksilver in Texas increased in quantity from 5029 flasks in 1903 to 5336 flasks in 1904, a gain of 307 flasks, and increased in value from $211,218 in 1903 to $232,116 in 1904, a gain of $20,898. The quicksilver production in California amounted to 29,217 flasks, valued at $1,270,940, as against 30,526 flasks, valued at $1,330,916 in 1903, a loss in quantity of 1309 flasks and in value of $59,976. The average price for quicksilver per flask in San Francisco was $44.10 in 1902, $45.29 in 1903 and $43.50 in 1904. The value of quicksilver imported into the United States in 1904 was $1405, whereas 16,351 flasks, valued at $650,076, were exported from San Francisco alone, mostly to China, Mexico and Japan, while the total exportation amounted to 21,064 flasks, worth $847,108. The greater part of the world's consumption of quicksilver is satisfied by the older mines. Besides the famous Almaden mines, worked by the Rothschilds under a renewal Government agreement for ten years from 1900, there are commercial deposits in the provinces of Almeria, Granada and Oviedo. Spanish quicksilver usually sells in London at 1 shilling per flask higher than the Italian metal. This difference is partly explained by the Spanish export tax of 540 pesetas per 100 kilos, imposed in 1898 as a result of the Spanish-American war. As the Italian output from the mines near Monte Auriate, Tuscany, is not large, any variation in the price of other brands would not influence this market appreciably. The Idria mines in Austria rank third in the list of producers and, although they have been worked for 412 years, their ore reserves are estimated to last forty or fifty years longer at the present rate of mining. Germany showed an increased consumption of quicksilver in 1904 by importing 1,522,964 pounds, and re-exporting only 94,772 pounds. Russia has enlarged the output of its mines in the Ekaterinoslav district, which are worked by A. Auerbach & Co. An appreciable quantity of quicksilver is exported annually from Russia to Hamburg, Germany. In Mexico the great activity in the gold and silver mines has given an impetus to the quicksilver industry, especially in the Guadalcazar district, in San Luis Potosi, and at Huitzoco, in Guerrero. Other deposits are at Ranas, in Queretaro, and at Batuco in Sonora. Quicksilver occurs also at Yulgibar, in New South Wales; at Huancavelica, in Peru; at Taghit, in Algeria; in Japan; in Germany; and near Akluri, in Turkey.

Amador County.

Near Amador City the Fremont shaft is to be sunk to the 1300-foot level and connected by a drift with the 1500-foot level of the Gover shaft. The mill is running full capacity.

At the Markley mine, 4 miles northeast of Volcano, fifteen men are grading for a 10-stamp mill. The dump is to be worked first.——It is reported that the soapstone deposit on the Bean place, east of Sutter Creek, is to be developed by Dr. Bishop of Sutter Creek.——The new 10-stamp mill at the Newman mine, on the Mokelumne river near the West Point bridge, has been started.

Calaveras County.

The Chapman gravel mine, near San Andreas, has been bonded to L. C. Hunter, who intends to open it up. This property is a consolidation of several interests. The channel is opened at both the upper and lower ends of the property and good values are known to exist at both ends.

El Dorado County.

(Special Correspondence).—The Crusader mine, at El Dorado, has been purchased by W. P. Frick and Seymour Hill. They have commenced development work, and the machinery is being received and placed in position on the property.

El Dorado, Aug. 29.

Those interested in the Rio Vista copper mine, near Fairplay, have been investigating a new electric process of concentrating their ore.——The Larkin property, south of Placerville, is being operated under bond.——The H. L. Robinson gravel beds, between Smith's Flat and the Five Mile House, near Placerville are to be prospected under a bond. They are owned by W. C. Green of Georgetown. C. S. Older has taken the bond.——A new hoist has been put in at the Koppikus mine, near Georgetown.——Ten additional stamps are to be added to the Pyramid mill, near Shingle Springs, making 25 in all.——A new engine and boiler are being put in at the Red Raven mine, near Shingle Springs.

Madera County.

(Special Correspondence).—There is unusual activity in the mining section of the high Sierras in this county the present season. Iron and copper deposits which have been known for years past, and which have been located and relocated many times over, have again been taken up and considerable development done. In the same region, east and southeast of Mount Raymond and south of Yosemite valley, there are gold, silver, copper, lead, zinc and iron deposits of considerable extent. The most extensive of the latter are those in what is known as the Minarets district, 75 miles northeast of the city of Fresno. A large number of locations has been made. The ores outcrop in great masses of hematite and magnetite. Most of the ores contain a little gold and silver. Near the iron mines is found siliceous silver ores. The entire district is heavily mineralized and only requires convenient and less expensive transportation to become producers. At Texas Flat, near Coarse Gold, the gold mines are in operation, after a long period of idleness.

O'Neals, Aug. 28.

Nevada County.

W. J. Morris, the agent of the American Smelting & Refining Co., which is operating the Selby smelter at Vallejo Junction, has purchased from the Pioneer Reduction Works, near Nevada City, the sulphuret tailings that accumulated through years of operations at the old works. The local company is not in a position to work these tailings as closely as the Selby company, and the latter also desires it as flux in the treatment of ores and sulphurets.——The work of opening up the Wright & Bailey mine at North San Juan has commenced under the direction of Manager Crane. It is said that a mill will be put up during the fall.

San Bernardino County.

(Special Correspondence).—On the Sunrise mine of Beck & Body, in Kingston mountain, two ore shoots have been opened up and drifting is under way.

Sandy, Nev., Aug. 29.

The Arizona-Mexican M. & S. Co. expects to have its plant at Needles in operation within ninety days. The preliminary details have been completed and the property of the Fletcher S. Co. transferred to L. D. Gotshall, managing director of the new company, who will make changes that will amount to practically building a new plant. The equipment will include an automatic mechanical roasting furnace and sampling works.

Shasta County.

The new smelter of the Mammoth Copper Co. at Kennet is now almost completed and ready to go into operation. From the time the ore enters the smelter from the mill, 2½ miles distant, the process is entirely automatic. The ore is conveyed to the smelter from the mine by a system of trams, which present a novel feature. The grade from the mine entrance to the millsite is so steep — the two levels being 2219 feet apart — that two tramways are used for covering the entire distance. Midway between mine and mill a transfer station is placed. The grade from the mine to the station is 22%. This necessarily generates a much higher power than is required for the conveyance of the ore. The surplus power is utilized in compressing air. The grade from the transfer station to the mill is just sufficient to provide for the conveyance of the ore. The smelter consists of three 250-ton water jacket furnaces, the fumes from which are conducted by individual goosenecks to a hopper bottom dust chamber 280 feet long, where the dust and fumes are collected. At the south end of the dust chamber the stack, which is constructed of boiler-plate steel 150 feet high and 12 feet in diameter, stands. This stack is deeply seated in a concrete base so that it needs no guys to insure its stability. Under the dust chamber there is an electric track which leads the cars to the briquetting plant. The building containing the furnaces, which is the smelter proper, is 130 by 70 feet. There are two levels to the building — the lower for the tapping and the higher for the charging floor. From the former tracks lead away to the slag dump. Behind the smelter building is the storehouse, in which the fluxing ores, limerock, coke and custom ores are to be stored. It is 214 feet in length, and the railroad enters it at an elevation of about 20 feet greater than the charging floor. These tracks lead over to the bins and the ore is dumped in by gravity. Twenty-seven scales provide for the individual weighing of the cars. The sampler is situated at the north of the custom ore bins. The ore capacity of the bins provides for 1000 tons of the company's ore; 1200 tons of limerock and 2500 tons of custom ores. The blower house is 80x50 feet, in which are three blowers driven by three motors of 200 H. P. each. Each of the blowers will deliver 18,000 cubic feet of cold blast a minute. The capacity of the tram for delivering ore is estimated at 1600 tons a day of twenty-four hours. Each bucket has a capacity of 1100 pounds and they are placed at intervals of 150 feet on the rope.

Siskiyou County.

The new dredger, near Yreka, on Yreka creek will begin to dig September 4. This is the second dredger built on this ground. The first was on the scoop pattern, and was a failure. The present one is a modern, up-to-date bucket dredger.

Tuolumne County.

Work is to be resumed with power drills at the south extension of the Black Oak mine, near Soulsbyville.——It is reported that work is to be resumed at the Donella mine, near Arrastraville, by J. E. Conde.——At the Dutch mine at Quartz a sump is being put down from the 1720 level and a station is to be cut preparatory to drifting to the pay shoot. In the mine and mill sixty men are employed. A. Trittenbach is superintendent.——It is reported that a rich strike has been made on the 700 level of the Lightner mine, Angels Camp.——At the New Calico, east of Stent, since work was begun on April 6, the main vertical shaft has been sunk 225 feet and 1000 feet of drifting and crosscutting done. Sinking has been temporarily suspended and a crosscut started east from the bottom. An 8-drill air compressor has been ordered. J. A. Thompson is general manager.

COLORADO.

Clear Creek County.

The Central tunnel of the Big Five Tunnel, Ore Reduction & Transportation Co., near Idaho Springs, is in 4420 feet and is to be continued 5000 feet farther. It is to cut the veins of the Quartz Hill district. The ore transportation charges for mill ore, according to the Mining World, are 4 cents per cubic foot for 5000 feet or less of haulage and ½ cent per cubic foot additional for each additional 1000 feet or fraction thereof to 15,000 feet. For tramming smelting ore $1 per ton additional is added to the other rates, and waste is hauled for one-half the above rates. Air is furnished for driving drills at the following rates: Leyner drill, No. 5, each drill $4 per shift. Plunger drill with 2½-inch cylinder or less, each drill $4 per shift, with an increase of 25 cents for each ½ inch increase in diameter of drill cylinder; eight hours to constitute a shift and any less number of hours to be charged as full shift; if air be furnished for longer than eight hours at one time extra time will be charged pro rata for each hour or fraction thereof of thirty minutes or over. Sharpening hand drills, 3 cents each; sharpening plunger drill bits, 6 cents each; sharpening Leyner drill bits, 7 cents each; sharpening picks, per point, 3 cents each; sharpening gads, moils, chisels and similar tools, 3 cents each; making hand drill bits, 6 cents each; welding plunger drill bits, 25 cents each; welding Leyner drill bits, 35 cents each; laying picks, per point, 50 cents each; making plunger drill bits, with one weld, 65 cents each; making Leyner drill bits, two welds, not including making shank, 75 cents each; general smithing, smith only, 75 cents per hour; general smithing, smith and helper, $1.25 per hour. No charge less than 25 cents. The Newhouse tunnel is in nearly 3 miles and is transporting ore from the Gem, Sun and Moon and the Saratoga. This tunnel charges for the first mile, smelting ore, $1.25; mill ore, 65 cents; waste, 25 cents a ton, which charges increase proportionately up to $2 a ton for smelting ore with added distance. This and the other tunnels furnish free drainage for properties along the line of the tunnel, and are purely transportation enterprises; it is optional whether the companies owning the veins cut operate through the tunnel or not. The advantage of tunnel transportation is so great, notwithstanding the arbitrarily high charges, that practically all the ore in the veins cut by the tunnel, within a lateral distance of half a mile along the tunnel course, will be taken out through the tunnel. In the case of the Newhouse tunnel, the tunnel company has no financial interest in the mines along its course, and it furnished the funds for driving the tunnel, except that in some cases arrangements were made with mining companies to advance funds for the work, to be credited on future transportation charges. The tunnel cost about $500,000. The tunnel is equipped with a double track and an electric trolley system of haulage. The portal is immediately upon the railroad track and the ore cars are dumped automatically into bins for loading by gravity into cars. The Newhouse tunnel is 9x12 feet and the Central 6x8 feet, single track. These tunnels have cost $15 to $25 per foot to drive, no timbering being used except at the portals.

The R. E. Lee tunnel of the Southern M., M. & Dev. Co. on McClellan mountain, near Silver Plume, is in 460 feet. Above the R. E. Lee a crosscut is being driven to the King of the West lode. F. A. Babcock is superintendent.——The Dives-Pelican mill, near Silver Plume, is now running continuously, as a larger dynamo has been put in for driving the Huntington mills. A large duplex pump has been put in to supply the mill with water from the creek.——It is reported that B. J. O'Connell intends driving a lower tunnel on his property on Republican mountain, near Silver Plume.——Superintendent Cæsar Garrett of the Colorado Central property, on which F. A. Maxwell recently secured a lease and bond, reports that the task of cleaning out the old workings and putting them in shape for operation is completed, and that a large ore production will now be commenced.——D. W. Stewart of Idaho Springs has secured a bond and lease on the Blue Bird claims from Wm. Hunt of Georgetown and Nels Frohm of Denver. He proposes to continue work on the crosscut, which is in more than 800 feet.——A strike is reported from the Dictator property on Columbia mountain, near Georgetown, being operated by George August under lease.

Gilpin County.

The Gold Dirt mill at Perigo, 3 miles above Rollinsville, has been started up. E. C. Englehardt has charge of the cyanide plant. The crushed ore is carried from the Huntington re-grinder (where it is ground to 100 mesh) by an elevator to hydraulic sizers, and the sands from the sizers run by gravity to revolving barrels, where they are cyanided, the process being completed in four hours. The slimes from the sizers are settled in six 10x20 slime tanks, the first two receiving them, the overflow passing into the other four. In due course the settlings with the solution are pumped through the entire series of tanks. The mill is equipped with compressed air, bullion furnaces and assay office. The main inclined shaft of the Gold Dirt mine is down 700 feet, but Manager Anderson is sinking a new vertical shaft near the mill. The mill is an experiment to treat by cyanide pyrite ores.

The Druid G. M. Co. is operating in Willis gulch of the Russell district under the superintendency of C. W. Anderson. Operations in the main shaft are being car-

ried on in the 150 and 200-foot levels, drifting being carried on in the 200-foot level, where ore is showing up on both sides of the shaft, while stoping is in force in the east and west 150-foot levels. Both milling and smelting ores are being taken out, the milling ores being sent to the Polar Star mill, while the smelting ores go direct to the smelters in Denver.

At the Pride mine, on Mammoth hill near Central City, the main shaft is down 180 feet. Hoisting is being done with a whim, but M. E. McLain intends putting in hoisting machinery soon.

The Chemung-Belmont mine, near Lake gulch, has been started up under the foremanship of Wm. Willis of Central City. The property is being operated by the Central Bonding & Leasing Co. with Chris Hesselbine of Denver as manager. Work was resumed in the main shaft with a contract for 100 feet of sinking, the shaft being down 600 feet. Drifting will be commenced on both sides of the shaft at the 600-foot point.——It is reported that machinery and topbuildings will be put on the No. 2 shaft on the Russell property of the Russell M. Co. The company owns the Russell and West Pewabic in the Russell district. Frank Paxton is superintendent.——It is reported that the Hillhouse mine in Russell district, owned by Potter & Co. of Central City, is to be started.

It is reported that work is to be resumed on the Gunnell properties in Eureka district, near Central City. New machinery is to be put in. F. C. Young of Denver is manager.

Gunnison County.

The aerial tramway of the West Gold Hill M. Co., which runs from the Carbonate King claim to the mill, near Tin Cup, is in working order. A tram from the Iron Hat to the Carbonate King, where the ore is transferred to the mill tramway, is also in place. The track has been laid in the Carbonate King incline and ore is being taken out. L. Cavnah is in charge.——The Keyes Placer M. Co. has men and teams working on their ground, 7 miles northwest of Tin Cup, making preparations for hydraulic mining next spring, as the ditches cannot be gotten in shape until too late for work this fall. The old ditch in Dry gulch is being repaired and water from Willow, Cow, Pass and Texas creeks will be used.——A new strike has been made by Charles Stiles on the McKinley property on Anna mountain in the Tin Cup district.

Hinsdale County.

Machine drills are to be put in the Wyoming mine, near Lake City, by Superintendent W. G. Pitts.

Lake County.

The Fortune mine, near Leadville, owned by James McNeece, has been leased to Geo. Becker, T. S. O'Brien et al. Development is being continued to the upper workings. The drawing of the pumps from the lower levels of the Resurrection has not flooded the lower levels of the Fortune, and work from the bottom of the shaft will be carried on next month after the lessees have prospected the ground and located the ore shoots. The Resurrection is working the upper levels and shipping a fair grade of iron.

Park County.

The Almaden M. Co., operating at Alma, has acquired the Colorado claims near the Golconda mine, on Fall river, and is preparing to put in machinery. W. T. Dumbleton is in charge.

San Juan County.

On King Solomon mountain, near Silverton, the Arpad M. Co. is running a new tunnel with three shifts. The Arpad Co. is composed of Denver people, with Theodore Grabowsky as general manager and mine superintendent.——A 2700-foot flume is being built by Charles Dale from Stony creek to Old Hundred mill in Cunningham gulch. A tank is being put up for the Old Hundred Co. for a reservoir at the mill. Its diameter will be 15 feet and its height 12 feet.——An air compressor and drills are to be put in at the new 1000-foot tunnel to be run by the Mayflower Co. from Arrastra gulch, near Silverton.

Summit County.

The Beaver Creek G. M. Co., which is operating the Old Lucky and adjoining lodes on Mineral hill, near Breckenridge, has had the concentration mill on the property running on ore from the mine. The management will add a number of concentrating tables to the plant later on. At present the concentration of the second-class ore is being done with Hartz jigs. By adding concentrating tables the capacity of the plant will be increased. G. E. Moon of Breckenridge is superintendent.

Niles & Walker have nearly finished building a 5-stamp mill and concentration plant near the mouth of the lower tunnel of the Laurium in Illinois gulch, near Breckenridge.——The Quandary mill, near Breckenridge, is to be overhauled and its capacity increased to 100 tons a day. W. H. Harrison of Grand Island, Neb., has been at the mine.

Teller County.

C. G. Jackson & Co. have a lease on the Fountain Valley claim of the Banner G. M. Co., between Beacon and Rosebud hill, Cripple Creek. Work is to be started as soon as a compressor has been put on the Mary Nevin. The main shaft is to be sunk 100 feet deeper, giving a depth of 438 feet.——Tube mills are to be used at the Little Giant mill in Pony gulch, 3 miles southeast of Cripple Creek, to crush the ore for cyanide treatment. ——The Last Dollar G. M. Co. of Cripple Creek has resumed hoisting after a short shut-down to repair the hoist. It now can handle 50% more rock than before. ——Manager E. M. De La Vergne of the Elkton Con. expects to finish repairing and retimbering the Elkton shaft by Sept. 1.——Gold-bearing ore is reported to have been struck by Lessees Duncan and Kain in the east end of the Teutonic property of Ironclad hill.

IDAHO.

According to E. W. Parker's statistics in the U. S. Geological Survey's report on "Coal Production in 1904," Idaho produced 3330 short tons, with a spot value of $12,230. The only coal areas of Idaho from which any production has been obtained are found in the Horseshoe bend and the Jerusalem districts, occupying the lower portion of a ridge between the Boise and Payette rivers, in front of the Boise mountains. In the Horseshoe Bend district there is one seam of high-grade lignite of about 3 feet in thickness. The Jerusalem district, which contains four different seams averaging from 3 to 8 feet in thickness, also contains lignite of about the same character as that of the Horseshoe Bend district. There are two other occurrences of coal in the State—one near Salmon City, the other at the northern edge of the State, where the Sublette field of Wyoming extends across the line. No mining is carried on in either of these districts at the present time. The production from the Horseshoe Bend and Jerusalem districts has been very irregular, never reaching any commercial importance.

Custer County.

At the Golden Sunbeam, 7 miles from Custer, Superintendent Gable has ten men at work. The mill is running. ——Considerable excitement has been caused by the recent strike at Parker mountain, between Custer and Challis.——It is reported that John Wallace of Boise will put a dredger on his placer mine near Bonanza.

Nez Perces County.

A. C. Weary and G. S. Ellinger of Chicago have returned from a visit to the Gold Crown mine, on the upper Snake river, near Cave gulch. They will arrange for a 100-ton cyanide plant. The property is managed by J. M. Edwards of Lewiston.——G. A. Garvin and I. S. Hammond of Portland have completed arrangements for a cyanide plant at Lewiston to handle black sand from the Snake and Clearwater rivers. The plant will have a capacity of sixty tons per day at the beginning. The black sand is separated from the gravel on concentrating tables.——The Ry-Bar M. Co. is operating a concentrating plant 3 miles south of Lewiston, on Snake river, and is securing 800 pounds of concentrates daily. The process is new, having been perfected by the local assaying firm of Jellum & Jones.

Owyhee County.

The War Eagle Consolidated Co., of Silver City, are cleaning out the Oro Fino tunnel, which drains the mines belonging to that company to the depth of 400 feet, with the intention of pumping out the Chariot shaft through that tunnel. The men who have been making the upraise from Sinker tunnel have been laid off and work from that point suspended until the shaft has been pumped out and surveys made to ascertain where they are at. The manager had contemplated tapping the bottom of the Chariot shaft with a diamond drill, starting the hole from the Sinker tunnel upraise, now up from the tunnel 600 feet, with 300 feet more of a raise to make to reach the bottom of the shaft. But the uncertainty of driving the hole right, and the danger of tapping a body of water with 1000 feet pressure, even with a drill hole, were too serious engineering problems to be solved by that means.——The De Lamar mill at Silver City is being overhauled.——A. Buckbee, manager of the Pioneer M. Co. of Silver City, has contracted with the Trade Dollar Co. for electric power; ordered a motor, and is having a survey made to the Cumberland mill from the power line now running up War Eagle to the Poorman, and having a transformer put up at the mill, for the purpose of having the mill run by electricity.——The Addie M. Co. is pushing the reconstruction work on its mill, but will require two weeks to get it ready to start, new pans and settlers being put in.

Washington County.

Manager S. Peacock of the Ladd Metals Co. of Landore states that his company is putting in a reverberatory furnace of fifty-five tons daily capacity.

MICHIGAN.

Houghton County.

The Allouez, which has been operating one skip, has placed a second one in commission and resumed sinking for the fifth level. At the Centennial mill a second head is being overhauled to give the Allouez the exclusive use of one head instead of having Centennial run three days and Allouez three days alternately on the same head. This second head will be available for Allouez in a week. About two-thirds of the rock going to the mill comes from underground, while one-third comes from the stock pile which accumulated from the openings before the milling began. The buildings completed at No. 1 are the steel shaft rock house, the steel and stone engine house, the stone boiler house, with four boilers, the compressor house, the machine ship, which at present contains the blacksmith shop, and the change house. Work is progressing favorably at No. 2 location, in getting into shape for sinking the permanent shaft. The third drain shaft is going down very well, having reached a depth of 50 feet, and the flow of water is decreasing there, while in the first and second drain shafts it has been reduced to a very marked degree.

At the Erie-Ontario property the steam power hoisting engine has begun service. As this replaces the derrick and horse power which have been in use, the work will be prosecuted with greater facility. An air compressor has been put in at the Erie-Ontario.

MISSOURI.

Jasper County.

The Cataract M. Co. intend to put up a new 150-ton mill on the Gover land, at Chitwood. R. S. Neal is manager.

Stone County.

The Oronogo mill, on the Riddle tract, southwest of Galena, has been burned. It was operated by Robert Murdock and James Keyes. The loss is estimated at $5000; insurance, $1000.——Schellack & Co. have started a shaft on the Weyman tract, northwest of Galena.

MONTANA.

According to the report of the U. S. Geological Survey on "Coal Production for 1904," Montana's total coal production in 1904 was 1,358,919 short tons, valued at $2,194,548. Although most of the coal of Montana is of Cretaceous age, coal-bearing formations are found in all rocks, from the Jurassic to the Tertiary. The coal found in the Jurassic, however, is too thin to be profitably worked. The coals of Montana vary in character, from lignite to bituminous, some of the latter being fair coking coals. The total area of Montana underlain by coal is estimated at 32,000 square miles. The producing areas are in somewhat widely separated fields, among which may be mentioned the Bull Mountain field, northeast of Billings, where a considerable amount of prospecting and development work has been done. The coal of this field is lignitic in character. In the Clarks Fork field, in the southwestern portion of Yellowstone and northeastern part of Sweetgrass counties, and extending southwestward through Carbon county, the coal is lignitic and not at present worked to any large extent. The Rocky Fork field, in Carbon county, contains five different beds of coal, varying in thickness from 4 feet to 7 feet 9 inches. All of this coal is between lignite and bituminous and said to make an excellent steam and domestic coal. The Yellowstone field and the Trail Creek field are in Park and Gallatin counties and cover the operations in and around Bozeman and Livingston. The Cinnabar field is a small area lying just north of the Yellowstone National Park, and west of this are the West Gallatin and Ruby Valley fields, which have not yet been developed to any great extent. Other areas are the Toston, Smith River and Belt, or Great Falls fields, the last mentioned being the most important. Some of the largest mines in the State are those at Cottonwood, in Cascade county. Judging from the activity in the coal mining industry of Montana, there has been little or no change in the industrial conditions of the State during the last ten years. Coal production has remained practically stationary during that time, ranging from a minimum of 1,358,919 short tons in 1904 to 1,661,775 in 1900, and averaging 1,513,818 short tons for the entire period. The greater part of the coal production in Montana is used by railroad locomotives, and as there has been no railroad building to speak of in the State for the last ten years, the stationary condition of the coal mining industry may be accounted for. The production in 1904 was the smallest tonnage recorded since 1894. Compared with 1903, when the output was 1,488,810 short tons, the production in 1904 exhibits a decrease of 129,891 short tons, or 8.7%. The value of the product decreased from $2,440,846 in 1903 to $2,194,548 in 1904—a loss of $246,298, or a little over 10%. During 1904 the coal mines of Montana gave employment to 2505 men, that averaged 243 working days each, against 2155 men for 254 days in 1903. The average production per man employed for the year in 1904 was 542.5 tons, against 691 in 1903 and 805 in 1902. The average daily tonnage per man was 2.23 in 1904, 2.72 in 1903 and 2.98 in 1902. The majority of the mine workers in Montana worked nine hours a day, all of the larger mines but two reporting a 9-hour day. There were nineteen mines, employing altogether 646 men, that reported eight hours; eight mines, employing 1653 men, reported nine hours, and four mines, employing twelve men, worked ten hours.

Deer Lodge County.

After being closed down a month to permit of the retimbering of the shaft, operations have been resumed at the Never Sweat mine at Butte. During the time the mine was out of commission no ore was raised, but a number of miners were engaged in opening up new ground and doing other dead work.——At the Mountain View of the Boston & Montana, the new boilers for the new hoisting engine will be finished soon. The job is not interfering with the mining of ore in the property.

Fergus County.

The Hedges G. M. Co., owning seven claims at Kendall, is preparing to do diamond drill work for the purpose of determining the extent of the ore bodies in its Mary claim, on which a shaft was sunk some time ago. This is now on a ledge of ore at a depth of 75 feet. Its tract comprises 140 acres. The officers are M. M. Hedges president, C. M. Goodell vice-president and J. W. Hedges secretary-treasurer.

G. S. Wells has sold to A. M. Plumb the Edna property at Kendall, and the owner will develop this prospect at once.

Madison County.

E. W. Merritt is running 100 tons of ore from the Highup mine through the Shafter mill, near Virginia City. The mine is at the head of Hungry hollow and is developed by a tunnel, the face of which is in 250 feet.

Silver Bow County.

(Special Correspondence).—A new and large ore body has been opened in the Corra mine, one of the United Copper properties, and the mine is now shipping 600 tons of ore per day.——The Lexington mine, an old silver producer, is turning into a copper property. F. A. Heinze is developing the mine and is shipping about fifty tons of copper ore daily. The Lexington will go into the new La France C. Co.— The August output of copper from the whole Butte district will exceed 31,000,000 pounds, and of that amount the Washoe smelter, at Anaconda, will contribute 15,250,000 pounds, the highest mark in the history of the smelter. The Washoe treats the ores from the mines of the Anaconda, Washoe, Parrot, Trenton, Speculator and Butte & Boston Cos.—— With the exception of several mines that are closed by injunction in the Heinze-Amalgamated litigation every property in the Butte district is working, many mines to their utmost capacity. The stimulus is the high price of copper and the fact that there is comparatively little stored.——The North Butte M. Co. is shipping about 800 tons of ore a day.

Butte, Aug. 29.

NEVADA.

Esmeralda County.

(Special Correspondence).—In the Goldfield district the following mines have reached water level and the sulphide zone, and are producing sulphide and undecomposed ore: The Florence, Combination, Red Top, January, Quartzite, Jumbo and Silver Pick. Several leasing companies on the above mentioned properties are now sinking to get to the sulphide zone.

Goldfield, Aug. 28.

Lincoln County.

(Special Correspondence).—The Shenandoah lead-silver patented mine has been bought by Judge Barton, of Pioche.——Development work on the Chiquita gold mine improves the size of the ore body, and arrangements are under way to mill the ore in the Keystone mill at Sandy.——The Potosi lead-silver mine has 35 men at work. Ore is shipped by the San Pedro & Salt Lake railroad to the smelter in Salt Lake valley, Utah.——D. W. Johnson is developing a lead-silver mine.

Sandy, Aug. 29.

An automobile line has been established between Searchlight and Leastalk, on the Salt Lake route, and Manvel, on the Santa Fe.——F. D. Howells intends to continue sinking the Sazerac shaft at Searchlight till the lower ore bodies are reached, estimated at a depth of 800 feet.——Gordon Surr has resumed cyaniding the tailings from the Cyrus Noble at Searchlight.——The Searchlight Bonanza M. Co. has been formed, with H. A. Perkins as manager, to work the Black Bear, Nevada, Lion and Iowa claims. A 200-foot shaft is to be sunk.

Lyon County.

The Nevada Smelting Co., which has recently purchased the plant of the Boston-Nevada Smelting Co., is trying to make contracts with the copper mine operators near Yerington for sufficient ores to run for ten years a smelter they plan to establish. The company offers to reduce the ores at the rate of $10 a ton and buy the copper at the regular market price.

Nye County.

A 15 H. P. gasoline hoist is being put in at the Steinway mine, near Bullfrog. Sinking is to be resumed.——Superintendent McCauley is putting in a new gasoline hoist at the Great Eastern mine, near Bullfrog, and will resume sinking from the 110-foot level.——After reaching a depth of 330 feet work has been stopped at the Amargosa, at the south end of Ladd mountain, Bullfrog district, until a new hoist can be put in.

Storey County.

The steel headframe at the Union shaft at Virginia City has been completed and the rope changed from the temporary wood gallows frame. This is the first steel headframe to be used on the Comstock, and was put in to replace the frame destroyed by fire.

White Pine County.

It is reported that the smelter of the Con. M. Co. at Ely is nearly completed. This is to have a capacity of 250 tons, and Superintendent J. L. Giroux hopes to treat 100 tons of ore with eight tons of coke.

NEW MEXICO.

Dona Ana County.

The Modoc M. Co. has resumed work at Organ and will put in a new dry process to treat its low-grade ore. Shipments of lead ore are being made to the smelter at Deming. —— The Stephenson-Bennett Con. M. Co. has put in a new air compressor and is pushing work on its double-compartment shaft, which will be sunk to a depth of 450 feet to cut the old Bennett vein on its dip.

Grant County.

The St. Louis Copper Co. is working the Garnet group at Jarilla under lease and bond. The shaft is down 400 feet and a number of shipments of a good grade of ore have been made. As soon as electric power can be had an electric hoist and electric drills are to be put in. —— The Lincoln Copper Co. is developing claims at Jarilla and will put in electric machinery as soon as the contemplated electric power plant of the Southwest S. & R. Co. has been built. A double-compartment shaft and a crosscut are planned.

Taos County.

The Mammoth mill at Pinos Altos has been running steadily on ore from the Mina Grande, which Walter Brandis, the superintendent of the mill, has under lease. The mill has been treating twelve tons a day, but the capacity is to be increased shortly to twenty-five tons, and two shifts will be put on, both at the mines and the mill. Brandis also has a lease on the Mogul. A tunnel connection will also be made with the Mina Grande, so that ore from the latter may be taken out of the Mogul shaft.

OREGON.

Baker County.

The ore body cut on the 400 shaft level of the Baisley-Elkhorn mine, near Baker City, is being drifted and is said to be equal to that mined on the upper levels of the property. The ore was found on a diorite-granite contact at a depth of about 700 feet, as the collar of the shaft is in a long crosscut having a depth of 300 feet.

Douglas County.

The mill of the Oregon Securities Co., at Bohemia, has been shut down since August 1 on account of lack of water. Prior to the mill closing the stamps were treating between fifty and sixty tons a day. The management expects to start the mill on October 1, and keep it in continuous operation.

Tillamook County.

Drilling for oil in the Nehalem district has commenced under the direction of the Portland Development Co. A standard rig drill has been secured and is said by the management to have commenced boring. It will drill to a depth of 2500 feet, if necessary, to prove the formation.

SOUTH DAKOTA.

Lawrence County.

The Dizzy M. Co., in False Bottom gulch, 3 miles from Maitland, has resumed work with two shifts. The work was stopped by water recently, but a pump with a capacity of 200 gallons per minute has been put in. H. H. France is superintendent of the company.

Pennington County.

The Mainstay Co., at Keystone, is having an artesian well drilled to a depth of 400 feet below the bottom of the shaft, making a hole 700 feet deep. Machinery is being received.

UTAH.

Beaver County.

A gasoline hoisting plant has been put on the Moscow mine, near Milford. William Ferguson is superintendent.——The Lenora M. Co. is shipping high-grade silver-lead ore from Milford. The Lenora group is in Star district. M. L. Burns and son are the owners.——J. C. Brownfield, manager of the Wasatch King M. Co., in Beaver Lake district, has driven the tunnel in over 400 feet.

Juab County.

The ore shipments from Tintic district were 148 carloads for the week ending August 24: Centennial-Eureka, 62; Eureka Hill (lease), 6; Bullion-Beck, 6; Gemini, 12; Victoria, 6; Grand Central, 6; Mammoth, 13; Carica, 5; Ajax, 4; Swansea, 7; South Swansea, 1; Eagle & Blue Bell, 14; Yankee Con., 2; Uncle Sam, 4. Two carloads of concentrates were shipped from the Uncle Sam mill.——Work is progressing satisfactorily at the Raymond-Illinois property, north of Eureka. Superintendent J. C. Sullivan is running a drift from the 1500-foot level, so as to tap the ore extension of Tintic in the north.——A body of silver-lead ore has been cut by W. R. McComb in the old workings of the Gomery claims, in East Tintic.

Salt Lake County.

At the Fortuna mine at Bingham machine drills are at work in the crosscuts. A gasoline hoist is being put in on the main working level, where an old shaft was cut. This shaft is to be sunk deeper, to give a depth of 1500 feet on the vein.

The management of the Congor mine at Bingham is having difficulty in unwatering the lower workings and the examination by representatives of the holders of the existing bond is being delayed. G. G. Hall is manager. ——H. M. Crowther, manager of the Continental Alta mine at Alta, states that the first shipment of wulfenite concentrate from that property is ready.

The Phœnix M. Co. of Bingham has put in an electric air compressor. The building is 18x50 feet.——The Ohio Copper Co. will sink to the 500-foot level.

Summit County.

To get around the last cave in the Ontario drain tunnel at Park City it has been decided to employ the same tactics that were used to draw off the water without endangering the lives of the men employed when the first bad cave was struck, and which, at the time, was thought to be the one that was holding back practically all of the water and allowing the mine to fill up. First the ground was tested by driving pipe into it. That was followed by Superintendent M. Connolly drifting into the mass for 50 feet. From that point he has put men and machine drills at work to parallel the main tunnel with a new one. Where this work is being done the ground has been considered rather treacherous for 400 feet ever since the tunnel was constructed. That being so, Superintendent Connolly will probably push the side drift for the distance named. Strong concrete and steel bulkheads will then be put in, as in the first instance, and a large number of holes will be drilled through to the main tunnel from the pipes set in the bulkhead and equipped with valves to control the water as each puncture is made. This will probably take four months more.

WASHINGTON.

Okanogan County.

Henry Bahrs, manager of the Copper World Extension M. Co., at Loomis, is sinking a shaft on the Copper World Extension mine. This shaft is down 150 feet and will be sunk to a depth of 300 feet before any more crosscutting will be done.——The Douglas mountain tunnel, on Palmer mountain, which is to be driven 3000 feet in all, is now in 308 feet.

Stevens County.

The traction outfit of the Copper King mine is delivering 60 tons of ore per day to the railroad for shipment to the Northport smelter.——The Nellie S. mine has four men at work sinking on the main shaft near Chewelah. President H. H. Baker has charge of the work.

FOREIGN.

AFRICA.

Transvaal.

The Main Reef series has been cut at a depth of 3862 feet in the shaft of the Angelo Deep, east of Germiston. The shaft of the Cinderella Deep at Boksburg is also close upon the Main Reef. There are now between 40,000 and 45,000 Chinese at work in the Rand mines, and, beyond a little friction with the white miners, no serious trouble has been experienced.

AUSTRALIA.

New South Wales.

The New South Wales gold yield for July amounted to 39,862 ounces, valued at £128,092, as compared with 27,169 ounces, valued at £102,486, in the corresponding month of last year. The total yield for the seven months ending July 31 was 171,140 ounces, valued at £603,280, as against 196,216 ounces, valued at £704,312, in the first seven months of 1904.

Victoria.

Regarding dredger mining and hydraulic sluicing in Victoria during 1904, D. B. Sellars in his annual report to the Secretary for Mines and Water Supply, says that twenty-two bucket dredgers working for an aggregate period of 839 weeks raised 4,653,026 cubic yards of material for a yield of 18,962 ounces of gold, or 1.9 grains per cubic yard. The area treated was 202 acres, the quantity of gold saved per acre being 93.7 ounces. The dredger which treated the most material got 1479 ounces for fifty-one weeks' work, from 19½ acres of ground, which averaged 1.5 grains of gold per cubic yard of material dealt with. The average weekly yield of gold per plant was 22.6 ounces. The number of men employed was 325. Thirty-one pump hydraulic sluices for an aggregate working time of 912½ weeks dealt with 5,302,014 cubic yards of overburden and washdirt for a return of 29,294 ounces of gold, or 2.65 grains per cubic yard; 23 tons 15 cwt. of tin were also won. The area worked was 136½ acres, the quantity of gold saved per acre being 214.4 ounces. The plant with the highest yield got 3078½ ounces from 14½ acres of ground, containing 660,660 cubic yards of material, or an average of 2.2 grains per cubic yard. The average weekly yield per plant was 32.1 ounces, and the number of men employed was 1015. One other plant working gave 51 ounces, but further particulars are not available. Six hydraulic jet elevators working for an aggregate of 109 weeks put through 237,360 cubic yards of alluvium for a return of 1463 ounces, or 2.95 grains of gold per cubic yard of material treated; 19 cwt. 3 qrs. 2 lbs. of tin were also won. The area dealt with was 7⅞ acres, the quantity of gold won per acre being 185.8 ounces. These six plants provided work for 69 men. An additional yield of 256 ounces was obtained from five other plants, but other information is not available. In all, fifty-nine dredger mining plants, comprising twenty-two bucket dredgers, thirty-one pump hydraulic sluices and six jet elevators, treated 10,192,400 cubic yards of material for a yield of 49,718 ounces of gold, or an average of 2.34 grains per cubic yard of solid matter dealt with. The area worked was 346.7 acres, which averaged a return of 143.4 ounces of gold per acre, and employment was given to 1409 men. From returns supplied in connection with hydraulic sluicing by gravitation, it appears that there were ten plants operating, of which seven were working under leasing conditions and three under mining by-laws of the district. The aggregate number of weeks worked was 181, the quantity of overburden and washdirt dealt with being 464,842 cubic yards for a return of 3014 ounces, or at the rate of 3.1 grains of gold per cubic yard of material treated. The area worked was about 9½ acres, the quantity of gold saved per acre being 313.9 ounces. The highest yield was 1646 ounces from four acres. These plants gave employment to 83 men. Four other plants gave an aggregate return of 80⅛ ounces of gold and 35 tons 9 cwt. of tin; further particulars not available. Other plants working sent in no returns. An additional yield of 2136 ounces was obtained by small sluicing parties working under miners' right. The total quantity of material treated during the year under the heading of dredger mining and hydraulic sluicing by gravitation was 10,657,242 cubic yards, as against 7,963,927 cubic yards for 1903. The amount of gold obtained shows an increase of 13,211 ounces, being 55,257 ounces, as against 42,046 ounces. The yield of gold per cubic yard of material treated was 2.375 grains, as against 2.39 grains for the previous year. The number of men employed was 1505, and the total area treated 356⅛ acres. The quantity of tin obtained during the year was 60 tons 3 cwt. 3 qrs. 26 lbs. It is satisfactory to note that the elevator as an aid to mining has disappeared from the bucket dredgers. Originally there were seven plants in use fitted with this appliance; at present there are none. It has been discarded in favor of the box sluice. Box sluices, furnished with a silt distributor by means of which the finer materials are spread out evenly and regularly over the top of the coarse material, are now doing good work in the Bright and Omeo districts. Experience shows the necessity of having, when dealing with very light wash or stiff clayey material, greater power for the nozzle than for the elevating pump in hydraulic sluicing, otherwise much financial loss occurs through pumping large quantities of simply useless water. It is generally supposed that ground having once been treated by a dredger becomes useless thereafter for mining purposes. In the case of stiff, clayey ground, however, this rule does not always hold good. Two cases have occurred during the past year where bucket dredgers have worked through, at a profit, previously dredged ground, and in one other case similarly treated ground yielded sufficient gold to pay working expenses.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Chicago men have completed an examination of the Chicago-British Columbia M. Co.'s properties in Skylark camp, 2½ miles from Phœnix. In the party were J. Gerts, vice-president of the company; N. Kuhnen, treasurer; T. T. Mueller and L. Warneke. They were met by Manager H. H. Shallenberger. The group consists of the Lake, Iola, Yellowstone fraction, Crescent fraction and Don Pedro.

Ore shipments from the mines of Boundary for the week ending Aug. 26 were: Granby mines to Granby smelter, 9137 tons; Mother Lode to British Columbia Copper Co.'s smelter, 3328 tons; Emma to Nelson smelter, 390 tons; Skylark to Granby smelter, 20 tons. Total for week, 12,875 tons; total for year to date, 571,-007 tons. Boundary smelters this week treated ore as follows: Granby smelter, 11,102 tons; British Columbia Copper Co.'s smelter, 1956 tons. Total treatment for week, 15,058 tons; total treatment for year to date, 585,-534 tons.

Slocan District.

The London Hill D. & M. Co. has let a lease and given a bond on its two claims on London hill at Bear lake to A. E. Eckert of Sandon.

Yale District.

Regarding the Similkameen division the British Columbia Mining Record reports that development work on the Sunset, at Copper mountain, by the British Columbia Copper Co., is proceeding satisfactorily, and fine ore is being met with on two drifts on the lead. The drift into the porphyry has been run 118 feet without reaching the contact. A few tons of ore were lately shipped for the purpose of having tests in concentration made. The ore is high in silica and low in lime and iron, so it presents a more difficult smelting problem than the copper ores of the Boundary. Some effective method of concentration would greatly simplify the treatment of this ore. The management are considering the feasibility of driving a tunnel from the Princess May claim with

the object of striking the Sunset lead at greater depth. This tunnel would have to be nearly a mile in length and would pass through a number of claims having good surface showings. Between 20 and 25 men are working on the Sunset.——Pouwells & Bonnevier have completed a 50-foot shaft on the Red Star at Roche river. ——Within two miles of Princeton, on One Mile creek, W. C. McDougall is employing several men on the United Empire group. During the past six months, on this group, a tunnel was run 150 feet, and a shaft sunk on a vein carrying copper and gold. Average assays are said to show values of $24.65 to the ton. A wagon road is being constructed to connect the property with the main trunk road up and down the valley.——Between Princeton and Granite Creek, on the Tulameen river, Oswald Coulthard is working on the Roany claim. ——An important resource that promises to be of commercial value is found in connection with the coal in this district, in the shape of an excellent fire clay that approaches closely in quality the best Scotch and English clays. A seam between 2 and 3 feet in thickness has been exposed in the tunnel the Vermilion Forks Mining & Development Co. has driven on its large coal cropping near the Similkameen bridge.

CHINA.

The Mining Journal reports that to the north of Tonkin, near the Chinese frontier, in the district of Cao-Bang, there are extensive tin deposits. These deposits lie in a high valley on the side of the Pia-Ouac mountain, in the district of N'Guyen-Binn, circle of Cao-Bang. They were discovered in 1899 by G. Gaillard and Duverger. Tin has long been mined by the Chinese in the alluvial deposits formed by erosion. The grant of Tinh-Tuc has already given excellent results, in spite of the primitive plant available. A granulite formation along the crests of the mountains contains the mineralized stock work of cassiterite, accompanied by wolfram and quartz. There are some valleys formed of privileged placers where the cassiterite is workable on strata of fine material containing white mica, tourmaiine, obsidian and quartz. Cassiterite is found scattered about with a little gold and wolfram in the deposits of the upper valley. The proportion of the cassiterite increases with the depth of the alluvium. The barren superficial earth is so much thicker and more clayey as it occupies the lowest parts of the valley. The average percentage of tin is 50%, though some samples have given 65%. The proportion of ore to the cubic meter of earth treated is, after washing, an average of 5 kilograms. Washing experiments made at various parts of the deposit gave 2.800 to 9.500 kilograms of cassiterite per ton of earth treated. A certain number of small local workings treat the ore on the spot, after washing, in Chinese furnaces, with very primitive blowing apparatus, employing wood as fuel. Nevertheless the yield attains 80% of the analyses of the ore utilized. In rich parts of the veins one, and exceptionally two, kilograms of metal are obtained per Chinese coolie per day. The claim of Duverger freres, which is the most important, was established on the Tinh-Tuc mine. It comprises a useful workable area of 12 hectares. Mining is done by forming a single step 25 meters long without previous removal of the superficial barren soil. The large stones are separated from the earth to be washed and are piled in the center of the excavation over a rich place to avoid cost of transport. The ore, often mixed with sterile materials, is carried away to be washed in baskets containing an average maximum of 2 kilogs. Two sluice boxes of the old Malacca type are employed. They are badly maintained and managed, a large quantity of fine ore rich in cassiterite being lost. The ore, still mixed with quartz and magnetite, is reduced in cupola furnaces, where the excess of silica to scorify makes the operation long. Not more than 1 kilogram of tin is produced per coolie per day. The tin is of excellent quality, thanks to the small amount of wolfram and mispickel. It is run in pigs weighing 25 kilos., which are sold at 3 to 3.50 francs per kilogram to the Chinese of the frontier. The Syndicat Francais Indo-Chinois intend to work a tin mine northwest of Cao-Bang. Stanniferous deposits are also to be found at Laos and Pak-Hin-Boun—a cassiterite in contact with ferruginous ore. At Yunnan the Chinese work stanniferous deposits similar to those of Cao-Bang.

MADAGASCAR.

Consul Hunt of Tamatave, Madagascar, furnishes a decree issued by the President of the French republic on June 23, amending a decree issued on June 3, suspending all prospecting for precious metals and precious stones on unclaimed lands in Madagascar. The effect of this modification will be that requests for prospecting permits may be received and registered by the mining department, which registration will simply maintain priority rights until the promulgation of a new decree amending the mining laws of February 20, 1902. The modified decree issued by President Loubet follows: Requests for permits to prospect for natural deposits of gold, precious metals and precious stones in Madagascar, prescribed on the conditions of Chapter 2 of the decree of February 20, 1902, will be, notwithstanding the stipulations contained in the decree of the Governor General of Madagascar, dated June 3, 1905, received and registered, as is provided in Article 12 of the aforesaid decree, but will have no other effect than to establish the priority of the requests and the eventual rights of the applicants for the obtaining of permits to prospect in accordance with the dispositions of a new law to intervene in the matter. It will not be applied to these prospectors' permits until after promulgation in Madagascar of the said law. The decree of the Governor General of Madagascar, dated June 3, 1905, is amended in all that is contrary to the dispositions of Article 1 of the present decree.

MALAY PENINSULA.

Gold mining operations are limited to certain mines in Pahang and Negri Sembilan. In Pahang the result is unfavorable. The total export of gold in 1904 was 20,157 ounces. The quantity obtained during the year from actual crushings was in Pahang, 12,625 ounces from 54,961 tons, and in Negri Sembilan 2189 ounces from 3438 tons. In addition, 146 ounces were won from alluvial workings, and 2115 ounces from 11,350 tons of tailings by means of the cyanide process.

MEXICO.

The Mexican Government has appointed a commission to study and reform the laws regarding coal and oil. As the law stands now, these minerals go with the land, and the land is owned in immense tracts generally by men who know nothing of these minerals, and the development of these industries is retarded. The plan of the Government is to segregate oil and coal from the land and put them in the same position with gold, silver, copper and other metals, which can be located by anyone on private lands. The commission is composed of J. L. Requena, Rodolfo Reyes, E. Martinez Baca, Joaquin Rounds and M. Ortega of Espinosa. As land stands now, its owners pay practically no taxes and they will resent anything which interferes with their prerogatives. The method of treating coal and oil will undoubtedly call for a tax on the lands which contain them, giving the land owners the first right to locate, and paying taxes is something a big Mexican land owner is unaccustomed to.

During the fiscal year 1904–5 the Department of Fomento issued 2840 titles to mines in the republic, covering 45,797 hectares of land, equal to a fraction over 113,164 acres. Of these titles, 1232 were issued in the half year from July 1 to December 31, with 19,690 hectares of land, and 1608 titles, covering 26,107 hectares, in the half year from January 1 to June 30, showing that 376 titles, with 6416 hectares of land, more were issued in the second half of the fiscal year than in the first half.

The following dividends were paid by Mexican mining companies during July, 1905: Dos Estrellas $90,000, Santa Gertrudis–Guadalupe $60,000, La Blanca, Pachuca, $50,000, San Rafael, aviadoras, $48,000, Santa Maria de la Paz $48,000, Amistad y Concordia $39,296, Real del Monte $25,540, Norias de Bajan $20,000, Soledad, aviada, $19,200, San Rafael, aviadas, $19,200, La Union Hacienda $15,000, Victoria, San Luis Potosi, $12,500, Providencia, San Juan de la Luz, $12,000, Sorpresa, aviada, $9600, San Francisco, Hac, $6000, Maravillas - San Eugenio $5000, Santa Maria de Guadalupe $5000, Turquesa, preference, $750, total $485,086.

American capitalists continue to search the mining districts of Mexico for profitable investment, and not infrequently promising mines, both old and new, are found, which are promptly equipped and sooner or later are placed on a paying basis. Good mines are to be had in Mexico, but no longer "for a song." The native miners have awakened to a realizing sense of the value of their mines, and to-day a good prospect or a developed mine in Mexico commands a price similar to that which it would bring if located in the southwestern United States. There are bargains occasionally, but as a rule a Mexican mine costs all the showing warrants these days.

Chihuahua.

At the Pinos Altos mines, in the Ocampo district, twenty stamps of the mill are ready to be started. The rest of the mill is undergoing repairs. The pan amalgamation process is to be substituted by concentration, with the cyanide process for the tailings. The pans are to be abandoned.——H. T. R. Cowell, manager of the Barranca de Cobre copper mines, 40 miles south from Bocoyna, on the line of the Orient Railroad, west of Minaca, has resumed operations on the mines. The concentrating mill will be started up next month. The management suspended all operations some months ago, but, now that the Orient Railroad will soon be running into Bocoyna, the mines will be within 40 miles of railroad transportation. The mines belong to a company which is controlled by the National Metal Co. H. P. Lewis, manager of the latter company, is expected to visit the mines.

Guanajuato.

The Guanajuato Reduction & Mines Co. has made final payment to the Casa-Rul M. Co. for the Veta-Madre mining properties at Guanajuato, and also mining properties in the district of La Luz. A 250-ton reduction mill and cyanide plant are to be put in before January 1, 1906.

Guerrero.

The Mexican M. & S. Co. has taken over the San Jose mines in the Taxco district and will operate a smelter there. L. W. Tatum of Cincinnati is general manager and W. D. Budrow has been appointed superintendent.

Mexico.

R. B. Hutchinson, manager Concheno mine, near Ocampo, is to increase the capacity of the cyanide plant from 60 to 100 tons daily. An electric power plant is to be put in.

Sonora.

The Democrata Cananea–Sonora C. Co. at Cananea, P. F. Hook superintendent, which has been developing during two years past, having closed down the smelter with a record of production of 3,000,000 pounds of refined copper in the year 1903, is preparing to put in a new furnace with a daily capacity of 300 tons of ore, and resume production.

SOUTH AMERICA.

Colombia.

Consul Snyder of Bogota furnishes a copy of the law recently enacted by Colombia reorganizing the national monetary system, from which the following items are taken: The monetary unit and current money of the republic is the gold dollar, divided into 100 cents, 1.672 gram weight and 0.900 fine. The other gold coins are: Double condor, of the value of $20; the condor, of the value of $10; the half condor of the value of $5. There will also be silver coins as follows: The half dollar, value 50 cents gold; the peseta, value 20 cents gold; the real, value 10 cents gold. Each of the coins mentioned will be of 0.900 fine and the weight corresponding to its value, relative to the gold monetary unit. For the purpose of minting the silver and fixing the values of the coins, each gram of gold of 0.900 fine will be considered as equivalent to 33 grams of silver. For each $100 of gold put into circulation there can only be put in circulation $10 of silver. If the Government deems it necessary for smaller transactions it may also order the minting of fractional coins of nickel, copper or bronze, with sufficient aluminum, of the value of 5, 2 and 1 cents, and not to exceed 2% of the amount of gold in circulation. The paper money legally emitted by the old National Bank and by the departmental governments will continue to preserve its character of forced currency and its independent powers according to the following rules: 1. It is in the power of all classes of contracts or transactions, civil or commercial, be they official or private, to state freely any class of domestic money or foreign gold. 2. In those parts of Colombia where the legal medium of exchange is silver, this will pursue its free power in relation to the price the standard of gold may have in the market, and contracts may be freely made in said money. The national silver coins known as ancient money, as the pesos of eight-tenths, and the coins worn in use will be classed with the money of 0.835 fine for the purposes of changing same for the new national money. The Government is authorized to recall, whenever it may deem it convenient, all old silver money circulating in the country in order to change it for those expressed in the present law, in the proportion which corresponds to it according to its value. The coins thus taken up and those received in the national treasury will be recoined in the mint. Individuals, both native and foreign, are prohibited from importing silver money. Domestic or foreign moneys which may be introduced into the country will be confiscated.

Books Received.

"The Western Electrical Directory," with names of companies operating electric light and power plants and electric railways, with additional information, is published by the Blanchfield Pub. Co., Rialto Building, San Francisco, Cal.

Professional Paper No. 36 of the U. S. Geological Survey, "The Lead, Zinc and Fluorspar Deposits of Western Kentucky," by E. O. Ulrich and W. S. T. Smith. This is a detailed report on the geology and mining of this district and should do much toward opening up many undeveloped resources of the country.

As extracts from "Mineral Resources of the United States" the United States Geological Survey has published "Statistics of the Clay Working Industries in 1904" by J. Middleton; it deals chiefly with the pottery and brick and tile industries, and is largely tabular in treatment. And "Statistics of the American Iron Trade in 1904" by J. W. Swank.

The latest addition to the recent literature on cementing materials is a comprehensive summary on "Cements, Limes and Plasters," by E. C. Eckel. The author's sequence of treatment is based on a logical classification of cementing materials into two groups, the simple and the complex. The simple cementing materials includes all those which are produced by the expulsion of a liquid or gas, through the action of heat, from a natural raw material, and whose setting properties are due to the simple reabsorption of the same liquid or gas, and the reassumption of original composition. The author subgroups this into the hydrate cementing materials or plasters, manufactured by dehydrating gypsum, and the carbonate cementing materials, or limes and magnesia, manufactured by driving off CO_2 from limestone or magnesite. The complex cementing materials include those whose setting properties are due to the formation of new chemical compounds during manufacture, or use, the set cement differing in chemical composition from the raw materials from which it was derived. This includes the silicate or hydraulic cements, whose setting properties are due to the formation of silicates, and the oxychloride cementing materials whose setting properties are due to the formation of oxychlorides. In succession is detailed the composition, distribution and excavation of raw materials; the chemistry, machinery and methods for manufacture and the composition, properties and tests of the finished product. In contrast to L. C. Sabin's "Cement and Concrete," this is more essentially a treatise for the manufacturers. Stress has been laid in the discussion of manufacturing methods on the general chemical and physical principles which underlie these methods rather than on the details which differ at every plant and may change with each year. The data on labor, power and costs seem to be particularly reliable. It is published by John Wiley & Sons, New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $6.

Commercial Paragraphs.

THE Ogden Assay Co., 1725 Arapahoe street, has moved its office to 1540 Court place, Denver, Colo.—a more central and commodious place for their line of work.

PEARY of Arctic fame has sent to A. Leschen & Sons Rope Co., St. Louis, Mo., for some of their patent flattened strand Hercules hoisting rope for use in his Arctic explorations.

THE El Paso Con. G. M. Co., Cripple Creek, Colo., is installing a Jeanesville Iron Works triple expansion station pump 1000 feet below the surface; capacity 2000 gallons per minute. The pump is fitted up with Corliss valve motion; the steam cylinders are lagged with Russia iron, steam separators and power lubricators.

THE Mine & Smelter Supply Co., Denver, Colo., with branch houses in Salt Lake City, Utah, El Paso, Texas, City of Mexico, Mex., and office in New York City, has recently purchased the patents for the United States of the Wilfley concentrating table and Wilfley slime table from A. R. Wilfley and in the future will manufacture this line of machines. A. R. Wilfley will be associated with the Mine & Smelter Supply Co. as director of the company and consulting engineer.

Personal.

W. T. McDONALD, of Chinipas, Mexico, is in New York City.

W. E. SHARPS is manager Kelvin reduction works at Kelvin, Ariz.

G. F. COLTON has been appointed manager Good Hope mine, near Searchlight, Nev.

H. B. MAXSON of Reno, Nev., has been elected secretary of the National Irrigation Congress.

OWEN DOYLE has succeeded R. B. Stanford as superintendent Ranch mine, near Columbia, Cal.

W. N. FREDERICK has been appointed superintendent Richfield M. Co., near Tuape, Sonora, Mexico.

JAMES FLEMING of Minnesota has taken charge of Last Chance mine at Maybert, Nevada county, Cal.

S. C. PRUNTZ has been appointed superintendent Bautista and San Rafael mines at Ameca, Jalisco, Mexico.

F. M. SMITH has been appointed manager, Helena, Montana, smelter of the American Smelting Securities Co.

A. F. WILLIAMS, manager De Beers Con. Mines, Ltd., will return soon to South Africa from San Francisco, Cal.

F. G. OWEN is to have charge of Mexican Petroleum Co.'s drilling operations in Ebano fields, Tamaulipas, Mex.

E. G. HADOW, manager Ferguson Mines, Ltd., Trout Lake City, B. C., is in London, England, on a business trip.

FRED BUTLER, superintendent Topaz gold mines at El Mico, Nicaragua, has been visiting Salt Lake City, Utah.

F. J. CLARK has been appointed manager Butterfly-Terrible mine near Telluride, Colo., vice J. F. Heating, retired.

PAT SHEEHAN of Butte, Mont., has succeeded J. A. Czizek, retired, as manager Lost Packer smelter at Loon Creek, near Custer, Idaho.

JOHN SHAW has resigned as foreman Iron Mountain mine, Shasta county, Cal., to take a similar position at the United Verde mine, Jerome, Ariz.

JOHN BLATCHFORD of Terry, S. D., has resigned as superintendent Golden Reward mine, and will take charge of mining operations at Kirwin, Wyo.

EMERSON GEE is in Los Angeles, Cal., from Sonora, Mexico, where he has been engaged in professional business, and is returning to Sonora and Sinaloa, Mexico.

J. F. CALLBREATH, secretary American Mining Congress, has returned to Denver, Colo., from a visit to Portland, San Francisco, Los Angeles and Salt Lake City.

J. H. TALBOT, formerly superintendent Riena de Oro M. Co., at El Tiro, has succeeded the late P. E. Murray as superintendent America M. Co., at Cananea, Sonora, Mexico.

E. E. ALEXANDER of Spokane, Wash., has been appointed superintendent department of mines and mining at Spokane Interstate Fair, which meets this year October 9 to 15.

J. D. KENDALL of London, England, consulting engineer Slough Creek Gravel Gold, Ltd., has been inspecting the company's drift mine on Slough creek, Cariboo, B. C.

RENSSELAER H. TOLL, of Mancos, Colo., is in Denver, Colo. He has resigned the superintendency of the M. Con. G. M. & Dev. Co., to attend to private interests and engineering practice.

THOS. KIDDIE has resigned as manager Tyee Copper Co.'s smelter at Ladysmith, Vancouver island, B. C., to accept the management of the Britannia Smelting Co.'s smelter at Crofton, Vancouver island.

E. B. BRADEN of the Everett and Helena smelters, H. B. Underhill, Jr., of the Selby smelter, and H. R. Rust of the Tacoma smelter, are the Western committeemen having charge of the interest of the American Smelting Securities Co. on the Pacific coast.

Obituary.

JOHN FEDERER, superintendent of the Modoc mine, died at Cripple Creek, Colo., August 22, of pneumonia.

WM. A. CAIN, foreman Standard mill, Bodie, Cal., was killed August 24 by falling on a revolving flywheel.

JAMES C. SAVERY, owner of the Cable mine, died at Cable Mountain, Mont., August 21, of heart failure. He was a pioneer in California, Idaho and Montana.

Trade Treatises.

A catalogue, entitled "Morgan Continuous Gas Producer," gives information concerning this rapidly developing industry. The application of producer gas to all operations requiring fuel for heating purposes is shown to be desirable economy. In tests made by Robt. W. Hunt & Co. an average efficiency of 92% is reported to have been obtained; 6x9, fifty pages, embossed cover, from the Morgan Construction Co., 40 Exchange Place, New York City.

Latest Market Reports.

SAN FRANCISCO, September 1, 1905.

METALS.

SILVER. — Per oz., Troy: London, 27¾d (standard ounce, 925 fine); New York, bar silver, 60c, refined (1000 fine); San Francisco, 60c; Mexican dollars, 48c, San Francisco; 46c, New York.

COPPER.—New York: Standard, $16.50; Lake, 1 to 3 casks, $16.50@17.00; Electrolytic, 1 to 3 casks, $17.00; Casting, 1 to 3 casks, $16.12½@16.17½. San Francisco: $16.50. Mill copper plates, $17.50; bars, 18@24c. London: £71 10s spot per ton.

Copper has made a further advance within the week, and according to expectation has touched the 17-cent mark for the best Lake metal. There exists at the present time an unusual condition in the copper market. The sellers are reluctant to make quotations, and the general feeling appears to be that no large orders out of the ordinary could promptly be filled by the producers. The threat of Thos. W. Lawson to raid the market has had no appreciable effect upon the price of the metal, as yet, nor is it likely to have. The industrial conditions of this country, and of Europe, are such that the present demand for copper must rather increase than diminish, and as it is apparent that the supply does not more than meet the demand, there seems little likelihood of the price going much lower at present. If, owing to a bear movement, the price of the metal falls, it will, without doubt, promptly recover. That the present price of the metal is maintained by the legitimate demand of the world's industries appears to be without doubt. Should a treaty of peace be signed by Russia and Japan there are those who think such an act would affect the market adversely, but the beginning of a new industrial life in the Orient would quickly tend to offset any temporary effect caused by the conditions which made a demand for copper imperative in the conduct of the war. True, Japan, and probably China, also, will soon be larger producers of copper than heretofore, but all of the metal they will produce for some time to come will be absorbed by their home requirements, even if their domestic output can supply the demand which a revival of industrial life must bring. For the present no material fall in price need be anticipated, or should such occur it is evident it cannot remain below 16 cents for any considerable length of time. Indeed, it seems quite likely to go above 17 cents. Its only dangerous competitor is aluminum, and the controlling interests of the copper market do not care to make this competition too sharp. The relative merit and usefulness of copper and aluminum is likely to fix the price of copper as long as present conditions prevail.

LEAD.—New York, $4.80; Salt Lake City, $3.50; St. Louis, $4.52½; San Francisco, $3.70, carload lots; 4¾c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £14 8s 9d ℔ long ton.

SPELTER.—New York, $5.75: St. Louis, $5.65; London, £25 12s 6d ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $32.75@33.25; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 35½c; less, 35½c; bar tin, ℔ lb., 35@37½c. London, £150 5s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $41.00@$41.50, large lots; London, £7 7s 6d; San Francisco, local, $38.50@39.00 ℔ flask of 75 lbs.; Denver, $42.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.00c; San Francisco, Plumbers', 100-lb. lots, 19.00c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb., .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 33@37c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $14.85; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$21.00; open hearth billets, $23.00@$23.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¼c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10¼c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¾c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¼@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7¾c; less than 500 lbs., 8c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 55c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.25.

URANIUM.—Oxide, ℔ lb., $3.50.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING AUGUST 15, 1905.

797,398.—SWITCH—W. J. Bell, Los Angeles, Cal.
797,168.—MINING SLUICE—P. Bouery, Weaverville, Cal.
797 170.—BORING MACHINE—L. Brodt, Berkeley, Cal.
797,171.—FRUIT WASHER—A. Cerruti, San Francisco.
797,097.—ADVERTISING CURTAIN—F. C. Chapman, Los Angeles, Cal.
797,405.—LINOTYPE MOUTHPIECE—R. Collins, San Francisco.
797,177.—DISK PLOW—W. S. Cook, San Jose, Cal.
797,187.—CAR SIGNAL—F. Ensign, Los Angeles, Cal.
797,195.—DRIFTING TOOL—H. D. Gould, Hood River, Or.
797,196.—DRIFT PLUG—H. D. Gould, Hood River, Or.
797,108.—SAW HANDLE—O. C. Hanson, Eureka, Cal.
797,279.—GAME BAG—L. W. Harpham, San Francisco.
797,109.—DREDGER—M. C. Harris, San Francisco.
797,057.—BALE TIE TIGHTENER—C. A. Hartmann, Hoquiam, Wash.
797,114.—AMBULANCE—W. R. Hill, Sacramento, Cal.
797,004.—COAL BUCKET—J. D. Isaacs, Oakland, Cal.
797,206.—CARBURETOR—H. L. Jessen, Oakland, Cal.
797 146.—CENTER BOARD—V. L. Ogidinssen, San Francisco
797,072.—BICYCLE SADDLE—H. M. Perkin, Los Angeles, Cal.
797,533.—MOTOR CARRIAGE—R. M. O. Phillips, Los Angeles, Cal.
797,223.—SWIMMING APPARATUS—C. P. Randolph, Oceanpark, Cal.
797,226.—STOVE—E. H. Richardson, Ontario, Cal.
797,230.—INJECTOR BURNER—A. C. Rush, Los Angeles, Cal.
797,465.—CLAMP—J. G. Sloberg, Oakland, Cal.
797,088.—PASTRY KNIFE—F. A. Tobler, Los Angeles, Cal.
797,478.—COFFEE FILLER—E. A. Weil, Sacramento, Cal.
797,164.—DUMP WAGON—R. E. H. Wurdisch, San Francisco.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

SHOE LACE FASTENER.—No. 797,743. Aug. 22, 1905. John A. McCoy, Sisson, Cal. The object of this invention is to provide a neat, simple and practical means for securing the end of a lacing without the tying of any knots. It consists in combination with a shoe having a lacing opening, of an eyelet secured to one side of the opening, said eyelet composed of a shank and a head, said shank having an opening through it for the lacing and having a longitudinal slot, and said head being made concavo-convex with its convex side presented outwardly and its peripheral edge normally in contact with the shoe upper, said head, also, radially slotted from its center outward, and with said slot arranged coincident with the slot in the shank and the walls of said radial slot turned outwardly at the entrance to the slot to permit the unobstructed passage of the lacing when winding the latter upon the shank portion interior to the concaved portion of the head.

WINDOW TIGHTENER.—No. 797,767. Aug. 22, 1905. G. H. Dyer, San Francisco, Cal. This invention relates to a device which is designed to prevent the rattling of windows and maintaining them substantially tight. The device consists of an inclined plate to be fixed to one of the parts of a window, a plate to be fixed to a companion part of the window, a pin mounted in the last-named plate, and a roller mounted on said pin, said roller having a slot extending radially from each side of its center and through which slot the pin passes whereby the disk is slidably mounted relative to the pin and the inclined plate.

JAR FASTENER.—No. 797,711. Aug. 22, 1905. E. Abramson and E. O. Bennett, San Francisco, Cal. E. O. Bennett, assignor of whole interest to E. Abramson. This device comprises two wire loops having inwardly projecting and horizontally curved hook members, each adapted to embrace a segment of a jar, said members having their inner ends overlapping and provided with eyes, and an operating lever formed of a single piece of wire, having its ends forming inwardly extending pintles adapted to enter the eyes of the hook members, said lever having, also, at points between its pintles and the outer end, eccentric portions located to one side of the pintles and adapted to fulcrum on the cover of the jar, and such details of construction as are necessary to produce the required result.

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W. H. Shockley and Party.

Bad Trail for Camels.

Quartz Outcrop.

Quartz Outcrop.

The Guide.

Musa on His Lode.

Panning Samples at Abandob.

Juniper Forest, Hagar Nush.

W. Shockley, Ali, and Warthogs.

SCENES NEAR TOKAR, EAST NUBIA, IN THE SUDAN, AFRICA. (See Page 175.)

The Ubiquitous Mining Engineer.

In these days of strenuous industrial development, no portion of the earth's surface seems to escape the inquiring, investigating proclivities of the mining engineer. He is found everywhere that mineral is known in commercially profitable quantities, and often seeks for it where it is not. The odds and ends of earth's dark places—the terra incognitas—are each being subjected to that prying inquest for mines and mineral deposits. It is but a few years since the mineral resources of China were little known to the outside world. To-day the mining engineer is there in numbers, and China's mineral industry seems likely to grow into surprising prominence. The Arctic regions have become almost as well known as others of the earth's vast sparsely settled provinces, and that mostly within the last ten years, all due to mining development, and now attention is being turned to the Antarctic region. Not only are these remote and scarcely known lands being invaded by the mining engineer, but attention is being also directed to some of the oldest known regions of the earth. On this page are presented nine illustrations of a country which, in the early history of the world, was on the confines of a land noted for its high civilization—east Nubia, in the Sudan, Africa, overlooking the Red sea. The earliest civilization of the earth flourished in the countries about the Red sea, in Egypt, Arabia and immediately surrounding territory, and now, after 6000 years, the modern mining engineer invades the wilderness of the Sudan in search of mining possibilities. On page 175 is given some of the recent experiences of an engineer in that desert land. That east Nubia was ever settled by a civilized nation is not known to be a fact, but it has for ages been the land of roving Arabs, and there are numerous towns and villages scattered throughout the region. It would seem from the report of the engineer that the copper prospects in that section are not particularly promising, though with development something more alluring may be discovered.

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From Silver to Copper.

Among the first mines discovered and developed in the Butte district of Montana were those of the "Rainbow Lode." Noted among the early producers were the Alice, Magna Charta, Moulton and Lexington. Some of these were opened as early as 1876. The croppings were siliceous, mineral stained and attractive to the prospector, as the red iron and black manganese oxide gave them an appearance of carrying values in precious metals, which they did. Both gold and silver were found in paying quantities, and the mines of the Rainbow Lode became famous almost before the great copper mines of Butte were known. The lode consists of a vein system in which the vein upon which the Alice mine is located is the most prominent. Many millions of dollars in gold and silver have been taken from the lode and rich placers were found in the gulches below the outcrop. As depth was attained, the oxidized ore gave place to the sulphides of iron, lead and zinc; but little is said in early reports on the district about the occurrence of copper in these ores. An analysis made of ore taken from the lode in 1878 indicated the presence of gold, silver, lead, zinc, iron and sulphur, but copper is not mentioned. It is the more interesting, therefore, to note that the Lexington mine, which has recently come into the possession of F. A. Heinze, is now being worked for copper, and is said to be producing at present 50 tons of copper ore daily. If the Lexington becomes a copper producer there is a reasonable probability that the numerous other mines in this same system of fissures may also become copper mines; also, probably, heretofore no one has ever thought of them as such.

There are numerous instances of mines recognized as producers of gold, silver, lead and zinc ores, but which were not considered as having a possible value for copper, that with depth have become valuable for their output of copper ores. Notable instances are the silver mines of Cerro de Pasco, Peru; Horn Silver mine at Frisco, Utah, noted as a lead-silver mine, and some of the mines of Bingham canyon, Utah. These instances might be multiplied many times, but a sufficient number of important occurrences have been noted to indicate the possibilities which lie in so-called worked-out mines. In some districts zinc replaces iron and lead sulphide to a great extent, with increasing depth, but it would now seem that it is a possibility that copper, in its turn, may displace the zinc. Copper sulphides are the most readily dissolved and altered of the base metal sulphides, and the metal is carried away in solution to be redeposited elsewhere, often forming a zone of enrichment, but it must always be remembered that a normally very low grade of copper ore may result in the formation of a zone of greatly enriched ore—sulphide, or oxide, or carbonate, and that this forms no basis of estimate of normal values below. This new development in the Butte district of Montana will probably stimulate the exploration of the old mines on the silver belt for copper.

Experimental Metallurgy.

The hope for success in the commercial application of metallurgical processes is in nearly every case based on well-known chemical reactions. Tests are made in the laboratory, necessarily on a comparatively small scale, and on the result of these small-scale tests large plants are sometimes designed and built. Unfortunately, the conclusions which are reached as a direct result of the laboratory experimentation are not always borne out in a satisfactory manner when the process, which has been worked out along more or less elaborate lines, is applied on a commercial scale. There are several reasons for this, but the most common one is, no doubt, insufficient or improper experiment—the conducting of the tests along lines which cannot be economically duplicated on a working scale. Another cause for failure is occasionally found in the fact that the experimenter has wedded a "hobby." He has a certain elaborate scheme along the lines of which he determines to operate, regardless of the character of the ore. He is sure of the success of his pet process, if only the ore can be adapted to it. It is more particularly in metallurgical operations by wet methods that these mistakes are made, for in smelting there are certain laws of chemistry which can only be violated within definite limits, and, passing these limitations, the disaster is so pronounced that all will know who chance to be in the vicinity. Too much coke, too little coke, too much or too little of any of the essential elements in the charge, and something of a very pronounced nature occurs. An expert may be able to overcome the difficulty, and the refractory furnace be brought back to a normal condition by the application of the proper remedy. He may increase or diminish the blast, employ more or less fuel, add or reduce the silica, iron or lime. He is able to tell by the physical appearance of the inside of the furnace and a study of the charge what is wrong and make the necessary correction.

Not so, however, in wet processes. A weak solution looks the same as a relatively strong one. The rate and amount of extraction can only be determined by careful test. The pulp looks the same after treatment, generally, as it did before. No rule of thumb is applicable here.

No metallurgical process exemplifies the conditions here referred to better than the cyanide process. Cyanide solutions have been recognized as solvents for gold for more than 150 years and some historians say that a solution of potassium cyanide was known to dissolve gold in the Middle Ages. This knowledge had been made use of by electroplaters for many years prior to the first metallurgical patent granted for a process to extract gold from its ores by this method. The first patent for this process was issued February 5 and March 12, 1867, to Dr. J. H. Rae of Syracuse, N. Y. Since then there have been issued patents on modifications of the process and methods of applying it in great number.

The simple cyanide process, as described by the MacArthur-Forrest patents, is applicable to those ores which are free from mineral substances which have a tendency to foul the solution or to decompose the cyanide present, and in which the gold is in a fine state of division and so exposed that the metal may readily come in contact with the solution. Ideal conditions have in some instances been found in old tailings dumps which have for many years been exposed to the decomposing action of the winds and rains, by means of which the sulphides, if originally present, have become oxidized and have left the ore in a fit condition for the application of the process in its simplest form.

There are many ores which are not amenable to the cyanide process without some preliminary treatment. This may be amalgamation for coarse gold; concentration for sulphides, or probably roasting may be necessary to render the ore susceptible to cyanidation. There are instances, however, where a high percentage of the values may be extracted by old and well-tried means, which, if properly applied, will render the cyanide process unnecessary.

Take as an instance gold quartz ore carrying about 1% sulphurets, mostly pyrite. The gold is both coarse and fine, and when freed from its matrix amalgamates readily. Concentration follows and auriferous sulphides are collected for treatment by chlorination or smelting. This ore should, by proper milling, yield 95% of its values, or possibly more, but only 80% is obtained. Evidently something is being done which should not be done, or something remains undone which should be done. An investigation is made and it is found that the screens, though nominally 30-mesh, are really 24 to 26. A 30-mesh screen is tried and the saving is raised from 80% to 85%. A 40-mesh screen is tried, and the tailings after the machines show the extraction to have been increased to 90%. This suggests that gold had previously been lost in the uncrushed grains of quartz. A test of the tailings from the 30 screens and an assay of the coarse sands prove this surmise to be correct. A careful test of the tailings below the concentrators shows that there still remain some values in the form of sulphides which have passed the machines. A classifier is introduced, the coarse sands are sent to one machine and the fines to another, and the result is a further saving of 5%. The ore as it reaches the mill is worth $10 per ton. By a rational process of crushing, classifying and concentration a saving of 95% is effected, and the tailings are too low grade to cyanide. It is surely not to be recommended in such a case to change this simple and highly satisfactory process for one which will leave sufficient values in the tailings to pay to treat by the cyanide process.

It may be claimed that by reducing the mesh of the screen the capacity of the mill is cut down. This would be a natural result of introducing a finer screen, but this may in most instances be offset in a measure, if not altogether, by lowering the discharge, which in itself would have a tendency to increase the crushing capacity of the mill.

IN the operation of the cyanide process there appears to be a tendency to revert to the original practices, and to discontinue the use of the numerous modifications introduced within recent years. The entire process, after all, is based on simple facts—the reactions which take place when a weak solution of potassium cyanide comes in contact with fine gold in the presence of oxygen. So many side issues have been introduced into the process in the effort to solve some unusually difficult metallurgical problem, that these modifications of the process are sometimes employed from the beginning instead of the more simple process of straight cyanide of potassium solution. No metallurgical process in use requires the exercise of a greater amount of common sense than the cyanide process, but this is not always a pronounced feature of the efforts made in its application.

THE note on cyaniding raw sulphides in South Africa which appears elsewhere herein should attract the attention of those who have similar problems to solve. In this case it appears that the element of time—forty days—was an important factor. More experimentation along these lines might result in valuable information. As usual, it is not unlikely that much depends upon the ore. Raw treatment may be a success at one mine and, for some unknown cause, not successful at another. In all cases, however, fine grinding appears necessary. In West Australia raw ores are successfully treated at some of the mines.

CONCENTRATES.

QUARTZITE is often gold-bearing. Copper, lead, zinc and other mineral also occur in quartzite, and such ores are sometimes rich.

ORDINARILY an estimate of 1 cubic foot of water per horse power per hour is sufficient to generate steam in a boiler where a modern engine is employed.

A CHANGE in the locality where water, which has been appropriated, is used does not invalidate the right. A ditch or flume may be extended and the water used at another place.

SHAKING screens always clear themselves more quickly and afford larger capacity than screens which are stationary. Impact screens operate in the same manner as shaking screens.

A 10-STAMP BATTERY of 1000-pound stamps will weigh, including all iron and wood work, guides, etc., about 34,000 pounds. The mortars weigh from 5000 to 6000 pounds, and certain special designs even more.

IN quartz veins limonite and hematite almost invariably change to sulphides in depth. Large masses of hematite, however, do not always change to sulphides, as, for instance, the large iron deposits of Michigan and Minnesota.

THE roasting of sulphide ores not only volatilizes or oxidizes the sulphide, arsenical and antimonial compounds present, but also renders the ore more porous and better fitted for leaching or other metallurgical treatment.

FOR settling and classifying, tanks having vertical sides and conical bottoms, sloping at an angle of about 50° to the horizon, are believed to be of great practical value. Some excellent work is being done with tanks of this description.

ORES consisting largely or wholly of talc, and which give considerable difficulty in crushing to proper fineness, sometimes can be handled more satisfactorily if first calcined. This dehydrates the rock and it is more easily reduced to powder.

A DYNAMO can usually without material alteration, or without any at all, be employed as a motor. Motors were introduced for convenience and for particular purposes. A single dynamo may run any number of motors within the range of its electro-motive force.

SOME engineers require that only clean, sharp sand shall be used in cement mortar. Experiments made by competent engineers have indicated that sand with clay or loam up to 15% results in forming a stronger mortar than where clean, sharp sand only was used.

THE deepest gold mines in the world are at Bendigo, Victoria, Australia—over 4000 feet vertical. The deepest vertical shaft in California at the present time is in the East shaft of the Kennedy mine near Jackson, which is down 2800 feet and sinking at the rate of 60 feet per month.

WHERE a party enters into an agreement to work for another party for an indefinite term, and a date is stipulated at which time the money shall be paid for such services as may have been rendered, the money is not due before such date, and there would be no hope of collecting the money sooner by filing a labor lien.

WHETHER wet crushing has any advantage over dry crushing should be determined by the character of the ore and the method of treating it after crushing. In a few mills the ore is crushed in cyanide solution in the battery, and the ore subsequently amalgamated. The process appears to have nothing in particular to commend it.

WHERE ore passes in mines are of a height exceeding 100 feet, and suitable rock (slabs from the walls) cannot be obtained to build strong walls in these raises, or ore passes, they may be timbered with good sized poles laid longitudinally of the vein, the ends abutting on the ore pass. The wear on timbers laid in this manner is much less than where the sticks are laid at right angles to the walls.

WHEN wall plates in an inclined shaft get out of level through carelessness in placing, or by reason of being shifted by blasting and not reset in proper position, the error may be corrected by shortening the posts for two or three sets on the lower side; but in doing this care must be taken to keep the alignment perfect, or the shaft will take a "wind" and cause much trouble in the future.

QUARTZITE may be usually distinguished from quartz by its structure. The latter is massive and the former has a granular appearance. Quartzite is a metamorphic sedimentary rock in which the grains of sand have been cemented by silica. It occurs from fine to rather coarse grain—that is, a texture in which the granules of the original rock may be readily seen without the aid of a magnifying glass. Massive quartz in veins is sometimes fractured by pressure so as to resemble quartzite, and it may then be difficult to distinguish it from quartzite without the polarization microscope, but generally the two may be easily told one from the other.

THE amount of water usually estimated as necessary for coarse concentration, as in the case of native copper from its gangue, or sulphide copper ores from its matrix, is about 4000 gallons to the ton of ore crushed, but the amount really depends upon the character of the ore, that containing clay requiring more than where the gangue is quartz, calcite or some other brittle mineral.

SECTIONAL MACHINERY—pans, mortars and other parts in which quicksilver is to be charged and ground or stamped—must be put together with the greatest possible care, or leakage is sure to result. The sections come planed and every effort is made by the makers to have the parts fit perfectly, but much depends upon the manner of fitting these parts together when set up at the mill.

ZINC precipitation boxes are made in long units divided by double partitions into sections each about square. They are also made in individual boxes, and in some works half barrels are used for the purpose. It is not apparent that one kind of box has a great advantage over any of the others. The single boxes have the possible advantage of being more easily cleaned and moved about when necessary.

THERE are a great many patents issued for modifications of the cyanide process in the United States. Some of these patents cover metallurgical features—some are on the mechanical devices employed—and it would be impossible to state whether it would be necessary to pay a royalty on the use of the process or not unless all conditions were known, and even then it might require a suit at law to settle the matter satisfactorily.

GOLD ORE which consists largely of hydrated iron oxide (limonite) is often difficult to amalgamate, either on plates or in pans. In such ores the gold is usually very finely distributed, the ore slimes bady on crushing, and these two conditions render amalgamation unusually hard to satisfactorily accomplish. Burning such ore aids somewhat, but it is better to treat it by chlorination, if the values be high enough to justify it.

THE lowest grade of copper ore which can be worked depends entirely upon the conditions surrounding the proposition. In the Lake Superior region some of the mines pay which carry not to exceed 1% metallic copper. In British Columbia at one mine copper ores are mined and worked at a profit which do not carry more than $5 per ton. This proposition is so variable that no definite answer can be given to a question of this kind.

THE Cripple Creek ores from the superficial portions of the veins—the oxidized ore—are treated by cyanidation without roasting, but that from the deeper levels where the ore has not been affected by oxidation is roasted prior to treatment. The telluride ores of the Black Hills, occurring in the oxidized zone, yield a high percentage of their values to cyanide, but the unoxidized blue ores are not found so amenable to this treatment.

THE cost of electric power, where supplied by distributing companies, is usually influenced by the cost of other power which may be available. The competitors to electric power are commonly water, steam, gasoline or similar engines and competing electric lines. The price ranges from $3.50 per horse power per month under favorable conditions to $12 or over where the expense of generating power is high and where competition is not very active.

WITH machine drills having about 3-inch pistons and operating under about 90 pounds pressure, 45 to 50 feet of holes in an eight-hour shift is considered a good day's work in hard rock—greenstone, granite, quartz-porphyry or other similar hard, massive and unaltered rock, that is not softened by weathering or decomposition, for some hard and tough rock becomes very soft on being subjected to alteration by atmospheric or chemical agencies, such as solfatara.

SOME States require that a person taking up a water right shall make affidavit to such fact before a notary public. The water right should also be recorded, and work begun on the dam or ditch within a "reasonable time," and continued with "reasonable diligence." The exact meaning of the terms reasonable diligence and reasonable time is not made clear by the law, and it would require the opinion of a court to determine what, under existing conditions, would be reasonable time and diligence. If a person has located a water right and has allowed his right to lapse, he alone or with another may again locate the right, if in the meantime it has not been taken by another.

THE magnetic needle is strongly influenced by an electric current. If a magnetized needle be held over a horizontal copper wire through which no current is passing, and the wire is carefully adjusted to coincide with the direction of the needle, and a current of electricity is passed through the wire, the needle will at once swerve to the right or left to the extent of nearly 90°, depending on the strength of the current. As soon as the current is shut off the needle will swing back to its former position, pointing to the magnetic pole. If the direction of the electric current be now reversed, by changing the connections of the wires, the needle will again be deflected from its true position, but in the opposite direction. If the needle be held beneath instead of over the wire, the deflection of the needle will be directly opposite to those of the first trials. The distance between the needle and the wire also is a factor—the nearer the wire the greater the deflection for given strength of current.

THE velocity of water flowing in a stream is not uniform throughout its entire cross section. It has been found by careful experiment that the average velocity of a stream is from 0.81 to 0.93 of its maximum velocity. At a point about midway between the surface and the bottom of the current the velocity is close to 0.915, and on the bottom about 0.83, of that at the surface being more or less according to the character of the bottom—whether smooth or rough. To find the volume of water flowing in a stream, multiply the area of cross section in feet by the velocity in feet. This will give the cubic feet passing during a stated interval, either per second or per minute, depending on the length of time given to velocity. Thus if a stream be 5 feet wide and 4 feet deep, and the maximum velocity be 30 feet per minute, the volume of water flowing in the stream will be approximately $30 \times .915 \times 4 \times 5 = 549$ cubic feet per minute, or 9.15 cubic feet per second. It is likely to give greater accuracy if the velocity of the stream be taken for a minute or even longer than for a shorter period.

WHEN unpatented mining claims are forfeited to relocators because of failure to perform the necessary assessment work, any buildings, cabins, machinery or other fixed improvements become the property of the party relocating the claim. As a matter of safety the relocator should state that it is a relocation of a claim, and he should place the location of record, whether the State laws require it or not. It is not necessary to bring suit to quiet title, but the former proprietor may file an adverse, when the relocator must prove that the claim was subject to relocation at the time the relocation was made. It does not appear that a pipe line and giant, in place on a line thus relocated, would be excepted from the improvements which pass to the new proprietor, even though the pipe line were not tied to the ground or to trees, etc. Pipe lines are only so tied where necessary to render them secure as to slopes. The original locator having failed to comply with the law—the condition of the statutes which requires the performance of certain acts to insure his title to the ground—he is an intruder and no longer has the color of title to the property. Although the statute does not define what property shall be considered as fixtures, it is only reasonable to include a pipe line in such improvements, while a wheelbarrow or a portable forge might not be properly so considered. The relocator may legally enter upon the use of such improvements as were left by the former proprietor, and may do so at once.

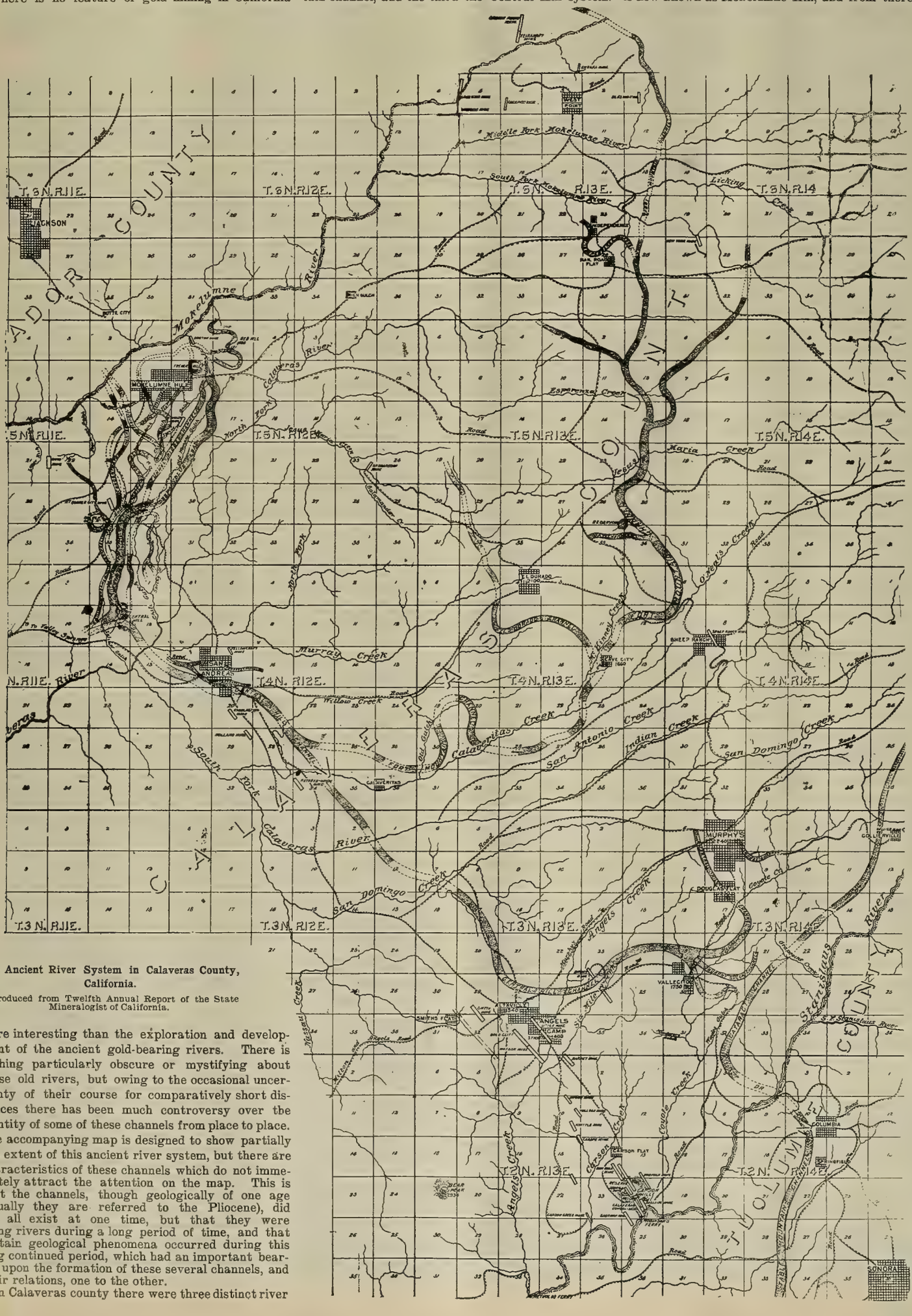
THE principal kinds of rock are sedimentary, eruptive, metamorphic, and those resulting from chemical deposition. Each of these is divided into numerous classes. Among the sedimentary rocks are sandstones, shales, calcareous sandstones, sandy limestones, and various gradations between purely argillaceous and purely sandy rocks. Under this head also come grits (coarse sandstones) and conglomerates. The eruptive rocks are chiefly of two kinds: (1) those intruded from below in the form of roughly round masses, or bosses; in elongated sheets (dikes) and in flat sheets (sills), and none of which reach and flow out on the surface, and (2) those which do reach the surface and spread out in sheets—volcanic or effusive rocks. In the latter class is also included the fragmental rocks resulting from the recementing of volcanic debris thrown out from volcanic vents, such as tuffs, agglomerates, etc. Limestones are for most part in a separate class, but may be considered as sedimentary. They are formed in various ways. The principal sources of limestone are from the secretions and the shells of minute organisms in the ocean, and from the deposition from calcareous springs. Metamorphic rocks include every class of the above, when they have been changed from their original condition. This change may have been slight, or may have progressed to such an extent as to have entirely changed the rock from its original condition to a new one. (The decay of rocks, due to weathering, is not metamorphism.) By pressure and movement, and the heat developed in the operation of these processes, the individual constituents of a rock are changed, passing over to an entirely different lot of minerals and the formation of a new rock, not recognizable as having any resemblance to the original. Thus limestone may by metamorphism become marble, or it may be altered to pyroxene and the latter further changed to serpentine. These changes involve many chemical reactions, the removal of some of the original constituents and substitution of others with the introduction of still other foreign material. Sandstones may be altered to quartzite, or to mica schist, garnet schist, etc. Shales become hard slates, often with the development of coarsely crystallized minerals in the finer mass of the rock, such as garnets, chiastolite and other crystals. Metamorphism is a subject so involved that it would require a large volume to give a comprehensive idea of the great number of alterations, which individual minerals and rocks undergo.

Ancient Gravel Channels of Calaveras County, California.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

There is no feature of gold mining in California more interesting than the exploration and development of the ancient gold-bearing rivers. There is nothing particularly obscure or mystifying about these old rivers, but owing to the occasional uncertainty of their course for comparatively short distances there has been much controversy over the identity of some of these channels from place to place. The accompanying map is designed to show partially the extent of this ancient river system, but there are characteristics of these channels which do not immediately attract the attention on the map. This is that the channels, though geologically of one age (usually they are referred to the Pliocene), did not all exist at one time, but that they were living rivers during a long period of time, and that certain geological phenomena occurred during this long continued period, which had an important bearing upon the formation of these several channels, and their relations, one to the other.

In Calaveras county there were three distinct river systems taking their rise in regions several miles apart — the greater number originating in Amador county or even beyond the limits of that county. The map shows these three systems clearly—one the Mokelumne Hill system, the second the Fort Mountain channel, and the third the Central Hill system. The first is the most complicated and comprises at least ten separate channels, and there are probably one or two more not yet positively identified. These channels, mostly taking their rise apparently in Amador county, flowed in diverse directions toward what is now known as Mokelumne Hill, and from there by



The Ancient River System in Calaveras County, California.

Reproduced from Twelfth Annual Report of the State Mineralogist of California.

sinuous course in a generally southwesterly direction toward the valley of the Sacramento river.

The Fort Mountain system took its rise in Amador county, in the Sierra region, and flowed with its numerous tributaries in a southerly, and then a westerly, direction toward San Andreas, and about 4 miles west of that town joined the Mokelumne Hill system. The Central Hill channel had its origin somewhere northeast of the village of Murphys. There seem to have been several important channels in this system, some unexplored and practically unknown. For instance, about 1 mile southeast of Murphys a channel has cut directly across the Central Hill channel flowing in a southerly direction. This channel cut out 500 feet of the Central Hill channel, but little is known of it beyond this fact, and that where passed through by a tunnel driven to reach the Central Hill channel it was filled with coarse volcanic sand and was saturated with water.

In the vicinity of Douglas Flat and Vallecito there is a complex of ancient channels something like that at Mokelumne Hill, but the relations of these several channels are not fully established, nor can they be until further work is done and a systematic investigation carefully made of the entire district.

There is another channel system which originates in Calaveras county, in the region of the Sierra, above the Big Tree section, which flowed in a generally southerly and southeasterly direction into the adjoining county of Tuolumne, entering that county near the town of Columbia, and which, where worked, has been found usually to be rich in gold.

In Calaveras county alone there are more than 100 miles of these ancient stream beds. Of this about 25% has been removed by recent erosion; about 25% probably has been mined, and there still remains nearly 50% of these old golden rivers intact, awaiting the enterprise of the miner. It is this fact that gives these old river beds an interest beyond their mere existence. As a geological study there is nothing of greater interest, but this is enhanced by the possibilities of profitably mining these gravels, and recovering the gold which has lain in the old rivers for so many thousands of years.

When contemplating these ancient rivers and similar streams elsewhere it must be understood, and remembered, that the same natural forces which have formed the modern creeks and rivers were at work in Pliocene time, and the causes which produce familiar effects to-day produced similar effects at that time. Nature constantly strives to tear down the mountains to the level of the sea. The agencies which perform this work are the sunshine and rain, the wind and changes of temperature. The process is slow but never-ceasing, and in a long period of years a stream will cut a deep canyon into the hardest rocks. Where the stream contains much detritus and the volume of water is sufficient the erosion is more rapid than where the water is comparatively free from sediment and gravel. These are the first principles of erosion. A great mountain region will in time be reduced to a base level by erosion if nothing interfere to prevent it. When studying these ancient rivers these simple facts must be kept in mind, and a rational solution will be usually found for almost every perplexing problem which presents itself. It is at times difficult to identify certain channels when they are unexpectedly encountered underground in the development of another channel, but further development usually clears up a problem of this kind.

The most important economic feature of the ancient rivers lies in the fact that the tremendous erosion which produced these streams also freed the gold from the rocks and veins in the mountains, and the contents of millions of tons of ore was thus concentrated into a comparatively few narrow streams. Thus it will be seen that a country may produce only mediocre quartz mines, but by erosion make rich placers. There are numerous instances of this fact throughout the mining world.

The ancient river-forming period undoubtedly lasted for thousands of years. The gold was freed from the rich veins of this portion of the mineral belt of the State in Calaveras and Amador counties and was concentrated in the earliest system of rivers—channels of the first period. At this time began a period of volcanic activity which was spread over a wide region of the State, in both the Coast Range and the Sierra. Volcanic vents opened along and near the crest of the Sierra and volcanic debris poured out over the adjacent country. Ashes and mud covered the slopes and the accompanying violent rains swept the mud down into the gulches and canyons, often filling them, in time, to the brim and completely burying the gold-bearing gravels under the muddy flood. Following this outburst of volcanic rock came a period of quiet, and the erosive forces of nature continuing, another set of new channels was formed. These latter channels did not follow directly the course of the former streams, but conformed with them in a general way—flowing southwesterly, in a line normal to the general trend of the Sierra. In time these new streams reached the underlying crystalline bedrock and the gold-bearing veins were subjected, in places, to a second period of erosion. In some instances the later channels intersected the older channels, sometimes crossing and recrossing them, as shown on the map, in the neighborhood of Mokelumne Hill. The channels of the first period were cut out at these intersections and the contained gold went to help enrich the channels of the second period. Again volcanic activity played an important part in the economy of the golden rivers which were to yield up their gold in later ages, to the energies of civilization.

Once more the channels were filled with volcanic mud, sand and rocks, and then again followed a period of quiet and long-continued erosion. These alternating intervals of volcanic activity and quietude succeeded each other several times, always with similar results—the burying of the existing channels and the formation of a new system later, when the mud rivers had ceased to flow and the volcanic debris had settled into a semblance of firm rock or compacted sand. That there were long periods of freedom from volcanic outbursts is abundantly proven by the tremendous extent of the erosion which marked these periods. Great trees grew along the river banks, and with the coming of the next volcanic flow these trees were overturned or remained standing upright and were buried in the great volume of mud. The trunks of these ancient trees have been found in the course of mining operations, sometimes turned to stone; sometimes a hollow, cylinder-shaped hole in the indurated mud flow indicating where the tree formerly stood.

During all of this period of channel forming, with its variations, many of which are clearly indicated by a study of the several channels and their relations to each other, the entire Sierra region was slowly rising. This slowly moving uplift is supposed by some geologists to be in progress at the present time; but our lives or the history of the country are far too short to make conclusive such theories.

The rivers emptied into the great depression between the Sierra and the Coast Range—the great interior valley of California. At that time the valley was a vast fresh water lake. The sands, gravels and fine sediment from the ancient rivers during their several periods were carried down into this lake and spread out in fan-shaped flat cones in the estuaries formed at the mouths of the rivers. These deposits were essentially almost horizontal; but the beds formed at that time are now found raised above the interior valley along the eastern foothills and tilted toward the valley at a much higher angle than that produced by the deposition of sediment from a river into a large body of still water.

It is this long-continued uplift of the entire Sierra region that caused the comparatively rapid formation of this series of ancient rivers, for, with a constantly rising region, the streams kept up their grades and caused them to cut rapidly into the bedrock. As a stream approaches the base level of erosion—the level of the sea—its power of erosion and its ability to carry along with it the sediment, gravel and other debris, which are the most powerful factors in cutting and wearing away the bedrock, constantly decreases, until at sea level it is nil.

Having outlined the processes by which the ancient channels were formed, not only in Calaveras county, but in every other county of California where they may be found, it may now be proper to inquire more directly into the characteristics of the several channels.

(TO BE CONTINUED.)

THE Government of the Dominion of Canada has appropriated $15,000 for making experiments with the electric process of smelting ores and manufacturing steel at Sault Ste. Marie, and the Consolidated Lake Superior Copper Co. will furnish a building and dynamo capable of supplying 400 H. P. for four months free of charge. All kinds of ore will be experimented with, and important results are expected to be obtained. Great possibilities for Canada underlie the inauguration of a cheaper process for manufacturing pig iron and steel than is now in use. Ontario is dotted with ore bodies, the development of which is prevented by lack of cheap fuel. There is coal in the eastern and western parts of Canada, but the cost of conveying it to points where coke is needed for smelting purposes is prohibitive. On the other hand, there are a great many water powers throughout the Provinces of Ontario and Quebec where electricity can be developed and utilized. If the electric system proves to be commercially feasible, Canada is looking for the inflow of a large amount of capital and considerable mining development.

A METHOD to reduce the tendency of turbine wheels to burn out their steps is suggested in the Engineering News in the following: Cut across the bearing surface of the steps three or four deep grooves, radially. These grooves are of generous depth and width, say ⅜ and ½ inch, respectively. It would appear that their action is to allow free access of the water to the bearing surface of the step, aided possibly by a more or less energetic circulation through the grooves, thus keeping down the temperature. However it may be, the fact remains that the device is most effectual.

IN some of the Lake Superior copper mines occur native copper almost pure, and native silver also practically pure. As far as known these minerals are never found alloyed in these mines.

Cyaniding Silver-Gold Ores of the Palmarejo Mine, Chihuahua, Mexico.*

NUMBER VII.—CONCLUDED.

Written by T. H. OXNAM.

When treating charges containing the equivalent of 15 tons of dry slimes, usually four settlings and four decantations can be effected within the forty-eight hours of treatment, each decantation averaging about 22 tons of solution. Hence about 90 tons of solution are decanted in treating a 15-ton charge, and each decantation removes approximately 58% of the total solution present. Assuming the wash agitations to be perfect, the four decantations should then theoretically contain about 97% of the total values dissolved at the time the washing was commenced.

The settled pulp is discharged through the bottom valve and the 4-inch discharge pipe into the residues launder and is run to waste.

Table VIII shows the rate of settling per hour, determined at various times, on several different charges.

The pulp, ready for discharging, carries about 50% of moisture, the contained solution averaging 0.07% of KCN and having an average value of approximately $0.40 gold and 1.50 ounce of silver per ton. These values are, of course, higher than would be expected theoretically to remain in the solution after the several decantations and dilutions effected, but, as has already been recorded by several different parties operating similar slime plants, the dissolution of values from the slimes does not cease at the completion of the agitation proper, but continues throughout the washing, and the value of the wash solution is thus being constantly augmented. This feature, however, is more noticeable with the silver than with the gold values, since the gold dissolves much more rapidly than does silver and the maximum extraction of the gold values is obtained earlier. The solution used for washing will always carry a certain quantity of values, which, of course, results in a corresponding, direct increase of the values that would otherwise be carried by the solution contained in the discharged residues. Moreover, it may often be the case that the wash agitations are not perfect. For these reasons the solution contained in the discharged pulp will always carry more values than it should according to calculations based solely upon the successive dilutions and assuming the agitations to be perfect.

TABLE VIII.—SETTLING RATE OF SLIMES PER HOUR, WITH ADDITION OF LIME.

At End of	Settlement (in Inches) of Slimes.							
		Test No. 1.	Test No. 2.	Test No. 3.	Test No. 4.	Test No. 5. (c)	Test No. 6. (c)	Test No 7.
	Proportion of Solution to Slimes.....	2.5 : 1	2.5 : 1	2.5 : 1	2.5 : 1	2.5 : 1	2.5 : 1	3.3 : 1
	Lime Added per Ton Slimes (a)	2 lbs.	3 lbs.	3 lbs.	3 lbs.	3 lbs.	None (b)	4 lbs.
1 hour..		11.0	10.5	10.0	16.0	14.0	15.0	22.0
2 hours.		21.0	19.0	16.5	26.5	21 0	24.5	36.5
3 hours.		27.5	26.0	23.5	33 0	30 0	33.5	51.5
4 hours.		33 0	32.0	30.0	40.0	39.0	40.0	54.0
5 hours.		36.0	35.5	36.0	42.0	43.0	42.0	57.0
6 hours.		38.0	38.5	40.0	43.0	47.0	43.0	58 0
7 hours.		39.5	40.0	41.5	44.0	48.5	44.0	59.0
8 hours.		40.5	41.0	42 5	44.5	48.5	44.5	59.5
9 hours.		41.0	41.5	43.0	45.0	49.0	44.5	59.5
10 hours.		41.0	42.5	43.5	45.0	49.0	45.0	59.5
11 hours.		41.5	42.5	43.5	.....	.....	45.0	.....
12 hours.		41.5	43.0	.....	.....	.....	.....	.....

(a) This quantity of lime added was in addition to the lime already contained in the solution, sufficient lime usually being present in solution that the addition of 5 c.c. of lime water to a titration (with silver nitrate), for strength of solution, would make no difference in the titration.

(b) See note (a).

(c) Tests No. 5 and No. 6 were on material from near the head of the slimes pits, and which, therefore, contained a larger percentage than usual of fine sands.

Each 2 inches of solution equals 1 ton.

A portion of the sample of the pulp ready for discharging, together with its proper proportion of contained solution, is dried, the assay results being taken to represent the value of the discharged slimes. Another portion of the pulp is washed and then assayed. On an average the washed sample will run about $0.40 of gold and from 1 to 2 ounces of silver per ton lower than the unwashed sample.

As previously noted, the 3-inch centrifugal pumps connected with the decantation vats are the ordinary pumps commonly used for pumping solutions, the only alteration being that the bearing nearest the pump shell is tapped with a 0.25-inch pipe, which supplies the bearing with solution under pressure. These pumps run about four hours in twenty-four, and they have given excellent satisfaction during the five months that the plant has been in operation, the only repair work that has been required on them being an occasional repacking of some of the stuffing boxes.

For experimental purposes, one of the decantation vats has been connected with the pumps in such a manner that by means of loosely threaded elbows the ends of both the suction and discharge pipes are movable, and the suction may be dropped to the point of the conical bottom or may be raised at any

*Trans. Amer. Inst. Min. Engrs.

height up to about 4 feet above it, while the discharge pipe can be raised to the top of the charge or lowered to the bottom. The end of the discharge pipe is curved, conforming to the circumference of the vat, and imparts a circular motion to the charge during agitation. While practically this same idea was tried on the agitation vats, with very poor results, the scheme works very well on the decantation vats, doubtless due to the fact that the slimes before entering these vats have been thoroughly broken up and mixed in the agitation vats. Although the agitation in this specially connected vat seems to be excellent, and to all appearances is better than that taking place in the other decantation vats, no appreciable difference has so far been noticed in the average assays of the discharged residues.

Table IX, giving a somewhat detailed record of the treatment of one charge, may be taken to represent

TABLE IX.—DETAILED RECORD OF SLIMES TREATMENT.

Charge No. 29. Vat No. 1. Net weight of slimes charged, 18 tons. Moisture in slimes as charged, 31 5 per cent. Proportion of solution to slimes present, 2 : 1. 100 lb. lime added at commencement of charging.
Assay value of slimes per ton as charged was $4.34 of gold and 19.52 oz. of silver.

TREATMENT IN AGITATION VAT.

Date and Time.	Agitation.	Assay of Solution.		Values Extracted by Solution.		Assay of Tailings.		Extracted as per Solution-Assays.		Extracted as per Tailings-Assays.		Strength of Solution in KCN. Sample taken at		Remarks.
		Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	Vat.(a)	Pump.(a)	
	Hours.		Ounces.		Ounces.		Ounces.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	
Sept. 29.														
4 p.m.	.....	$0 95	0.85	.....	.....	.....	.....	.....	.....	.....	.....	0.11	.....	Commenced charging, 7 a.m. Finished, 4 p.m. Added 90 lb. of cyanide (NaCN = 125 per cent. of KCN), at 4 p.m.
4 p.m.	.....	0.90	0.96	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.09	
6 p.m.	2	1.05	1.01	$2.10	2 02	.....	.....	48.4	10.5	.....	.....	0.40	.....	
6 p.m.	2	1.15	1.45	2.30	2.90	$2.06	16.10	53.0	15.1	52.5	16.2	.....	0.16	
10 p.m.	6	1.20	2.13	2.40	4 26	.....	.....	55 3	22.2	.....	.....	0.30	.....	
10 p.m.	6	1.30	2.42	2.60	4.84	1.44	14.66	59.9	25 2	66.8	22.7	.....	0.22	
Sept. 30.														
2 a.m.	10	1.50	3.35	3.00	6.70	1.24	13.20	69.1	34.8	71.4	31.3	0.23	.....	
2 a.m.	10	1.55	3.73	3.10	7.46	1.14	11.78	71.4	38.8	73.7	38.7	.....	0.23	
8 a.m.	16	1.60	3.99	3.20	7.98	1.03	10.98	73.7	41.4	76.3	42.9	0.19	.....	
8 a.m.	16	.....	4.28	.....	8.56	1.03	10.68	.....	44.5	76.3	44.4	.....	0.19	Added 30 lb. of lime.
2 p.m.	22	1.65	4.65	3.30	9.30	.....	.....	76.0	48.4	.....	.....	0.22	.....	
2 p.m.	22	1.60	4.75	3.20	9 50	0.92	10.14	73.7	49.4	78.8	47.2	.....	0.22	
8 p.m.	28	1.70	4.76	3.40	9.52	0.82	10.34	78.3	49 5	81.1	46.2	0 19	.....	
8 p.m.	28	1 65	4.67	3.30	9.34	0.82	10.22	76.0	48.6	81.1	46.8	.....	0.18	
12 p.m.	32	1.70	4.83	3.40	9.66	0.82	10.26	78.3	50.3	81.1	46.6	0.18	.....	
12 p.m.	32	1.80	4.80	3 60	9.60	0.92	10.04	82.9	49.9	78.8	47.7	.....	0 18	
Oct. 1.														
4 a.m.	36	1.70	4.94	3.40	9.83	0.82	9.85	78.3	51 4	81.1	48.7	0.17	.....	Commenced to discharge into decantation-vat.
4 a.m.	36	1.75	4.81	3.50	9 62	0.82	9.70	80.7	50.1	81.1	49.5	.....	0.17	Discharging in 1 hour.

(a) Vat sample taken from surface of charge, in vat. Pump sample taken from discharge pipe, near pump.

TABLE IX.—(CONTINUED).
TREATMENT IN DECANTATION VAT.

Date.	Time.	Solution Decanted.						Remarks.
		Quantity.	KCN.	Assay-Values.		Total Assay-Value.		
				Gold.	Silver.	Gold.	Silver.	
		Tons.	Per Cent.		Ounces.		Ounces.	
Oct. 1.	5 a.m.	.....	.....	.....	.....	.....	.....	Finished receiving charge from agitation-vat. 20 lb. lime added while being charged. Let settle for 3 hours.
Oct. 1.	8 a.m.	18.0	0.18	$1.70(b)	4.84(b)	$30.60	87.12	Commenced decanting.
Oct. 1.	3 p.m.							Finished decanting. Added 18 tons 0.10 per cent. KCN solution, and 40 lb. lime. Agitated for 2 hours. Let settle for 6 hours.
Oct. 1.	11 p.m.	18.5	0.14	0.91	2.56	16.83	47.36	Commenced decanting.
Oct. 2.	4 a.m.							Finished decanting. Added 18.5 tons of 0.11 per cent. KCN solution, and 40 lb. lime. Agitated for 2 hours. Let settle for 4 hours.
Oct. 2.	10 a.m.	19.0	0.11	0.48	1.44	9.12	27.36	Commenced decanting.
Oct. 2.	3 30 p.m.							Finished decanting. Added 19 tons of 0.09 per cent. KCN solution, and 40 lb. lime. Agitated for 2 hours. Let settle for 5.5 hours.
Oct. 2.	11 p.m.	18.0	0.09	0.30	0.88	5.40	15.84	Commenced decanting.
Oct. 3.	3 a.m.							Finished decanting. Discharged vat.
Totals.	.....	73.5	.....	.....	.....	$61.95	177.68	

(b) In all these decanted-solution samples, the value of the solution, as added to the charge, has been deducted.

NOTE.—Assay of discharged residues (unwashed): $1.03 of gold, 9.62 oz. of silver. Extraction, 76.27 per cent of gold and 50.47 per cent of silver.
Assay of discharged residues (washed): $0.62 of gold, 8.38 oz. of silver.
Moisture contained in discharged residues, 51.4 per cent. Assay value of solution was $0.40 of gold and 1.24 oz. of silver. Strength, 0.09 per cent of KCN.
Extraction indicated by values contained in decanted solutions: 79.30 per cent of gold and 51.36 per cent of silver.
Total time of treatment: In agitation-vats, 45 hr.; in decantation vat, 48 hr

the usual practice, though the charges then being treated were heavier than those treated at the present time. The usual charge is now but 15 tons of slimes (dry weight), while the proportion, by weight, of solution to slimes present has been increased to 2.5 : 1.

PRECIPITATION.—All solution leaving the decantation vats is passed through the zinc boxes before being reused. The zinc boxes have to be watched very closely, since, owing to the excess of lime usually present in the solution, difficulty is experienced in obtaining good precipitation. Records are kept of the quantity of solution daily passing through the boxes, together with the assay values of the solution, before and after precipitation. These records show that, during the last three months, an average of practically 48 tons of strong and 117 tons of weak solution, or a total of 165 tons, were passed through the boxes daily, the average assays of the solution being approximately as follows:

	Strong Solution.		Weak Solution.	
	Gold.	Silver.	Gold.	Silver.
		Ounces.		Ounces.
Entering zinc boxes	$1.05	2.90	$0.60	1 70
Leaving zinc boxes	0.10	0.40	0.10	0 35

The zinc boxes having a combined total shavings capacity of approximately 120 cubic feet, the rate of flow of solution through the boxes during 1904 averaged 1.37 ton per cubic foot of shavings per twenty-four hours.

The precipitates recovered are always of lower grade than those obtained in the sand plant, because, in spite of all precautions, a certain quantity of suspended slimes will be carried with the solution into the zinc boxes and will be retained there, thus lowering the grade of the precipitates. The highest grade precipitates yet recovered from the slimes plant assayed approximately $6800 of gold and 17,300 ounces of silver per ton.

TONNAGE, PERCENTAGES, ETC.—The normal capacity of the plant, while treating 15-ton charges and allowing a two days' treatment in both agitation and decantation vats, is 30 tons per day. During the last quarter of 1904 approximately 2550 tons of slimes (net dry weight) were treated, and the extraction during this period, shown by the differences between assays of the charge and the residues, was 74.9% of the gold and 49.2% of the silver. During this period the assay values of the slimes, as charged, averaged approximately $4.35 of gold and 19.25 ounces of silver per ton. Since the above was written the consumption of cyanide has been steadily decreased, and during the last two months (March and April, 1905) has averaged 3.56 pounds of sodium cyanide (equivalent to 4.40 pounds of potassium cyanide) per ton of slimes treated.

The average extraction of silver for the last three months has been 51%.

The consumption of cyanide, zinc and lime per ton of dried slimes treated during this time was: Sodium cyanide 4.42 pounds, zinc 0.957 pound, lime 13.95 pounds. The sodium cyanide consumption is equivalent to 5.52 pounds of potassium cyanide. Table X gives the operating cost per ton of slimes treated:

TABLE X.—WORKING COSTS PER TON OF SLIMES TREATED.

Cyanide (4.42 pounds at $0.63)	$2.785
Zinc (0.957 pound at $0.30)	0.287
Lime (13.95 pounds at $0.0118)	0 165
Other supplies	0 238
Lubricating	0.033
Labor	0.491
Salaries	0.748
Assay office (labor and supplies)	0.066
Power (ditch, maintenance and supplies)	0.621
Miscellaneous (lighting, etc.)	0.002
Management and general expenses	0.179
Total	$5.615

NOTE.—In Mexican currency during this period $5.615 was equivalent to $2.66 gold. The cos of realizing on the precipitates produced is not included in the above working costs. For the same reasons as given in the portion of this paper relating to the sand treatment, these expenses are unusually high. The average cost of realization on the precipitates produced in the slimes plant, per ton of dry slimes treated, is: Government taxes, $0.856; treatment charges (including transportation expenses), $1.202; total, $2.058.

I wish to acknowledge my indebtedness to Mr. W. T. MacDonald, mill superintendent of the Palmarejo & Mexican Gold Fields, Ltd., for his valuable assistance n the preparation of this paper.

New Methods in Treatment of Low-Grade Copper Ores.*

Written by N. S. KEITH.

The following described process of treating low-grade copper ores, written with particular reference to the ores occurring in certain geological horizons in the Eastern United States, are of interest, as it deals with a problem which is not uncommon in some western localities as well, particularly in Utah, Arizona, western Colorado and southern Nevada, and the ideas are suggestive, at least, of application in many districts where ores of the character here described are found.—ED.

In many sections of the United States there are vast deposits of sandstone, carboniferous, triassic, and earlier, which contain copper, either in the metallic state, or mineralized as sulphides and carbonates. The chief sulphide is Cu_2S, variously called chalcocite, copper glance, or cuprous sulphide. Sometimes chalcopyrite occurs, more or less mixed or combined with iron pyrites, but comparatively infrequently. In the eastern section of the country these cupriferous rocks are noticeably occurrent in the Appalachian ranges, from Maine and Vermont to the Carolinas.

In the sandstone regions, disconnected from the main range, such deposits have been found, and have been somewhat exploited from the earliest years of the history of the country.

Beyond Maine, along the coast of New Brunswick, there is a considerable tract of cupriferous, carboniferous sandstone at Dorchester. In Connecticut, not far from New Haven, are copper-bearing sandstones. In New Jersey, at Arlington, 8 miles west of New York City, are such sandstones of the triassic formation, with intrusive trap dikes and sheets, from which trap the copper impregnations were probably derived.

On the banks of the Delaware river, in Warren county, New Jersey, a few miles above the Delaware water gap, are cupriferous rocks, classed as Medina and Oneida sandstones, of an older period than the triassic, and not associated with trap rocks, or other evidences of volcanic disturbances. There are other places in New Jersey where sandstone deposits have had attention given them.

In Adams county, Penn., nor far from Gettysburg, there are sandstones which contain not only chalcocite and carbonates, but metallic copper. In this case, as in all of the others, the copper carbonates (malachite and azurite) occur at and near the surface, and are the result of the action of the atmosphere and carbonated waters on the chalcocite and metallic copper.

All of these sandstones are essentially siliceous, being built up from quartz grains cemented together by silica from thermal waters containing silica in solution. The silica solution may have been, and probably was, the result of the solvent action of the thermal waters on the sand itself while lying on a horizontal plane, from which position the sandstones have been moved to planes having various dips from their original ones.

The sandstones frequently contain a small percentage of calcium carbonate, or calcium in some other combination, such as the sulphate.

In Virginia, near Virgilina, on the boundary line of North Carolina, there is a mineralized belt of country extending 25 miles north and south in the two States. The country rock is slate; in this slate there are quartz veins and porphyry dikes, parallel with each other, and conformable with the stratification of the slate.

These veins and dikes carry carbonates of copper and chalcocite, with bornite, and occasionally chalcopyrite. These rocks are siliceous, as in the other cases.

Besides their contents of copper the rocks at the various points I have named carry gold and silver, in amounts varying from traces to some dollars in value per ton of rock. The copper constituent averages in the several cases at from 1% to 3% of the weight of the rock; that is, from twenty to sixty pounds per ton.

There are many other places at which like rocks are obtainable; but these serve to illustrate prevailing conditions, and to show the foundation for the methods of treatment which I am about to consider.

In all of these cases the smelting of the rocks to obtain their metals is possible in theory, and practicable under favorable conditions; but these favorable conditions are absent. The unfavorable conditions are:

1. The absence of, or expense of, suitable fuel at the mines.

2. The absence of, or the expense of, suitable fluxes, such as iron oxides, iron sulphides, or limestone, at the mines.

3. The cost of transporting the rock to the neighborhood of fuel and fluxes.

4. The "low grade" of the rock. That is to say, the copper, gold and silver are not in quantities enough to yield values sufficient to pay either for

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bringing the fuel and fluxes to the mine, nor for taking the rock to the fuel and fluxes.

There are places where copper ores and rocks of no higher grade than these are worked at a profit. But they are where the ores are "self-fluxing." That is to say, where the ore itself is composed of materials which naturally react on each other in the furnace to produce slags which are liquid enough to permit the metals to come together, and where the necessary fuel is cheap enough; or, in cases where there are cheaply obtainable suitable ores to admix so as to make a fusible mixture. Then, again, the rocks which have their copper in the metallic state can be worked after the methods pursued at the Lake Superior mines, where rock containing less than fifteen pounds of copper per ton are mined and reduced at a profit.

But I am to consider the treatment of siliceous rocks where the considerations are unfavorable for smelting.

Foremost among the methods which have been tried is that of "leaching." Leaching consists in submitting the cupriferous material to the action of solvents of the copper constituent, and then reducing the dissolved copper from the solution by means of a reducing agent. The rock must first be crushed and ground to a fineness, say that of fine sand, so that the solvent may have access to all of the copper mineral. About the only available solvent of the chalcocite and metallic copper is a solution of ferric sulphate or ferric chloride. A solution of either of these salts of iron dissolves, though slowly, both chalcocite and metallic copper, by forming copper sulphate or copper chloride, and the ferric solutions are changed to ferrous solutions. These ferrous solutions are changed by exposure to air, by absorption of oxygen, to the ferric state; and are then again usable to dissolve more copper. The copper may then be deposited from its solutions by means of metallic iron, generally scrap, or by means of electricity.

This seems at first glance a simple process. But there are serious complications, chief among which is the presence of lime, or calcium compounds, in the rocks, as is almost always the case.

The lime acts up to its limit in quantity to neutralize its combining equivalent of the sulphuric acid, or chlorine, constituent of the solvent, and that action is preferential above that on the copper. The only exception to this is when the lime is present as a sulphate, which is seldom. It is generally calcium carbonate.

The next leaching method is to grind the rock to sand, as before, and then roast it, so as to oxidize its oxidizable constituents. The result then is, if the operation is carefully performed, the formation of oxide of copper in the sand, and of some calcium sulphate, and some calcium oxide, or lime. Then the roasted sand is leached with a dilute solution of either sulphuric or hydrochloric acid. But this has been found impracticable where acids are expensive, and where there is lime in quantity as low, even, as one-half of 1% of the rock.

If there be at hand some sulphide ores, as of iron, carrying some copper, say 2% of the latter, it may be ground and mixed with the ground sandstone or quartz and roasted as before. Then the lime will be sulphated and will not thereafter combine with the acid to its loss in the subsequent leaching.

Having thus obtained the solution of copper, with questionable economy, the method of precipitating the copper therefrom by the use of iron scrap, or pig, is pursued in various localities. This method of precipitation of copper is very old and well known, and is only one of the steps constituting some of the modern methods pursued in obtaining that metal. But, to-day, that step is too costly in most localities. While, theoretically, fifty-six pounds of iron should precipitate 63.35 pounds of copper, in practice nearly three times that quantity of iron is used. This comes from excess of acid in the copper solution, a waste in itself, uniting with its equivalent of iron; from oxidation of iron; from the formation of ferrous salts; scale and rust and dirt on the iron as purchased, small pieces undissolved, etc. Then the precipitated copper is very impure. It contains on the average about 70% of copper. The other constituents of this "cement copper," so-called, is iron oxide, sand, and other extraneous matter, which must be removed by smelting.

A better method is this: Having obtained the solution of copper by some method, it is deposited by means of electricity. In brief, this is accomplished by immersing the electrodes of a source of electricity into the copper solution, and causing a graded current of electricity to flow from the anode through the solution to the cathode. In this way, if the strength of the electric current be properly proportioned to the amount of copper in the solution (the electrolyte) at all instants of the time of the operation there will be produced on the cathode a deposit of reguline copper of great purity, and in a commercial scale much cheaper than by iron as above outlined.

But the anode must be insoluble. In sulphate solutions lead stands the action in the bath much better than any other sufficiently cheap material. Carbon anodes do not endure in sulphate solutions, but are practicable in use in chloride solutions, in which lead anodes are quickly chloridized. But lead anodes must be, as far as possible, kept continually in action to prevent them from sulphating. The cathode is generally a thin sheet of copper at the start, prepared by the electro-deposition of copper on a cathode of lead, from which latter it is stripped when thick enough for use.

Under the just-described method it is necessary, in order to economically deposit the ultimate quantity of reguline copper within a required time, to begin the deposition by use of the current at its maximum density between the electrodes, permissible in the production of reguline metal on the cathode, and retrogressively decrease that density as the action goes on, and in proportion to the decrease of the metal in the solution, till, at the end the minimum density of current is in use, and the minimum amount of copper is left undeposited in the solution.

It is not necessary to deposit all of the copper, because the solution will be used again to dissolve more copper, the acid from the deposited copper being freed by the electrolytic action so that it may again combine to form a soluble salt of copper.

It is evident from the above that the source of electricity, a dynamo, is not acting during the time on the average above one-half of its capacity. It was started at its maximum and finished at its minimum.

To obviate this difficulty I have devised the following described apparatus and method: The deposition vats are placed in series, so that the liquid or solution is caused to flow from the first to the last in regular succession. They are also connected with the dynamos in electrical series, so that the electric current flows through all in equal strength in amperes.

As the solution has, in practice, a nearly uniform amount of copper per unit in it as it flows into the first vat of the series, that vat has in it a cathode surface which permits the deposition of about the maximum amount of reguline copper obtainable on that area of surface.

That area is limited by the amperes of current available. In other words, the density of current is such that reguline copper is deposited, but the density of current is less than that which causes the deposition of a brown, sandy deposit.

In the second vat is a larger cathode area. As the same amperes of current flow in this vat, the density of current is less—because the area of cathode is greater. The same amount of reguline copper is deposited as in the first vat, and in the same time, but over a larger area.

The same progressive increase in cathode area is made in each successive vat of the series. The same current flows through all, but its density is less and less through the several vats of the series, so that reguline copper is deposited to the same amount in each, until the depleted solution flows out of the last vat of the series, to be again used to dissolve copper from more rock or ore. In this way the electricity is used most economically.

But none of these leaching methods obtains the gold and silver which almost invariably accompany the copper. To obtain these, leaching by cyanide of potassium solutions might be performed after thoroughly washing the pulp which has been treated for copper. But this will often be found too expensive for the values obtainable.

I have devised and put into successful operation the following described method of treating the siliceous copper-bearing rocks which we have been considering. It is based on these chemical and metallurgical facts:

Silica alone is infusible at temperatures at which copper, gold and silver are melted. In those rocks there is not enough iron or lime to act as fluxes for the silica, which last averages 90% or more of the whole.

Oxide of iron, and oxide of calcium, separately, are likewise infusible.

Copper carbonates, azurite and malachite, when exposed to red heat, are decomposed; carbon oxide is freed as a gas, and cupric oxide remains. If the atmosphere in which this decomposition takes place be a reducing one, say carbon monoxide, then the copper is reduced to the metallic condition by passing of the oxygen of the cupric oxide to the carbon monoxide to produce carbon dioxide. If the temperature be high enough to melt copper that will be found in small metallic globules if the carbonates were diffused in the rock.

Chalcocite, or copper glance, Cu_2S, when exposed to a like heat in an oxidizing atmosphere, as on the hearth of a roasting furnace, is decomposed; the sulphur partly distills off, and is partly oxidized to sulphurous acid, SO_2. The copper is first freed as a metal, and then rapidly oxidized to cupric oxide. If, then, the character of the flame and gases be changed to a reducing nature the copper oxide will be reduced and fused as stated above.

If carbon, such as coal, be ground or pulverized, and be projected into a flame in a furnace with free access of air, it immediately ignites and is oxidized to carbon monoxide and carbon dioxide. If the air be insufficient to furnish oxygen enough for the formation of dioxide only monoxide will be formed.

The air admitted with the powdered carbon may be sufficient to form at the first stage of the combustion only carbon dioxide, but as the action continues, the hot particles of carbon absorb half of the oxygen of the dioxide, reducing the latter to monoxide.

The atmosphere resulting from this operation consists of nitrogen, from the air, and carbon monoxide from the union of the oxygen of the air with the carbon. There are, also, small quantities of gaseous hydro-carbons, because of reactions due to the presence of water in the air and in the coal. This atmosphere of hot gases is ready to, and does, take oxygen from hot oxides and thus reduces them to the metallic state.

The practical, working furnace in which the several reactions above recited take place consists of a vertical shaft about 20 feet high, constructed of red brick with a fire-brick lining.

At the top of this shaft are many holes, or openings, through which the powdered rock, powdered coal and flames from producer gas, or like fuel, are introduced. The bottom of the interior of the shaft is inclined at an angle of about 45°, and this incline is extended into a dust-collecting chamber. This chamber, in turn, connects with another vertical shaft, also with an inclined bottom, dipping toward the other incline. The interior of this shaft is filled with pieces of coke, or small stones. This latter shaft is called the "condensing chamber." Near its top is a sprinkler to distribute water over the coke or stones, after the manner of a gas washer or scrubber. The draft for this furnace is produced by an exhaust fan through a pipe from the top of the condensing chamber. The draft is downward in the first shaft and upwards in the condensing chamber.

The operation by which copper, gold and silver are extracted from the siliceous rocks is described as follows:

The rock, as it comes from the mine, is dumped from the cars into a crusher, or a series of crushers, which reduces it to sizes suitable for the pulverizers, into which it is automatically fed, and in them reduced to powder. The fineness of this powder is determined by the diffusion of the copper mineral in the rock; and it should be so fine that the particles of rock and mineral are no longer coherent, but, of course, still mixed. The degree of comminution is measured by sieves, which may be as fine as 60-mesh, or finer, or coarser, according to the above requirement.

At some stage of this process of comminution finely pulverized coal, in weight about 3% of the rock, is intimately mixed with the powdered rock, and the mixture is deposited in a hopper above the furnace shaft.

The draft and gas flames having been started, the comminuted mixture of rock and carbon is continuously fed into the holes at the top of the shaft, passing into the furnace with the flames and air. The particles of carbon and copper mineral are immediately ignited and oxidized by the oxygen of the air in which the particles are suspended and diffused.

This oxidation is combustion, and produces an intense heat. At first the carbon particles have their surfaces oxidized to produce carbon dioxide; but as the particles pass farther down the shaft the oxygen of the air supply becomes exhausted, and then the carbon dioxide parts with half of its oxygen to the unburned incandescent carbon to form carbon monoxide, which last, in its turn, acts upon the oxides of copper and silver, taking their oxygen, thus reducing them to the metallic state.

As the heat is intense, these particles of metal are melted and assume globular shape.

The gold particles are likewise fused. The heat does not fuse the silica nor the lime. The result of this operation is a sand carrying in it minute globular particles of copper, gold and silver.

The dust and condensible gases are collected on the wetted surfaces of coke or stones in the condensing chamber and washed by the water to the bottom, where the water also meets the sand and carries it out of the furnace, in a constant stream upon concentrators, which separate the sand from the metal particles.

The metallic concentrates are then dried, melted and cast into merchantable shapes; such as copper anodes, when there is enough gold and silver to pay for the expense of electrolytic refining and separation of the associated metals.

The process is a continuous one and automatic from start to finish. It is cheap; and under the economic conditions of the localities we have considered the cost does not exceed $1 per ton on a scale of treatment of 100 to 200 tons per day of 24 hours.

The gas drawn from the furnace by the exhaust fan is a combustible one, consisting mainly of carbon monoxide and nitrogen, and may be used for heating purposes. The sulphur dioxide and carbon bisulphide, if any of the latter, are condensed in the chamber and pass off in the water.

The limits of this paper do not admit of entering into specific details of construction and operation.

The process is applicable in many cases where older methods are not practicable.

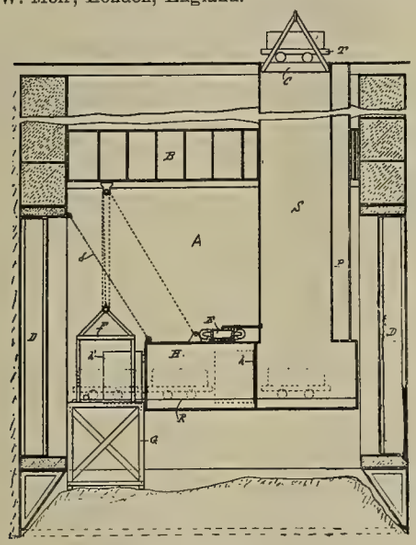
To attempt to locate and run long and expensive tunnels through bedrock to reach gravel channels, the depth of which has not been previously ascertained by means of drilling numerous bore holes, is foolhardy. Many tunnels have thus been run by guess, but those engineered in this haphazard manner usually fail in accomplishing the desired result — the tapping and draining of the channel.

Mining and Metallurgical Patents.

PATENTS ISSUED AUGUST 22, 1905.

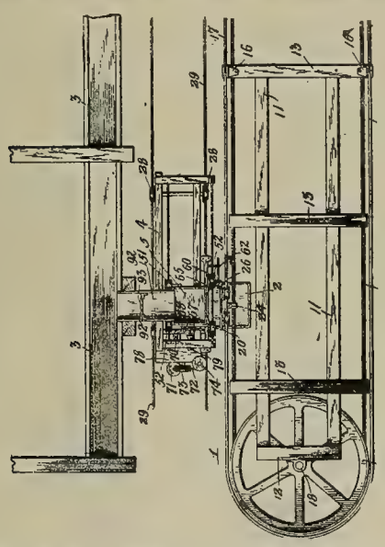
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

AIR LOCK APPARATUS FOR CAISSONS.—No. 797,817; E. W. Moir, London, England.



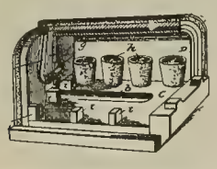
Air lock apparatus, comprising caisson having air-tight floor, vertical shaft, hoisting cage therein, horizontal air lock at its lower end, with runway in air lock and secondary hoist within caisson.

AUTOMATIC BUCKET LOADER FOR AERIAL TRAMWAYS.—No. 797,944; E. F. Crawford, Nelson, Canada.



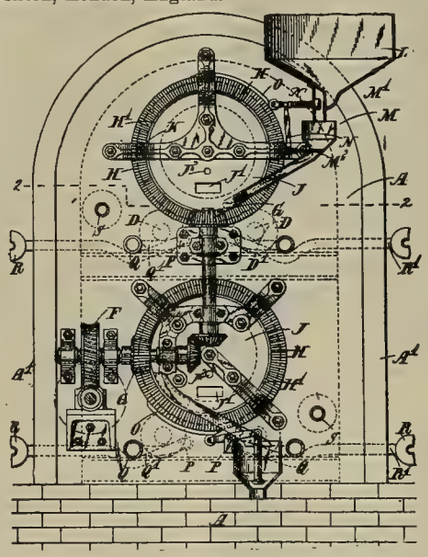
Combination of bucket or other container of tramway, loading hopper mounted to reciprocate and provided with discharge gate, accelerating lever for imparting motion of bucket to gate to open same, accelerating lever for imparting motion of gate to hopper to cause latter to move along with bucket while it is being loaded from hopper, means for automatically releasing hopper from bucket, and means for automatically closing gate and returning hopper to normal position.

ASSAY FURNACE.—No. 797,901; A. M. MacDuffee, Chloride, Ariz.



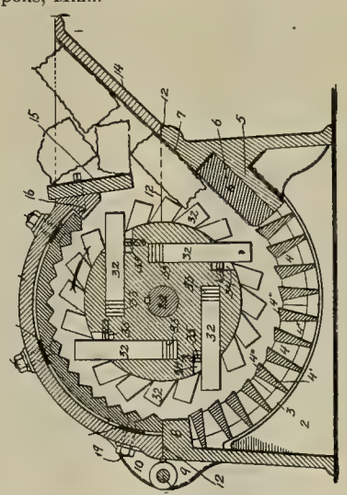
Assay furnace comprising base and ends and body portion forming muffle chamber, one of ends having projection on its inner face inclosing air space, muffle in chamber having opening in back end to connect air space with interior of muffle, muffle having normally loose, readily separable bottom thereby adapting muffle for both melting and cupeling operations, means for admitting flame to muffle, and means whereby spent products are allowed to escape from furnace.

FURNACE FOR ROASTING ORES.—No. 797,915; W. T. Rushton, London, England.



In continuous roasting furnace, combination of refractory furnace chamber, rotatable cylindrical muffle mounted therein having internal spiral conveying flange, inclined baffles projecting laterally therefrom, inwardly directed flange fixed on each end of cylinder forming annular recess, stationary disks closing cylinder ends and resting in annular recesses and means for rotating cylinders.

ROTARY BREAKER.—No. 797,616; J. M. Schutz, Minneapolis, Minn.

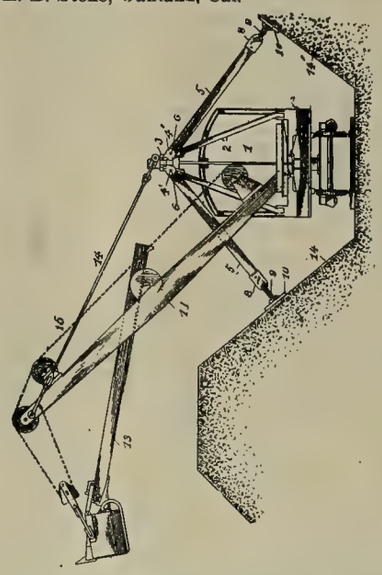


Rotary breaker comprising horizontal cylindrical shell or casing having feed chute in side and provided with breaker block at foot of chute, in combination with curved grating extending from block across bottom of casing, corrugated lining provided in top of casing, shaft extending through casing, bearings therefor, roll mounted on shaft within casing, and flat faced or ended hammer bars tangentially fixed in roll and therewith nearly filling casing.

CORE DRILL.—No. 797,627; W. S. Smith, Bigrun, Pa.

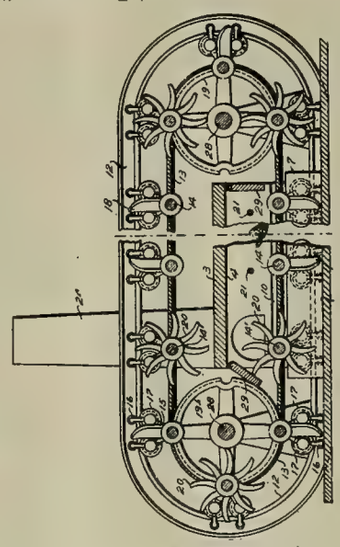
Combination with reciprocatory frame, of pair of racks carried by frame and adjustable thereon to operative and inoperative positions, teeth of racks being yieldable in opposite directions, respectively, shaft, and gear carried by shaft and intermeshing with racks.

JACK ARM FOR EXCAVATING MACHINES.—No. 797,627; E. B. Stone, Oakland, Cal.



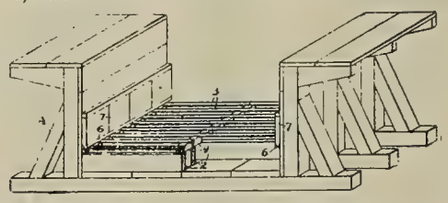
In machine of character described, combination with A-shaped supporting standard of pair of jack arms hinged to apex portion of standard so as to swing in vertical plane.

ORE ROASTING FURNACE.—No. 797,584; C. E. Keating, East Chicago, Ind.



In device of class described, combination of horizontally disposed hearth for supporting layer of material to be roasted, track extending along each side of hearth, shaft extending across hearth and supported by wheels riding on tracks, plurality of stirring devices mounted on shaft and rotatable about axis thereof, stirring devices having radially disposed arms and being adapted to rotate through engagement with material on hearth for stirring same, arms being curved in radial direction whereby rotation of stirring devices when shaft is moved along hearth will cause arms to pass endwise into mass of material on hearth and be lifted edgewise therefrom, and means for moving shaft along hearth.

MINING SLUICE.—No. 797,168; P. Bouery, Weaverville, Cal.



In sluice having bottom and sides and obstructing riffles, T rails having base flanges fixed upon riffles, blocks interposed between rails having ends fitting curvature of rail sides, holes made through blocks and countersunk depressions at ends, bolts extending through holes and through rail flanges, heads of bolts being enclosed within depressions at one end of block, and nuts by which bolts are secured to rail web being enclosed in next adjacent block.

Notes on Copper Deposits Near Tokar, Sudan.*

Written for the MINING AND SCIENTIFIC PRESS by W. H. SHOCKLEY.

These copper deposits lie between 17° 30′ and 18° north and 37° 45′ to 38° 30′ east. They cover with their float an area of 500 square miles; the ore in place was found over an area of 130 square miles. They have been but little studied and nothing has been published on them that I know of. The only engineers who have visited the region are J. F. Morris and myself; we were there during February to April, 1905.

The region is mountainous, the highest summits rising to 9121 feet on the Erythrean border, at a distance of 50 miles from the sea.

The formation is exclusively made up of schists having a strike a little east of north and a steep westerly dip as a rule. The schists are varied in structure and injected into them are eruptive rocks with well marked crystals. Limestones, sandstone, basalts, porphyries and granites, all of which are found to the west, are wanting.

The slopes facing the sea are covered with dense brush and small trees, and on the higher ranges are forests of juniper. The country is sparsely peopled by Hasas, a tribe of black Arabs, living almost entirely on milk from their sheep and goats. Cattle and camels are also kept. There is much game, gazelle, koodoo, warthogs, bustard and guinea fowl being the principal varieties.

The copper float found consisted of rock, stained green by malachite, varying from small pebbles to boulders weighing twenty-five pounds. The float, though distributed over 500 square miles, is nowhere abundant, and it needs careful searching to find it. The Arabs soon become expert in finding float; at first they had great difficulty in distinguishing between the chlorite and epidote rocks, which are common, and the copper ore. Specular iron ore is found as float and also in lodes. This mineral is found in the croppings of the copper veins at Bearhaven, in Ireland, which consist chiefly of white quartz. After sinking a short distance the quartz is replaced by copper ores. This fact I learned from Mr. Morris, who examined these mines recently with a view to reopening them.

By following up the copper float we found a number of lodes and indications of many others which our limited time did not allow us to discover. None of these deposits showed any ore that would pay to ship. It is possible that some of the deposits we found may improve in depth, and further prospecting may find much better lodes than we have yet seen.

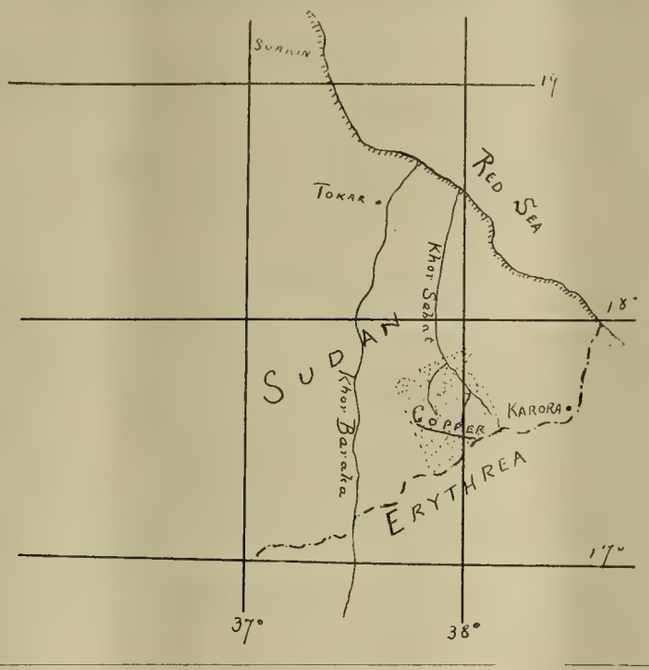
The strongest outcrop we saw was of white quartz 75 feet long, 10 feet high and 15 feet thick. This showed many small stains of malachite. Strata of schist, impregnated with copper, were found in many places varying from lenses 40 feet long, with a width of a few inches to 4 feet, to a vein a foot wide and extending for several hundred feet along the surface. The largest deposit showed copper stains in a space 100 feet wide by 200 feet long. The staining did not cover the whole space; the largest outcrop here was 15 feet long by 6 feet high and 2 feet wide. A sample taken here gave 2% copper.

*See illustrations front page.

The following assays were made chiefly of float and are only valuable as showing the existence of good ore:

From—	Copper Per Cent.	Silver Ozs.	Per Ton. Dwt.	Grs.
Khor Arelrib	2.01	0	6	14
Ibrahim Ledge, near Hubrab	2 03		traces	
Abandob (float)	11 96	2	2	11
Khor Dareb	42 59	20	16	0
Khor Arelrib at Abandob (float)	21 25	7	2	17
Khor Arelrib, near Abandob (float)	14 33	2	19	0
Khor Hamrik (float)	nil		nil	
Near Kutal Dul	34.24	15	10	0
Small Khor from Arelrib, near Abandob	5 59		traces	
Mahomed Ledge, Khor Hamrik	2 92		traces	

All these deposits are on the concession of the Tokar Syndicate, and will be further studied the coming winter. No other mineral deposits were found. Quartz veins are very abundant in one portion of the concession, and the ground is covered to a depth of several inches for many square miles with quartz float, but all the samples assayed were barren.



Sketch Showing Position of Copper Deposits Near Tokar, Sudan.

The Ventilation of Mines.

NUMBER IV.

Appliances for Regulating Air Currents: The use of doors and stoppings for systematizing the ventilation of metalliferous mines has not had the attention which its importance deserves, the currents being generally allowed to travel haphazard through the mines. The smoke and vitiated air from lower workings are consequently often found passing into upper ones to the detriment of the men there, when by a little trouble they could be diverted into a return way in which they could do no harm. Each level should, as far as possible, be made a separate "split" from the downcast current, the air being guided through the stopes above it and thence into the main return. Frequently it is not practicable to make each level a separate split, and then two or more may have to be worked on one split, but the more the principle of ventilating the mine in sections can be carried out the more thoroughly it will be ventilated.

The regulation of the distribution of the air can be carried out by stopping all unnecessary air ways, and placing doors so as to direct the currents into the paths along which they are desired to travel. In our examination of the metalliferous mines we found only two which made regular use of an air door system throughout the mine, namely, the Sons of Gwalia and the Ivanhoe, and in both the evidence of witnesses showed that their construction had been attended with great improvement of the ventilation. In the Sons of Gwalia the main shaft is an upcast, the downcast air coming from the surface into the mine through winzes and stoped-out ground, and in order to drive it to the bottom levels it proved absolutely necessary to use doors to prevent it returning to the upcast by the shortest route. In the Ivanhoe case the object of the air doors is to carry the downcast air through the main shaft into the bottom of the mine before allowing it to escape upwards through the workings. In the Lake View Consols mine good use is made of air doors at one or two important points, and in the Ida H. mine, near Laverton, we noticed a well-considered plan of using bag doors to good advantage, but in the great majority of the mines visited there was very little attempt made at any regulation of the air currents. Undoubtedly the judicious use of doors and stoppings would be of the very greatest advantage in almost all mines. In our opinion it should be incumbent on every mine to show should be marked, in order that consideration of this the course of its ventilating currents on suitable plans and sections, on which also all doors and stoppings question should be constantly forced upon the attention of the management, and come prominently under the notice of the inspectors of mines.

Devices for Mechanical Ventilation: A great many different devices for mechanically assisting the ventilation of metalliferous mines were mentioned by witnesses as being used in mines with which they were familiar here and elsewhere, from the large ventilating fans used in collieries to hand-driven fans, water jets, and other simple appliances employed in ventilating small portions of mine workings. There can be no doubt that, in order to insure a thorough and constant ventilation throughout a mine, the use of a powerful fan is the most certain method of attaining the desired end, and that in very many cases where the natural ventilation presents difficulties, the best solution would be a fan installation. The case of the Sons of Gwalia mine seemed to us one which could best be dealt with by a fan. Instead of having the main shaft the upcast, it would be much preferable to have it the downcast into the mine, which could be brought about by putting an exhaust fan on the small shaft, which is the present principal in-take of air, and enlarging the air-way from this through the workings. So long, however, as a fair amount of natural ventilation can be obtained in metalliferous mines in the course of opening them up in the ordinary way, it is hard to persuade owners to go to the expense of installing mechanical ventilation on a large scale, even though in many cases such ventilation would be so much superior that economy, instead of expense, would result. It is somewhat difficult to convince managers that this might be possible without direct comparison of cases where one system has been tried against the other, which are not available in this State; but the experience of coal mines strongly supports the contention that mechanical may be even more economical than natural ventilation, notwithstanding the obvious expense of the former as shown on the cost sheet. Should it enable the working force underground to do only 1% more work in the same time, there would evidently be a very considerable credit to put against the debited cost. That the state of the ventilation does affect the working efficiency of the men employed can not be disputed, especially when the mines are hot. With better ventilation, not only is it possible for men to work longer, on account of more rapid clearing of the smoke from blasting, but the lowering of the temperature brought about also enables them to exert themselves to better effect and do more work. The observations of Dr. Haldane as to the effect on men of high temperatures underground show very strikingly the impossibility of performing vigorous exertion when the workings are very hot and moist. That the temperature may be greatly reduced by ventilation was proved in the driving of the St. Gothard tunnel, where, "before the fan was brought into operation, the temperature used sometimes to be as high as 107° F., with 97% of moisture; but by artificial ventilation the temperature fell to 81° F., subsequently to 74.5° F."

Any of the well-known types of fans used for colliery ventilation may be used also for metalliferous mines, either driving air into the workings (plenum system) or exhausting it out of them (vacuum system), and the choice is a matter for individual consideration.

In the system of ventilating mines by large fans at surface, either blowing or suction, the mine excavations themselves are the principal conduits for the air. Another system, however, is often applied, especially in conjunction with natural ventilation, namely, that of blowing or exhausting the air through pipes. Root's and similar blowers are often used for this purpose, driving or drawing air through pipes into or from the places where ventilation is required. In the blowing system the pure air is confined to the pipes until it reaches the points of discharge, and all the smoke and vitiated air have to travel back through the mine passages; while in the exhaust system the pure air travels inwards to the faces through the workings, and the fumes are removed in the pipes and do not pass over the workmen to any extent. When the air is blown in, however, there is an advantage in the fact that the current can be sent forward some considerable distance from the end of the pipe, while with an exhaust there is little current perceptible a few feet from its end. The blast is, therefore, much preferable in clearing ends of smoke, as it is impossible to keep pipes right up to the faces.

Although the main ventilation of a mine may be very good, it generally happens that development work must be carried on so far ahead of any possible connections that some means must be adopted of carrying a current of air into them. This can occasionally be done by bratticing or by the air-sollar system, as already mentioned; but usually pipes of some sort are the most applicable method. Very generally, however, those used are much too small. Small fans and blowers driven by hand, or by water power, if available, or by a small compressed air engine, or by an electric motor, are often used successfully in such cases, causing air to pass in from a well ventilated part of the mine and removing the vitiated

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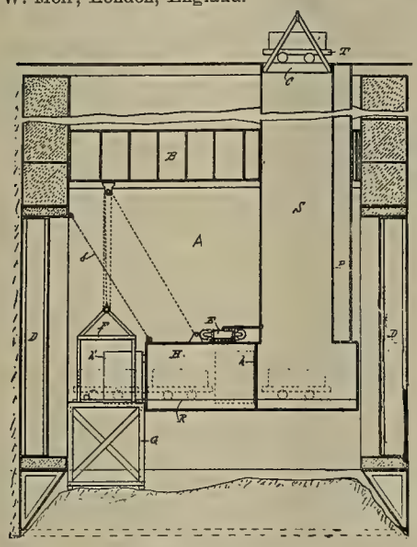
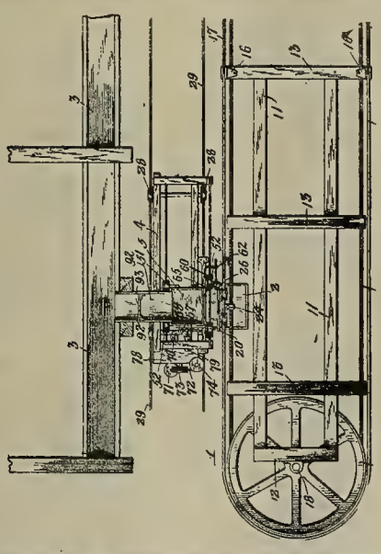


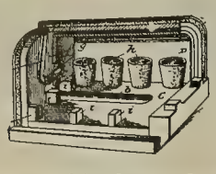
Air lock apparatus, comprising caisson having air-tight floor, vertical shaft, hoisting cage therein, horizontal air lock at its lower end, with runway in air lock and secondary hoist within caisson.

AUTOMATIC BUCKET LOADER FOR AERIAL TRAMWAYS.—No. 797,944; E. F. Crawford, Nelson, Canada.



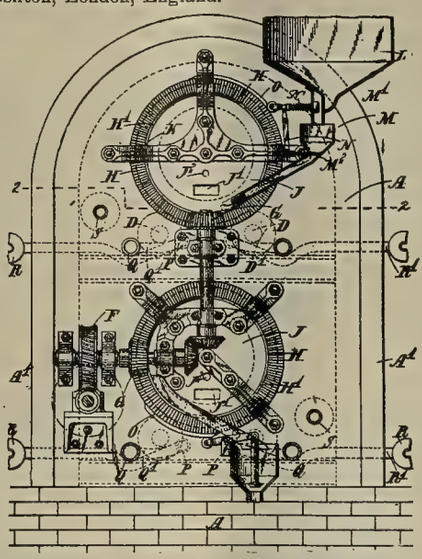
Combination of bucket or other container of tramway, loading hopper mounted to reciprocate and provided with discharge gate, accelerating lever for imparting motion of bucket to gate to open same, accelerating lever for imparting motion of gate to hopper to cause latter to move along with bucket while it is being loaded from hopper, means for automatically releasing hopper from bucket, and means for automatically closing gate and returning hopper to normal position.

ASSAY FURNACE.—No. 797,901; A. M. MacDuffee, Chloride, Ariz.



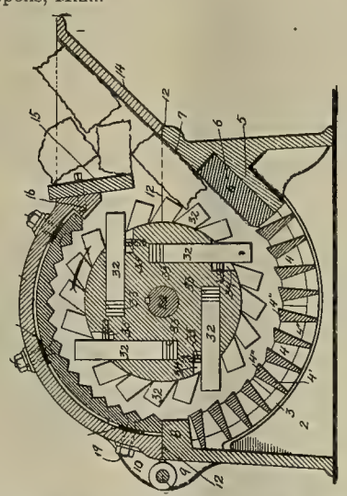
Assay furnace comprising base and ends and body portion forming muffle chamber, one of ends having projection on its inner face inclosing air space, muffle in chamber having opening in back end to connect air space with interior of muffle, muffle having normally loose, readily separable bottom thereby adapting muffle for both melting and cupeling operations, means for admitting flame to muffle, and means whereby spent products are allowed to escape from furnace.

FURNACE FOR ROASTING ORES.—No. 797,915; W. T. Rushton, London, England.



In continuous roasting furnace, combination of refractory furnace chamber, rotatable cylindrical muffle mounted therein having internal spiral conveying flange, inclined baffles projecting laterally therefrom, inwardly directed flange fixed on each end of cylinder forming annular recess, stationary disks closing cylinder ends and resting in annular recesses and means for rotating cylinders.

ROTARY BREAKER.—No. 797,616; J. M. Schutz, Minneapolis, Minn.

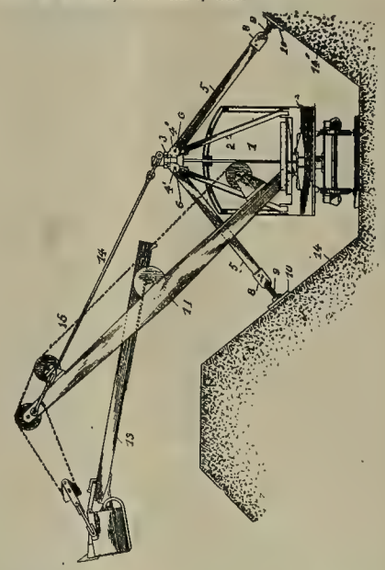


Rotary breaker comprising horizontal cylindrical shell or casing having feed chute in side and provided with breaker block at foot of chute, in combination with curved grating extending from block across bottom of casing, corrugated lining provided in top of casing, shaft extending through casing, bearings therefor, roll mounted on shaft within casing, and flat faced or ended hammer bars tangentially fixed in roll and therewith nearly filling casing.

CORE DRILL.—No. 797,627; W. S. Smith, Big-run, Pa.

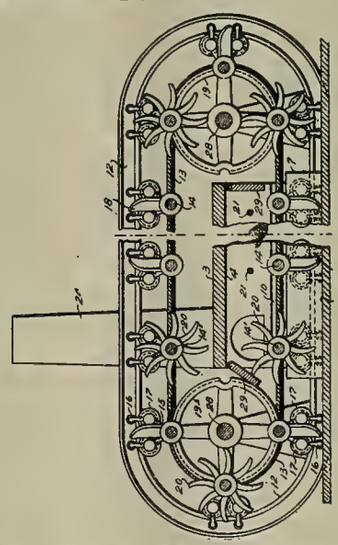
Combination with reciprocatory frame, of pair of racks carried by frame and adjustable thereon to operative and inoperative positions, teeth of racks being yieldable in opposite directions, respectively, shaft, and gear carried by shaft and intermeshing with racks.

JACK ARM FOR EXCAVATING MACHINES.—No. 797,627; E. B. Stone, Oakland, Cal.



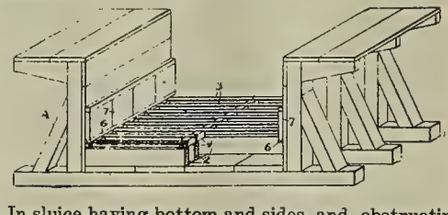
In machine of character described, combination with A-shaped supporting standard of pair of jack arms hinged to apex portion of standard so as to swing in vertical plane.

ORE ROASTING FURNACE.—No. 797,584; C. E. Keating, East Chicago, Ind.



In device of class described, combination of horizontally disposed hearth for supporting layer of material to be roasted, track extending along each side of hearth, shaft extending across hearth and supported by wheels riding on tracks, plurality of stirring devices mounted on shaft and rotatable about axis thereof, stirring devices having radially disposed arms and being adapted to rotate through engagement with material on hearth for stirring same, arms being curved in radial direction whereby rotation of stirring devices when shaft is moved along hearth will cause arms to pass endwise into mass of material on hearth and be lifted edgewise therefrom, and means for moving shaft along hearth.

MINING SLUICE.—No. 797,168; P. Bouery, Weaverville, Cal.



In sluice having bottom and sides and obstructing riffles, T rails having base flanges fixed upon riffles, blocks interposed between rails having ends fitting curvature of rail sides, holes made through blocks and countersunk depressions at ends, bolts extending through holes and through rail flanges, heads of bolts being enclosed within depressions at one end of block, and nuts by which bolts are secured to rail web being enclosed in next adjacent block.

Notes on Copper Deposits Near Tokar, Sudan.*

Written for the MINING AND SCIENTIFIC PRESS by W. H. SHOCKLEY.

These copper deposits lie between 17° 30′ and 18° north and 37° 45′ to 38° 30′ east. They cover with their float an area of 500 square miles; the ore in place was found over an area of 130 square miles. They have been but little studied and nothing has been published on them that I know of. The only engineers who have visited the region are J. F. Morris and myself; we were there during February to April, 1905.

The region is mountainous, the highest summits rising to 9121 feet on the Erythrean border, at a distance of 50 miles from the sea.

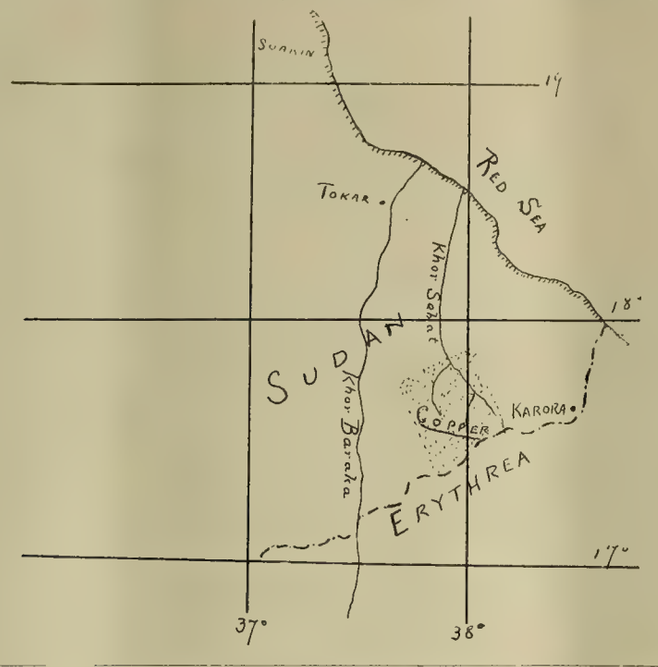
The formation is exclusively made up of schists having a strike a little east of north and a steep westerly dip as a rule. The schists are varied in structure and injected into them are eruptive rocks with well marked crystals. Limestones, sandstone, basalts, porphyries and granites, all of which are found to the west, are wanting.

The slopes facing the sea are covered with dense brush and small trees, and on the higher ranges are forests of juniper. The country is sparsely peopled by Hasas, a tribe of black Arabs, living almost entirely on milk from their sheep and goats. Cattle and camels are also kept. There is much game, gazelle, koodoo, warthogs, bustard and guinea fowl being the principal varieties.

The following assays were made chiefly of float and are only valuable as showing the existence of good ore:

From—	Copper Per Cent.	Silver Ozs.	Per Ton. Dwt.	Grs.
Khor Areirib	2.01	0	6	14
Ibrahim Ledge, near Hubrah	2.03		traces	
Abandob (float)	11.96	2	2	11
Khor Dareb	42.59	20	16	0
Khor Areirib at Abandob (float)	21.25	7	2	17
Khor Areirib, near Abandob (float)	14.33	2	19	0
Khor Humrik (float)	nil		nil	
Near Katal Dul	34.24	15	10	0
Small Khor from Areirib, near Abandob	5.59		traces	
Mahomed Ledge, Khor Humrik	2.92		traces	

All these deposits are on the concession of the Tokar Syndicate, and will be further studied the coming winter. No other mineral deposits were found. Quartz veins are very abundant in one portion of the concession, and the ground is covered to a depth of several inches for many square miles with quartz float, but all the samples assayed were barren.



Sketch Showing Position of Copper Deposits Near Tokar, Sudan.

The copper float found consisted of rock, stained green by malachite, varying from small pebbles to boulders weighing twenty-five pounds. The float, though distributed over 500 square miles, is nowhere abundant, and it needs careful searching to find it. The Arabs soon become expert in finding float; at first they had great difficulty in distinguishing between the chlorite and epidote rocks, which are common, and the copper ore. Specular iron ore is found as float and also in lodes. This mineral is found in the croppings of the copper veins at Bearhaven, in Ireland, which consist chiefly of white quartz. After sinking a short distance the quartz is replaced by copper ores. This fact I learned from Mr. Morris, who examined these mines recently with a view to reopening them.

By following up the copper float we found a number of lodes and indications of many others which our limited time did not allow us to discover. None of these deposits showed any ore that would pay to ship. It is possible that some of the deposits we found may improve in depth, and further prospecting may find much better lodes than we have yet seen.

The strongest outcrop we saw was of white quartz 75 feet long, 10 feet high and 15 feet thick. This showed many small stains of malachite. Strata of schist, impregnated with copper, were found in many places varying from lenses 40 feet long, with a width of a few inches to 4 feet, to a vein a foot wide and extending for several hundred feet along the surface. The largest deposit showed copper stains in a space 100 feet wide by 200 feet long. The staining did not cover the whole space; the largest outcrop here was 15 feet long by 6 feet high and 2 feet wide. A sample taken here gave 2% copper.

*See illustrations front page.

The Ventilation of Mines.

NUMBER IV.

Appliances for Regulating Air Currents: The use of doors and stoppings for systematizing the ventilation of metalliferous mines has not had the attention which its importance deserves, the currents being generally allowed to travel haphazard through the mines. The smoke and vitiated air from lower workings are consequently often found passing into upper ones to the detriment of the men there, when by a little trouble they could be diverted into a return way in which they could do no harm. Each level should, as far as possible, be made a separate "split" from the downcast current, the air being guided through the stopes above it and thence into the main return. Frequently it is not practicable to make each level a separate split, and then two or more may have to be worked on one split, but the more the principle of ventilating the mine in sections can be carried out the more thoroughly it will be ventilated.

The regulation of the distribution of the air can be carried out by stopping all unnecessary air ways, and placing doors so as to direct the currents into the paths along which they are desired to travel. In our examination of the metalliferous mines we found only two which made regular use of an air door system throughout the mine, namely, the Sons of Gwalia and the Ivanhoe, and in both the evidence of witnesses showed that their construction had been attended with great improvement of the ventilation. In the Sons of Gwalia the main shaft is an upcast, the downcast air coming from the surface into the mine through winzes and stoped-out ground, and in order to drive it to the bottom levels it proved absolutely necessary to use doors to prevent it returning to the upcast by the shortest route. In the Ivanhoe case the object of the air doors is to carry the downcast air through the main shaft into the bottom of the mine before allowing it to escape upwards through the workings. In the Lake View Consols mine good use is made of air doors at one or two important points, and in the Ida H. mine, near Laverton, we noticed a well-considered plan of using bag doors to good advantage, but in the great majority of the mines visited there was very little attempt made at any regulation of the air currents. Undoubtedly the judicious use of doors and stoppings would be of the very greatest advantage in almost all mines. In our opinion it should be incumbent on every mine to show should be marked, in order that consideration of this the course of its ventilating currents on suitable plans and sections, on which also all doors and stoppings question should be constantly forced upon the attention of the management, and come prominently under the notice of the inspectors of mines.

Devices for Mechanical Ventilation: A great many different devices for mechanically assisting the ventilation of metalliferous mines were mentioned by witnesses as being used in mines with which they were familiar here and elsewhere, from the large ventilating fans used in collieries to hand-driven fans, water jets, and other simple appliances employed in ventilating small portions of mine workings. There can be no doubt that, in order to insure a thorough and constant ventilation throughout a mine, the use of a powerful fan is the most certain method of attaining the desired end, and that in very many cases where the natural ventilation presents difficulties, the best solution would be a fan installation. The case of the Sons of Gwalia mine seemed to us one which could best be dealt with by a fan. Instead of having the main shaft the upcast, it would be much preferable to have it the downcast into the mine, which could be brought about by putting an exhaust fan on the small shaft, which is the present principal in-take of air, and enlarging the air-way from this through the workings. So long, however, as a fair amount of natural ventilation can be obtained in metalliferous mines in the course of opening them up in the ordinary way, it is hard to persuade owners to go to the expense of installing mechanical ventilation on a large scale, even though in many cases such ventilation would be so much superior that economy, instead of expense, would result. It is somewhat difficult to convince managers that this might be possible without direct comparison of cases where one system has been tried against the other, which are not available in this State; but the experience of coal mines strongly supports the contention that mechanical may be even more economical than natural ventilation, notwithstanding the obvious expense of the former as shown on the cost sheet. Should it enable the working force underground to do only 1% more work in the same time, there would evidently be a very considerable credit to put against the debited cost. That the state of the ventilation does affect the working efficiency of the men employed can not be disputed, especially when the mines are hot. With better ventilation, not only is it possible for men to work longer, on account of more rapid clearing of the smoke from blasting, but the lowering of the temperature brought about also enables them to exert themselves to better effect and do more work. The observations of Dr. Haldane as to the effect on men of high temperatures underground show very strikingly the impossibility of performing vigorous exertion when the workings are very hot and moist. That the temperature may be greatly reduced by ventilation was proved in the driving of the St. Gothard tunnel, where, "before the fan was brought into operation, the temperature used sometimes to be as high as 107° F., with 97% of moisture; but by artificial ventilation the temperature fell to 81° F., subsequently to 74.5° F."

Any of the well-known types of fans used for colliery ventilation may be used also for metalliferous mines, either driving air into the workings (plenum system) or exhausting it out of them (vacuum system), and the choice is a matter for individual consideration.

In the system of ventilating mines by large fans at surface, either blowing or suction, the mine excavations themselves are the principal conduits for the air. Another system, however, is often applied, especially in conjunction with natural ventilation, namely, that of blowing or exhausting the air through pipes. Root's and similar blowers are often used for this purpose, driving or drawing air through pipes into or from the places where ventilation is required. In the blowing system the pure air is confined to the pipes until it reaches the points of discharge, and all the smoke and vitiated air have to travel back through the mine passages; while in the exhaust system the pure air travels inwards to the faces through the workings, and the fumes are removed in the pipes and do not pass over the workmen to any extent. When the air is blown in, however, there is an advantage in the fact that the current can be sent forward some considerable distance from the end of the pipe, while with an exhaust there is little current perceptible a few feet from its end. The blast is, therefore, much preferable in clearing ends of smoke, as it is impossible to keep pipes right up to the faces.

Although the main ventilation of a mine may be very good, it generally happens that development work must be carried on so far ahead of any possible connections that some means must be adopted of carrying a current of air into them. This can occasionally be done by bratticing or by the air-sollar system, as already mentioned; but usually pipes of some sort are the most applicable method. Very generally, however, those used are much too small. Small fans and blowers driven by hand, or by water power, if available, or by a small compressed air engine, or by an electric motor, are often used successfully in such cases, causing air to pass in from a well ventilated part of the mine and removing the vitiated

air. They may be worked on the plenum or vacuum system, as the operator may consider most advisable. Where electric power is available in a mine, the use of small high-speed fans driven directly by motors affords a very flexible system of air supply; and where there are no electric leads a small engine, worked by compressed air from the rock drill mains, also permits a very convenient installation. Where there is a good deal of water allowed to pass from the higher levels to a pumping station lower down in the mine, the water may sometimes be made use of at the lower level as a source of power, being brought down in a pipe and used on a small Pelton wheel or other motor. Where there are Cornish pumps at work, the old "duck machine" or Hartz blower may be used very successfully. If high pressure water is available, as above, or can be obtained from a small pipe let into the rising main of a pump, it is often utilized more simply by merely turning a jet into the bell mouth of a ventilating pipe, the jet driving the air forward. The jet may similarly be arranged to exhaust. In the Ida H. mine we were shown another application of the water blast—a simple variation of the old and well known "trompe," the air being carried down by a stream of water from a rose in such a way that its only outlet was through the ventilating pipe. Air driven in by a water blast is often much liked by the men, on account of its coolness and sensation of freshness. In dry mines, however, either hand power, electric power or compressed air must be resorted to to produce the ventilation. One of the most convenient ways of employing the compressed air to produce a draught, either inwards or outwards as desired, is to use it as an injector, by introducing a small pipe through the side of the ventilating pipe and fitting it with a right-angle bend and small nozzle, so as to deliver a jet of air along the axis of the pipe. A Korting injector may be used as a more elaborate form of the same device. The jet device was employed in the Sons of Gwalia mine, but was dismantled at the time of our visit; we were informed by witnesses, however, that it had been very successful. It was also used in a long crosscut, some 1300 feet or more in length, made some years ago in the Queen Margaret mine, at Bulong, and was regarded as most successful by the manager—an opinion corroborated by some of our witnesses who had seen it in action. In both these cases the jet was turned into ordinary 6-inch or 8-inch galvanized iron ventilation piping.

The convenience of using a blast of compressed air from the mains to blow out the smoke from working faces after firing, makes up, in the opinion of many practical men, for the admittedly high cost of this method of air supply, and it is the means at present in almost universal use in our mines. We have shown, however, that the air so driven in is far too small for adequate ventilation, and ordinarily it is set free too far back from the face, at the coupling from the air hose, to have the best effect, and comparison of the horse power required to deliver a certain quantity of air by fans or blowers with that needed to supply the same amount as highly compressed air, proves that the latter method is absurdly more costly. It also has a great disadvantage, in many cases, in raising a large amount of dust. The difficulty of maintaining large and light ventilation pipes close up to the firing points is admittedly so great as to be almost impracticable, and the use of large, strong pipes means serious cost. We would suggest, however, that the following compromise system might meet the difficulty and would be worth practical trial: Large, light ventilating pipes exhausting to the shaft, either by furnace draught at surface, or, better, by exhaust fan, to be carried to, say, 200 feet from the face, and continued to 100 feet from it by stronger spiral-rivetted piping of the same diameter, the line to be extended from time to time by carrying forward the strong pipe and introducing behind it fresh connecting lengths of the lighter pipe. Then, to bring the smoke back to where the exhaust pipe can reach it, carry in as close to the face as practicable a strong iron pipe 4 or 5 inches in diameter—an old compressed air main would do—with the injector jet in it, by which a blast may be sent in which will reach the face; the injector to be attached to the air mains at the rock-drill hose coupling by a short length of hose. The smoke would then be blown out to the exhaust pipe and drawn out by it. In many cases of rising and sinking winzes the injector pipe alone would be required, the smoke being carried away by the natural currents when it reached the level. This plan might not give so high an efficiency as an electrically driven fan, but would, we think, be more adapted for the rough usage of mine work and be a long advance on the use of compressed air directly from the mains. The injector system uses a considerable portion of the power contained in the compressed air in moving a relatively large volume of other air, but the power in what is blown off from the mains is almost absolutely thrown away.

Where steam pumps are used in a shaft, the exhaust steam from them may be usefully turned into the bottom of a large ventilating pipe or wooden box placed in the shaft and connected with branch pipes into the levels. The warming of the air in the column up the shaft by the exhaust steam increases the draught very materially by accentuating the differences of temperature on which the movement of the air depends. The steam pipes leading down to the pump are sometimes placed inside a large surrounding ventilating pipe for the same reason, and also for the sake of a slight economy in steam, through the steam pipe passing through the warmer air instead of going down the shaft uncovered.

(TO BE CONTINUED.)

Placer Mining in Alaska.*

NUMBER V.

For moving up the cars within reach of the dipper as each one is filled, the device shown in Fig. 10 is used. This was devised by W. S. Purington, and has been in successful use for five years. The long cylinder, made with casting to attach to the shovel, here shown on the near side, contains a piston of equal length, which is supported on suspended track and wheel as it leaves the end of the cylinder. To the near end of the piston a cable passing over a sheave is attached. The other end of the cable is hooked to the corner of the gravel car, steam is turned into the near end of the cylinder, and as the piston travels back toward the forward end of the shovel car, the gravel car is hauled by the cable an equal distance—from 5 to 7 feet, as may be required. Steam is then turned into the cylinder, allowing the piston to return and the cable to free itself; the cable is unhooked and pulled by the car man to the following car and hooked in readiness to pull it along. The amount of steam and the time consumed in the operation are so small as to be almost negligible. By passing the cable around the body of the shovel car over a second sheave, the cars on the opposite side of the shovel can be moved, when the relative position of the shovel is reversed.

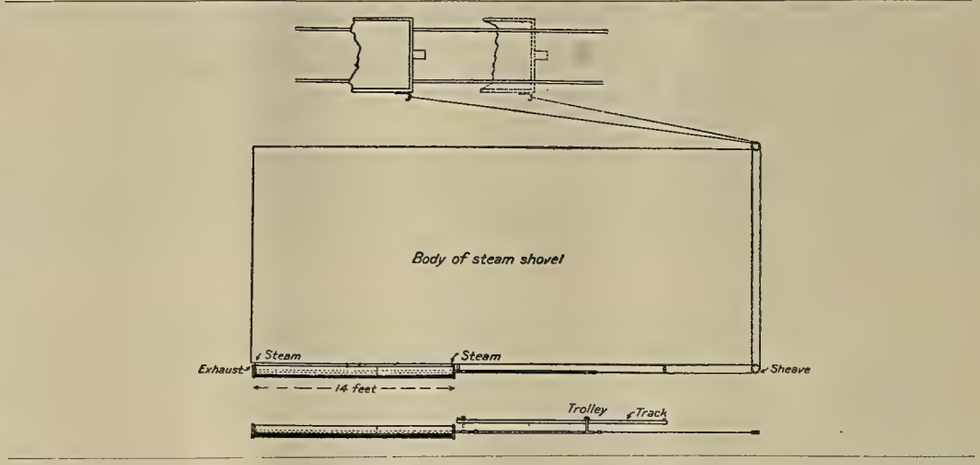


Fig. 10.—Pulling-Up Device for Steam Shovel.

Dipper chains are generally preferable to cables in placer operations, as illustrated by the experience of the shovel dredger in Solomon river. A link in a chain can be repaired where a wire cable can not.

In Anvil Creek plant the present arrangement for dumping the cars at the sluice is unsatisfactory and will be changed. Self-tripping, two-way dumping cars will be substituted for the man who trips the cars. The sluice presents no new features. It is 500 feet long by 32 inches wide by 36 inches high at the dump box, and narrows to 26 inches wide by 24 inches high, in 10-inch grade, and is furnished with angle iron riffles. The cost of digging, tramming and dumping the gravel to sluice is said to be 12 cents per cubic yard.

In the Anvil Creek operation the actual working cost of digging the gravel, tramming and hoisting, and tripping the cars to the sluice box is given below, as estimated by the superintendent—the figures covering 810 yards in twenty-four hours, and including superintendence on the ground, labor, crude oil fuel at $3 a barrel, lubricants, etc.:

COST OF STEAM SHOVEL WORK AT ANVIL CREEK, ALASKA, PER CUBIC YARD.

Digging	$0.045
Tramming to incline	0.025
Hoisting	0.018
Dumping	0 011
Proportionate superintendence on ground, and incidentals	0.021
Cost per cubic yard	$0.120

Although the cost of 12 cents on Anvil creek appears attractively low, it must be remembered that it does not take into account the labor of shovelers cleaning bedrock after the shovel. This operation, unfortunately, can rarely be dispensed with, at least in portions of the ground, and it will naturally increase the cost of getting the auriferous material into the cars. In some places in Alaska the slabs and leaves of bedrock must be scraped with brooms in order to recover all the gold. The prospective steam shovel miner should keep in mind the fact that a machine which will handle a large quantity of material, however cheaply, is of no avail unless it can succeed in extracting a large percentage of the values.

The steam shovel plant at the junction of Bear creek and Klondike river occupies the flood plain of the latter stream, a fact that influences greatly the economical excavation and disposal of material, since both lack of grade for washing gravel and dump for disposal of tailings must be supplied artificially.

This steam shovel digs in a pit 20 feet below the surface of the flat. The dipper empties into cars which are pushed by hand to the foot of an incline and raised by steam winch to the platform of the washing frame, where they are dumped by hand into a hopper. The material passes through a trommel, and the oversize falls into a self-dumping carrier and is elevated to dump. The undersize passes over tables and through sluices, and the fines are also raised by steam, a scraper being employed to secure dumping ground. There are, therefore, four distinct elevations, viz., by the shovel, the gravel by the tram, the coarse tailings by the bucket, and the fines by the steam scraper.

The pit in which the shovel works varies in depth from 20 to 24 feet. The gravel lies beneath 3 feet of muck, is generally mixed with considerable sand and extends to bedrock. The material is well rounded and contains but very few stones (but 1%) that are over 18 inches in diameter. Considerable black sand is found in the cleanup. In spots the ground is frozen, necessitating the occasional use of steam points. Steam is conveyed across the cut in a covered steam pipe hung from a stretched cable. A schist bedrock, generally hard, is excavated for about 2 feet by the shovel.

The shovel weighs 35 tons and revolves 360° upon a turntable. The dipper holds 1 cubic yard, and the machine has a capacity of 1000 yards in ten hours, though this cannot be obtained owing to inadequate tramming facilities. Its cost on the ground is about double that charged by the manufacturer. The boom, when horizontal, reaches 22 feet beyond the bow, but when at level of track only 14 feet. Three-quarter inch cables are used in transmitting power. The faults of cables in steam shovel practice in inaccessible localities have been commented on above. The dipper contains no new features. Prongs are added to save lip, the central one being longer than those adjacent. The machine has three engines and uses in all about 40 H. P.

For conveying material three cars of 2 yards capacity each are used, running on a 3-foot gauge track with 16-pound rails. The cars are pushed by hand to the foot of an incline, which has an angle of 22° and extends 100 feet, and thence elevated by cable connected to a 40 H. P. hoist. Two hundred and fifty cars are usually raised in ten hours. On reaching the platform the cars are dumped by hand and returned by gravity to the foot of the incline.

From the hopper into which the cars dump the gravel is fed into a revolving trommel 16 feet long and 3 feet in diameter supplied with a worm upon the inner surface and punched with holes varying from ½ to 1½ inches in size. The rate of feed is regulated by hand, a gate being raised and lowered when necessary. Water is supplied to the trommel by a 6-inch longitudinal pipe. All oversize passes directly over a sheet iron chute into a square hopper, from which it falls by gravity into a self-dumping carrier and is elevated approximately 40 feet upon a dump. A 10 H. P. winch does this duty. The hopper is furnished with a heavy iron gate, raised by the steam winch running the self-dumping carrier, and is lowered by its own weight. The fines (the material passing through the trommel) fall directly on gold-saving tables similar in design to those used on many gold dredgers. The tables, which are fed by two 4 inch pipes, are six in number (three on each side of the trommel), and have a gold-saving surface of 80 square feet. They are fitted with expanded metal and cocoa matting riffles, which prove to be very efficient, the greater part of the gold being caught near the upper end of the first table. The material then

*Bulletin 263 U. S. Geological Survey.

passes to a longitudinal sluice, which consists of eight boxes 22 inches wide, furnished with Hungarian riffles constructed of 1x3 inch inclined cleats, capped with three-sixteenths-inch iron. The tailings are removed by a steam scraper and elevated upon a dump. The winch for the scraper is 30 H. P. and elevates 400 4-wheelbarrow units 15 feet in ten hours, seven-eighth-inch cable being used. It will be seen that the above double elevation of material must be costly, using as it does, not only much power, but also additional men on separate winches.

The greater part of the water for sluicing, 300 inches, is brought by flume from Bear creek. The remainder, amounting to 100 inches, is raised from the pit by a series of pumps. A No. 6 centrifugal pump raises the water to the foot of the washing apparatus, from which it is lifted 25 feet by a No. 8 centrifugal and used for sluicing. A 35 H. P. engine does the latter work. An additional pulsometer pump is occasionally used in the pit.

The power plant contains two 60 H. P. boilers and one 50 H. P. boiler, wood being used for fuel. Sixty men are employed about the plant, the daily wage of the laborer being $4 and board. The men work two 10-hour shifts throughout the working season.

The above-described plant will undergo considerable change in the near future, improvements designed to effect greater economy being contemplated. It is planned to haul all material excavated a distance of 2000 feet by locomotive, in trains of six cars, to a washing plant on the banks of Klondike river, where the ground is 8 feet below the upper edge of the pit, and then wash it by gravity water from Bear creek. High water in the Klondike will greatly economize the handling of tailings, and it is hoped the full capacity of the shovel may be utilized.

A machine run on radically different principles from those above is illustrated by a steam shovel on El Dorado creek, in the Klondike region. In this case the use of a tramming system is entirely avoided by so arranging the plant as to allow direct dumping by the dipper into the sluice boxes. In this case the shallowness of the ground and the use of a 50-foot boom permit such an arrangement. The work lies in the creek bed proper and cuts are made longitudinally along the stream, the sluice boxes being moved every three or four days, following the progress of the shovel. This practice alone involves both good and bad features. The practice of dumping directly into the sluice is, theoretically, much to be desired, embodying, as it does, only one elevation of the gravel, an arrangement which consumes the least power and time—two all-important factors. The moving of the sluice boxes, however, in this case consumes much time—from one to two days for each move—and, wages being $6 a day and the season very short, constitutes a serious drawback, greatly reducing the capacity of the plant. The boom of the machine, as stated, is 50 feet long and hoists the gravel 30 feet above the cut. If an arrangement facilitating the moving of the boxes could be devised, so as to avoid the long delays caused by this operation, a very satisfactory result might be effected. Such a system requires a relatively shallow bank, however, and it is doubtful whether it is available for steam shovel operations in general.

In this instance the gravel to be taken out is frozen, and continuous thawing must accompany the advancing work. In this work fifteen steam points are driven into the bank to bedrock, where they remain 24 hours, the process consuming during that time three cords of wood. A 25 H. P. boiler is used for this duty.

Water is very scarce at this plant and is used repeatedly, being raised from the pit by a centrifugal pump and carried back to the sluice boxes in a flume. The pump also serves to drain the pit. The sluice boxes have a grade of 9 inches to 12 feet, but, with the water at hand, are unable to keep pace with the capacity of the machine.

The shovel carries a one-yard dipper operated by chains. It is claimed that one cubic yard is moved every two minutes. Bedrock of a slaty nature is taken up to a depth varying from 2 to 5 feet.

The problem of disposal of tailings is a difficult one and has not been solved economically. A steam scraper is used and all tailings must be scraped to one side and elevated. Not only is the expenditure for wood an item, but a man must be constantly attending the scraper while another handles the steam winch.

A tramming system which would convey the material to be washed to such a point as would admit of the disposal of the tailings by gravity, even if a thousand feet or more distant, would be a more economical arrangement, saving, as it would, not only all elevation of tailings, but also all delay in moving the washing apparatus.

Ten men are employed about the plant each shift, occupied in scraping tailings, forking gravel in dump box, running shovel, attending steam points, and in cleaning bedrock at places where the dipper could not effectually work.

The shovel is moved on rollers running on skids, power being obtained from the shovel winch. The dipper is furnished with soft steel prongs which wear very rapidly.

DRIFT MINING.—Northern gold gravel deposits, that are sufficiently rich to warrant the method, can generally be exploited by drifting beneath the overburden at all times of the year. In drift mining creek deposits the gravel is hoisted through shafts, and where bench gravels are worked it is generally trammed through adits. In all portions of the interior of Alaska and in the Klondike the drifting of auriferous gravels has been carried on with fully as much activity in the winter as in the summer. The expense of winning the gold by winter drifting and spring thawing is greater by over $1 per cu. yd. than that of summer work. This is due to the necessity of rehauling and, in many cases, of rethawing the dumps in the separate process of sluicing. In consequence, only the richer ground, running from $6 to $10 to the cubic yard, can be profitably drifted. The price of labor during the winter in the interior is only 25% less than in summer, so that this does not afford a great offset to the increase of cost from other causes. In Seward Peninsula, where the price for winter labor is only $2.50 a day and board, as against $5 in summer, it would seem that winter drifting can be undertaken more generally than heretofore. A reliable operator of Nome is of the opinion that winter drifting operations should be continued in that vicinity where timbering is necessary but thawing is not, and where the gravel can be trammed to surface through adit for $3 per cubic yard, including all expenses of extraction and sluicing-up in the spring. This is less than double the cost of drift mining in the Forest Hill divide region of California, where conditions are eminently favorable.

Neglect to sample is the worst possible practice, as many lamentable failures have resulted from overconfidence in the value of the ground taken out, and the miner who confidently waits for the big wash-up before thoroughly knowing the amount of gold in the material he is handling is frequently doomed to disappointment.

Where timber is scarce and costly and wood for fuel has to be hauled from a distance, it is advisable to consider the entire abandonment of attempts at winter work. The amount of gravel which can be hauled is less and the cost per cubic yard is greater. The time spent in sluicing the winter dump may frequently be more profitably employed in preparing for the summer. The ordinary small rig for drifting operations without timbering is shown in Fig. 11.

(TO BE CONTINUED.)

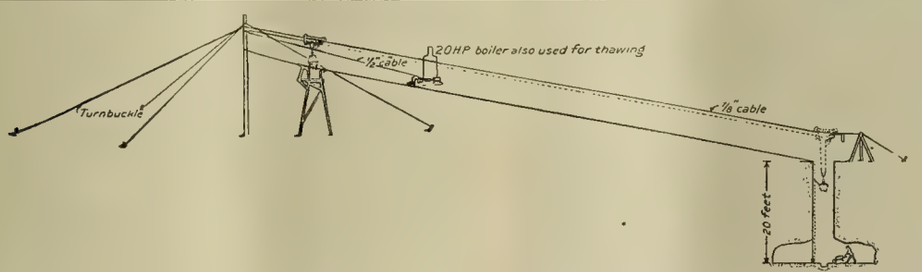


Fig. 11.—Rig for Small Drifting Operations in Alaska.

THE PROSPECTOR.

The samples from Oasis, Cal., were determined as follows: No. 1, quartz, with considerable brown iron oxide. At one end about a nucleal bunch of copper glance is green copper carbonate (malachite) and copper silicate (chrysocolla). On breaking the specimen galena (lead sulphide) was found. There are also indications of the presence of arsenic, and it may also carry gold and silver. No. 2 is feldspar porphyry. No. 3 is the same, but somewhat altered by pressure and shearing. On one side are seen several crystals of galena.

The gold sent with black sand from Burnt Ranch, Cal., is what may be called quartz or vein gold. It is rough and shows not the slightest sign of having been rounded by water wash or attrition of any sort. It is very probable that the vein or deposit is not far distant. A portion of the sand is magnetic, and is mostly altered pyrite—that is, pyrite in a stage of semi-oxidation, being what is known as a "pseudomorph"-limonite after pyrite. Gold when first freed from its matrix is always rough, no matter what the gangue may be. Placer gold is more or less rounded, according to the distance it has traveled from its source and to the scouring agencies. A large nugget may not travel far in a creek bed, and yet be much rounded by the scouring action of the sand and pebbles which are carried along by the water in the stream.

The rock samples from Prescott, Ariz., are: No. 1, a hard, dense, metamorphic rock, which was originally a clay rock. No. 2 is andesite. No. 3 is liparite. No. 4 is quartz-porphyry. No. 5 is granite. The black veinlet on one side is tourmaline. No. 6 is largely epidote and feldspar. The black metallic mineral in scales is specular or micaceous iron, a variety of hematite.

The rock sample from Dorleska, Cal., is hornblende schist. In rocks of this character frequently occur gold-bearing veins. The specimen contains very little silica, but in some localities this class of rock becomes silicified along certain zones, and then often carries gold, silver, copper, etc.

The samples from Constellation, Ariz., are: No. 1, mica schist, of no value whatever. No. 2, muscovite mica In its present condition it is of little commercial value except after being ground into powder. In depth the quality may improve, when it may become valuable for various purposes. Large electrical manufacturing concerns, like the Westinghouse company, are interested in getting a supply of inexpensive mica.

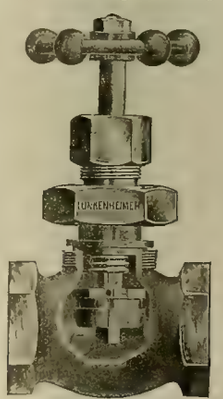
The samples from Burnt Ranch, Cal., are: A, a very siliceous metamorphic rock, originally fine sandstone, now practically a quartzite; b, a very much decomposed rock, impossible to properly classify, but seemingly an altered greenstone, probably diabase or some similar rock. C is principally silica, carrying finely disseminated iron sulphide. It is probably an altered dike rock, such as felsite.

The rocks from Barstow, Cal., are: No. 1, an altered and partly serpentinized limestone. It still effervesces with acids. No. 2 is the variety of volcanic glass known as pitchstone-porphyry or vitrophyre. It contains numerous crystals of feldspar and one or two fragments of stony rhyolite.

The ore from Elk City, Idaho, is evidently a portion of a silicified dike rock, possibly diabase or diorite. It consists principally of quartz with probably 3% pyrite (iron sulphide). By careful examination with a high power lens a few minute yellow spots were seen which may possibly be calaverite, but the quantity is so very small as to make positive determination impossible.

Improved Regrinding Valves.

The Lunkenheimer Co. of Cincinnati, Ohio, manufacturers of the Lunkenheimer engineering specialties, have made a number of changes on their regrinding valves, increasing the weight of the valve as an additional precaution against rough handling while attaching, etc. The medium pattern valves are guaranteed to stand a working pressure of 200 pounds per square inch, and the extra heavy pattern up to 300 pounds per square inch. They have also altered the shape of the valve, which improves its appearance and increases the area through the valve permitting an unobstructed passage, the area being more than equal to that of the connecting pipe. To insure a perfect and strong joint between the pipe and valve, the pipe threads have been made considerably longer, thus overcoming the danger of stripping threads. All sizes of the valves now have lock nuts on the hand wheels, which facilitates the taking apart and assembling of the valve for repairs. Referring to the sectional illustration, it will be



Improved Lunkenheimer Valve.

noticed that the hub which carries the operating stem is secured to the body by a union connection, which, in turn, screws over the shell of the valve body. By means of this construction, it is impossible for the hub and the body to become corroded together, as the thread which holds the union ring to the body is protected at all times from the action of the steam, the joint being made between the flange on the hub and the neck of the body. This tends to make the valve rigid and strong. The disc is held loosely to the stem by means of a lock nut, and will therefore adjust itself to the seat readily. The stem is fitted with a strong, durable and long thread, and the manufacturers emphatically state that the valve is easy to operate and that there is practically no exertion necessary to tightly close even their largest valves, as the hand wheels are so proportioned in respect to the seat opening that no additional leverage need be applied to the hand wheel to facilitate the operation of the valve. To regrind the valve, the bonnet ring is unscrewed and the trimmings are removed from the body. A wire or nail is placed through the lock nut and stem, a little powdered sand or glass and soap or oil is placed on the disc, and the trimmings are again placed in the valve and reground.

Gold Dredging in California.*

NUMBER IV—CONCLUDED.

There are two classes of sluice and table paving used in the Sacramento valley gravels to save fine gold. One is ordinary Hungarian or cross riffles with quicksilver, and the other cocoa matting covered with expanded metal, 2½-inch mesh. These are nearly equally satisfactory, so far as the managers report. However, in most cases each manager has used only one kind and made no comparison. Where comparison has been made the preference seems to be in favor of the riffles with quicksilver. There is no arsenic or anything else present to prevent a rather free amalgamation. Yet there is present so much black sand which would prevent the gold from reaching the quicksilver that it is found necessary, in putting in the riffles, to insert between them stones that stand up above the tops of the riffles in order to stir up the black sand and allow the gold to go to the bottom. On the cocoa matting the expanded metal, in diamond shape, about ¼ inch deep, is placed for the same purpose.

One of the most careful managers at Oroville states: "We originally used cocoa matting on our dredger, but later installed the riffles and quicksilver and increased our gold-saving area 85 square feet, by utilizing the space in the distributing box directly under the screen. We are going to use riffles and quicksilver in our new dredger."

Under the screens on the first tables quicksilver in large quantities held in place by riffles is used with a view to bringing the fine gold into contact as it drops from the screens. In this respect shaking screens do better work than revolving screens, because they let the fine material down over a larger surface.

Both at Oroville and Folsom, and even at Yuba, it has been found that gold—even the very finest gold—if brought in contact with the quicksilver, will amalgamate without much difficulty. In Colorado and in Idaho, where there is fine gold, and dredging has been done on rather an extensive scale, it has been found impossible to make any consequential saving of gold with quicksilver, owing to the presence of arsenic or something else. The result is that cocoa matting or some similar appliance must be used. It would appear that where the very fine gold amalgamates freely, riffles and quicksilver are preferable to cocoa matting.

As platinum does not amalgamate with quicksilver, there is a greater loss of this metal when riffles and quicksilver are used, than when cocoa matting and expanded iron mesh are used.

CREW OF A DREDGER.—The following table will give an idea of the number of men commonly required on dredgers. The wages named are those usually paid at Oroville:

CREW FOR ONE DREDGER.	Per Day.
One foreman, at $5 per day	$5 00 to $ 5 00
Three winchmen, at $3 to $3.50 per day	9 00 to 10 50
Three oilers, at $2 to $2.50 per day	6 00 to 7 50
One blacksmith, at $3.50 per day	3 50 to 3 50
One helper, at $2 to $2.50 per day	2 00 to 2 50
Two Chinamen, $1.75 to $2.50 per day	3 50 to 5 00
Total	$29 00 to $34 00

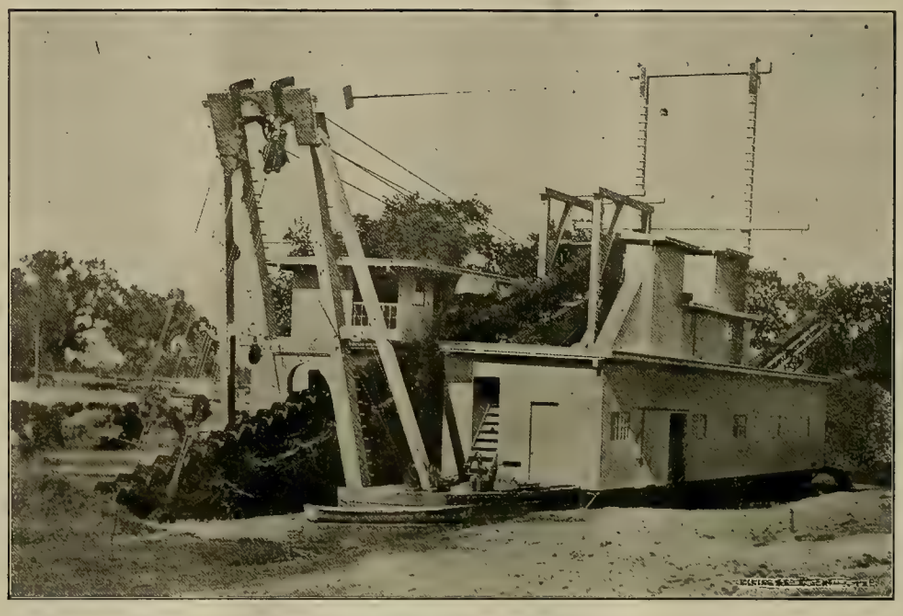
In addition there is a superintendent, whose time is generally divided among several dredgers. The winchmen and oilers work eight-hour shifts, while the blacksmith and helper work ten hours. The Chinaman clear the ground of brush and trees, "bury dead men," as making fasteners for the lines is called, and do general chores.

The depth to which the present dredgers may dig is from 30 to 60 feet below the water level, the latter depth being reached by the new dredgers on the Yuba. That greater depths may be reached is only a question of increased strength and power and longer digging ladders. These work at their best, it is claimed, on an angle of 45°.

WORKING COSTS.—A majority of the dredger companies in California have given statements as the approximate actual cost of dredging per cubic yard. These costs vary from 2.36 and 3 cents to as much as 8½ cents. It will be seen that where a return of 3 cents or less is given, it is for a new dredger with all the advantages of the latest ideas as to strengthening the parts of the machinery, and that there have been no breakdowns and consequently very little, if any, costs for repairs. The labor bill has been very light, for the running time has been full. The owners of this dredger have stated that their costs will be materially increased in working longer periods of time, through the loss in actual working time caused by breakdowns and the cost of new parts and for repairs.

So it is only those reports on dredgers which have been in operation for a long time, say three or four years at least, that are of much value in determining what would be the average cost of working under similar conditions. However, one must remember that the lately built dredgers are more strongly made and afford less opportunity for breakage and repair costs. The record for low cost is 2.36 cents per cubic yard with a new dredger.

In studying these reports, one must consider in respect to the different districts: (1) The cost of power; (2) the rate of wages; (3) whether the company reporting has one or several dredgers under one management; (4) whether the company has its own machine shop or not; (5) the hardness of the ground, and this particularly as to whether blasting with powder is necessary; (6) the size of the buckets; (7) whether the buckets are alternating or close connected; (8) whether belt or bucket conveyor is used; (9) whether revolving or shaking screens are used; (10) whether a sand pump is used; (11) the age of the dredger.



A California Dredger in Operation.

A Modern Dredger in Construction.

Only one company operating at Folsom returns cost of working, and that at 5 cents. At Folsom the cost for power is 0.65 of a cent per kilowatt hour, while at Oroville it is 1½ cents.

Some idea of the difference in cost per cubic yard between operating one dredger and operating several dredgers under one management may be had from the estimate of the Oroville Gold Dredging and Exploration Co.

Of course, under certain difficult conditions a dredger of small capacity may be preferable, but under most ordinary conditions, such as at Oroville, Folsom, and other places in the Sacramento valley, the greater the yardage capacity of the dredgers, the lower the cost of working.

It may be said that the cost of repairs is still excessive, but this item of expense has been reduced from year to year since the first successful dredger was put in operation in 1898. It may be said, too, that if the dredger builders had not increased the strength of the buckets, the quality of steel used, and in many other ways strengthened all the straining and wearing parts of the dredgers, it would now be impossible to build, as they propose doing at Folsom, a dredger with 13 cubic feet buckets, or even 7 cubic feet buckets. A comparison of costs of a new dredger with those of an old dredger of same size and type is therefore unfair.

Whenever the Bucyrus type of dredger is mentioned, it is understood to have close connected buckets, a shaking screen, belt conveyor, and riffles and quicksilver on the sluicing tables; while the Risdon dredger has alternating buckets and links, a revolving screen, bucket conveyor and cocoa matting, with expanded metal mesh covering them on the sluices.

It is for the dredger builders and for the skilled managers at Oroville or Folsom or elsewhere in the State to more seriously consider this question of cost of repairs than anything else, except, of course, the question of saving the present loss of fine gold, which is far greater than most of them suppose.

PROSPECTING AND EXAMINATION OF CONDITIONS.—It may seem a simple thing to say that a careful

*Bulletin 36, California State Mining Bureau.

study of all the conditions should be made before a dredger is ordered, no matter how large the values in gold may be found to be. The values may in many cases be of almost minor importance, or of no importance, where, as is the case in some of the mountain districts, the hardness of the bedrock, with much of the gold on the bedrock, has prevented dredging very rich ground. There have been many failures in California, and all because proper examination of the ground was not made before the dredgers were built.

In Trinity county, in one case, a dredger was put in and failed and has been dismantled because the fact that the ground was valueless was not proved. There is another case where a dredger was built and operated for a time on very heavy ground, but it was so weak in construction that it failed and was dismantled. Now another company is building a dredger to work the same ground, with every promise of success. There are similar wrecks in the Oroville sea caused by incompetent pilots.

It has been said in regard to sampling, that which will apply to any other part of the examination of a dredging property: "Haphazard and occasional sampling and assaying are worse than useless. They lead to great losses of valuable capital, frequently to the total abandonment of good properties, and, worse than all, to a false sense of satisfaction that discourages improvement by denying its necessity."

Conditions to be considered: The following are some of the conditions, etc., to be determined by drilling and other examination prior to determining whether the ground may be dredged, prior to estimating costs, and prior also to determining the kind of dredger to be used:

Value in gold per cubic yard, and its distribution.
Hardness of gravel.
Total depth of gravel to bedrock.
Depth of gravel from water level to bedrock
Whether level or rough on surface.
Size of bowlders.
Amount of clay in gravel.
Hardness of bedrock.
Whether bedrock is level or not.
Water—amount of supply, and cost.
Cost of power.
Wages.
Cost of transportation.
Cost of supplies.
Cost of repairs.
Cost of land.
Climatic conditions.

Hardness of Gravel: Generally speaking, any gravel that may be picked may be dug with the dredger, without the use of powder. If it is so hard as to require blasting, the cost per cubic yard will be increased from 2 to 3 cents.

Depth of Gravel: The most satisfactory depth to dredge with some newer dredgers now in use is not to exceed 60 feet, but they will work down to 70 feet. In order to work to a greater depth than 70 feet, some changes in the digger, stacker, and power would be required.

Level Surface of Gravel: With an uneven surface the use of headlines is not so satisfactory as spuds.

Size of Bowlders: Very large bowlders can not be handled with the ordinary dredger, and much gravel may be left on the ground. The size of the bowlders must be considered also in deciding whether to use an open or close connection of buckets in the digger, the latter rendering it impossible to handle the larger bowlders.

Climatic Conditions: Of course, freezing weather will prevent washing the gravel, and cause a stoppage of work. In the northern latitudes of Montana and Alaska, the season is commonly not more than five months long.

Clay in Gravel: The clay will not permit of clean dumping from the buckets, and not only is much gold carried back to the bottom and lost, but the yardage capacity of the dredger is decreased. Besides this, the clay carries off gold and fine amalgam from the sluice boxes.

Hardness of Bedrock: If the bedrock is too hard to dig, gold in the crevices or lying near the bedrock is lost. The drill will locate the position of the pay which may not be too close to the bedrock.

Level Bedrock: The bedrock should be near enough level to permit the boats to float over all the ground to be worked.

Presence of Arsenic: The presence of arsenic or anything else that will prevent free amalgamation makes the use of quicksilver and riffles of little avail, and cocoa matting, plush, or other such means must be adopted to save the gold, especially where it is in fine particles.

Drilling: Nearly all this work in the Sacramento valley districts of California has been done with Keystone drills, No. 3 traction. Owing to the presence of water in the gravel in most instances, it has been found impracticable to sink shafts. The cost of the drill, including freight, etc., is about $1900 complete. Three men are required to work it, with wages from $3.50 to $4, and $2.50 and $2 per day. To this must be added the cost of fuel, water, repairs, etc., and wages of one or two men to do the sampling. The sampling, if properly done, would require a skilled man, and his pay might add much to the cost. The total cost per day to run the drill and do the sampling varies from $15 to $30. About 12 or 15 feet per day is a good average speed for sinking in the gravels of the Sacramento river basin. With larger bowlders and harder ground the cost might be materially increased.

In comparatively shallow ground, where there is not much water, it is much more economical to sink shafts than to drill, and the results will be found more satisfactory.

The following table shows the form in which notes of sampling have been kept in making an examination at Folsom:

Column marked "a" indicates colors of fine and flour gold, smaller than "b" size.
Column marked "b" indicates colors of size estimated 25 to 1 cent.
Column marked "c" indicates colors coarser and heavier than "b" size.

APRIL 11, 1904—HOLE NO. 1.

No. of feet.	Material.	No. of Colors. "a"	"b"	"c"	Remarks
0	Surface line.				
1 2 3	Sand and gravel.	2	0	0	One pan.
4 5 6	Loose gravel.	6	6	0	Hole 4½ feet 6 P. M. April 12, 7:30, two pans started.
7 8 9	Loose gravel.	30	8	2	Five pans.
10 11 12	Loose gravel.	15	4	0	Rockered.
13 14	Bedrock.	10	0	0	No water, rockered.
Total.....		63	18	2	

GENERAL REMARKS.—Drilled 14 feet in the clay, being a volcanic ash; first few feet a light brown color, then whitish, down as far as we drilled. This clay is called "bedrock."

Diameter of drill, 5⅝ inches; diameter of shoe, 7 inches; casing, 5¾ inches, inside diameter.

By proper sampling is meant the determination, from a comparatively small sample, of the values in a much larger volume of the same material. Care, judgment, and experience are necessary, and all such work, whether done by drilling or by sinking shafts, should be put in charge of an experienced man. Gravel lifted by drills or taken from a shaft must be accurately measured or weighed, and proper allowances made for expansion when loosened. Allowance must be made for excess of bowlders not sampled, and for excess of gravel beyond the normal width of the drills that may come in and be lifted.

Prospecting: There is no rule as to the number of holes that should be sunk. More drill holes would be required, to give satisfactory results, than shafts. If the values are comparatively evenly distributed over the tract to be examined, fewer holes would enable nearer approach to a correct estimate of values than where the pay is uneven. In districts where the character and values are comparatively well known in parts of the gravel that have been sampled, less careful examination is necessary on intervening tracts in order to determine most of the conditions and values.

Errors in sampling frequently occur from the squeezing in of material around the bottom of the casing, so that more gravel than is called for by the size of the hole is lifted. A check on this is to drill and pump in a section of a foot or so and weigh the material. Sliming and consequent loss of gold sometimes result when too long a period of churning transpires before pumping the hole.

The casing should be kept driven below the point of drilling, whenever possible.

Fine Gold: When the gold is as fine as at Oroville or Folsom, the pan and rocker will not save all of it, but will save all that the best saving tables in the dredgers will save, and may save considerably more. But when it is considered that if some of the finest gold now being saved be shaken up in a bottle of clear water it will take one or two hours to settle, there can be no question that some is lost whether the sampling is done by panning or rocking, and also in the sluicing. How much this is could be determined by gathering samples, especially of the water from the pans and rockers and also at the ends of the sluices and subjecting them to proper tests. It would seem that this work should be undertaken and carefully carried out by the dredger people. If much gold is being lost, there is a spur to ingenuity in devising means for saving it.

Temporary and Permanent Headframes.

Not infrequently it becomes necessary to construct a permanent headframe over a pre-existing temporary wooden structure, while the work of mining continues, using the wooden frame. The accompanying engraving illustrates how this was accomplished at the Mizpah mine at Tonopah, Nevada. The old two-post wooden frame was used daily, while the new steel frame was being placed. In some cases the hoisting plant is located opposite the end of the shaft to facilitate the installation of the permanent hoist.

Steel Headframe Building Over the Temporary Wood Frame.

THE recent ousting of A. J. McMillan from the management and directorate of the Le Roi mine at Rossland, B. C., will probably result in ending a long-fought battle for control of that property. It is thought by those competent to judge that if the conflicting interests are harmonized, and the Center Star and certain other properties be consolidated with the Le Roi, the proposition can be placed on a paying basis, if the metallurgical branch of the enterprise is properly handled.

WOODEN TANKS will last longer and give better service if the outside of the tank is painted. A mixture of coal tar and asphaltum in equal parts, applied hot, makes a good coating for the inside of tanks.

Cyaniding Raw Sulphides.

At Barberton, S. A., a somewhat unusual operation was recently undertaken in the cyanidation of iron sulphide concentrates assaying about $60 per ton in gold. Ordinarily only low-grade material is treated by the cyanide process, but the success of the attempt in South Africa, here described, indicates that high-grade ores may also be successfully treated by this process under favorable circumstances.

The work was done by A. L. Edwards, and is thus described by him in the Journal of the Chemical, Metallurgical and Mining Society of South Africa:

As the results from several experiments proved favorable, the company decided to cyanide their accumulated concentrates, some 210 tons in quantity, assaying 60 dwts. to the ton.

The concentrates were ground in a small ball mill, and passed through a 1600-mesh standard screen, sampled, thrown into treatment vats, water washed, and four pounds of lime per ton of concentrates added, a first weak (.05% KCy) wash was run on, leached off, then a second medium (.1% KCy) solution run on, and leached off, and the concentrates were turned over. A strong (.75% KCy) was then run on, and allowed to remain in contact for twelve hours, the solution drawn off, and all dissolved gold washed out as rapidly as possible; this treatment was repeated on three subsequent occasions, with the result that the extraction was brought up to 93%.

The time occupied in treatment was forty days, but this could have been reduced to 25% had time been allowed for grinding the concentrates to a finer state of division.

The cost per ton for cyanide was 12s, zinc 4d, lime 3d and labor 5d (the costs of power, lubricants and supervision are not available); it will be seen that the solvent is responsible for 12s of the 13s, the high consumption being due to the unroasted state of the concentrates. An experiment carried out on a quarter ton lot of roasted concentrates showed a cyanide consumption of 8s per ton on a twenty-eight days' treatment.

It was known beforehand that, to successfully treat concentrates by percolation, roasting was essential, but the company having "shut down," time did not allow of this being done.

The leaching was good and the precipitation excellent, and the action so strong as to necessitate the flow being reduced to two tons per hour.

Two-thirds of the gold, 390 ounces, was precipitated in the first three weeks.

In the strong box only clean zinc was used, while the zinc-lead couple was used with good effect in the weak box, the solutions leaving at from six to eight grains. The strongest solution used was .75%, and the weakest .08% with a final water wash.

Towards the end of the treatment period the "white precipitate" made its appearance in the weak box.

I am informed that chlorination charges are:

1.	£4 per ton for treatment	£4	0 0
2.	15% of gold contents not paid for	1	18 0
3.	Railage at 20s per ton	1	0 0
	Making a total charge per ton of	£6	18 0

This sum deducted from the value of the concentrates means roughly 50% of the value.

Now, if we put the total charges of cyaniding at 40s (a liberal margin) we find that the cost of treatment locally is only 15% as against 50%. It is hoped that these notes may prove of service to members and associates engaged in cyaniding in the outside districts, and in far away Rhodesia, where cyaniding concentrates by agitation as at the George Goch, or fine grinding by tube mills are not applicable.

If the press reports to the effect that Thomas W. Lawson of Boston is organizing a "bear raid" on copper stocks and the metal be true, that astute and somewhat spectacular operator has adopted a most unusual method in carrying out his plan. It is not customary for large operators to so openly announce their intentions concerning the market. Under existing conditions a bear raid looks somewhat like a risky proposition, though success in the stock market is largely, if not wholly, based upon the cupidity and fear of the public. These very human attributes are responsible for most of the rapid fluctuations in stock and metal prices in the markets. The eagerness with which the public sometimes buys offered stocks and other securities has an immediate effect upon the market—the demand raises the price—and the precipitate haste with which the same public endeavors to unload their holdings upon a falling market must be a matter of supreme satisfaction to the manipulators, who know the real value of the article dealt in, and who fully appreciate and take advantage of these weaknesses of the investing public. Few of that class of speculators buy for actual value of the stock, and for the dividends honestly earned and paid, but for the purpose of making quick turns, either on a rising or a falling market, for the experienced operator knows how to make money in either event; but when he publicly announces his intention to raid the market either way it is just as well to be a spectator, and not an active participant in such a campaign. It would seem that Mr. Lawson, with a full knowledge of the fact that the stock-gambling public is easily elated and as readily thrown into a panic, has some idea of engineering a campaign against copper stocks, but that he seriously contemplates attacking the metal market with a view to "pounding down" the price of copper—the metal—seems unlikely.

The New Leadville Discoveries.

When one learns of the numerous important discoveries of valuable ore bodies in the Leadville district of Colorado made within the past year, it is a matter of surprise that these discoveries had been so long delayed. It was not due to a lack of knowledge of the geology of the region nor of the possibilities which remained in untried areas, for, more than twenty years ago, the work of S. F. Emmons and of others of the United States Geological Survey, and that also of other engineers, indicated clearly the character and, to a considerable degree, the probable extent of the ore-bearing formations. Possibly the fear of encountering large volumes of water have deterred some of the mine operators of Leadville from sooner proving the unprospected areas. Several of the most important finds have been made by means of the diamond drill—and for the purpose of securing definite information at minimum cost this device is certainly superior and should be employed more than it is. From a district which was moving along in a slow and rather uncertain way, Leadville has taken on new life and is again one of the leading centers of the mining industry in Colorado. Another important factor in the revival of Leadville is the discovery of a means by which the large amount of zinc in the ores may be utilized at a profit. Old dumps and certain ore bodies, known to carry large amounts of zinc, were left untouched for years simply because they were not commercially available. The electro-magnetic separators have solved this problem, and the zinc of Leadville district now finds as ready a market as its lead or silver. That the limitations of Leadville's ore-bearing territory have been sharply defined many do not believe, and there are those who think that properly conducted prospecting in the region about Breckenridge would result in the discovery of ores similar to those at Leadville, and at the same geological horizons.

Refining Zinc Precipitates.

The following method of refining the precipitates recovered from the zinc boxes at the Homestake cyanide plant has been adopted by C. W. Merrill. It comprises a preliminary treatment with HCl, the removal of the liquid through a filter press, a subsequent treatment with H_2SO_4, the washing and drying of the precipitates, mixing with litharge, borax, silica and powdered coke, sprinkling with lead acetate, and briquetting under a pressure of from two to three tons per square inch. The briquettes are melted upon the hearth of an ordinary cupelling furnace, the resultant slag is run off, air is turned on and the Pb is cupelled in the same furnace. The resultant metal 975 to 985 fine, is run into bars. Cupel slags and bottoms are put through a blast furnace, recovering the Pb for the next cupellation, and the litharge is added to the next charge of precipitates. Mr. Merrill says that the blast furnace slags carry less than 5 dwts. to the bar; that the total cost of refining is less than .75%, and the loss, less than .1%, goes to the next precipitate. The total cost of this refining amounts to less than .75%. The loss in refining is given as less than .1%.

Books Received.

"The Delavan Lobe of the Lake Michigan Glacier of the Wisconsin Stage of Glaciation and Associated Phenomena," by W. C. Allen, Professional Paper No. 34 of the U. S. Geological Survey.

"The Structure and Genesis of the Comstock Lode," by J. A. Reid, Bulletin No. 10, Vol. 4, of the department of geology of the University of California, is a study of the ore deposits, in which the author discusses the form of the Comstock lode, the deposition of the ores and the location of the bonanzas.

Recent geological work carried on by the palæontologists of the University of California is embodied in Bulletins Nos. 7, 8 and 9, of Vol. IV, of the department of geology. These are: "New Mammalia from the Quaternary Caves of California," by Wm. J. Sinclair; "Preptoceras, a New Ungulate from the Samwel Cave, Cal.," by E. L. Furlong, and "A New Sabre-Tooth from California," by J. C. Merriam.

Obituary.

ALFRED MULHALL, assistant superintendent of the United Verde mine at Jerome, Ariz., was recently killed by an accident.

F. H. RINDGE, a mining man of Los Angeles, Cal., died at Yreka, Cal., August 29, while inspecting mines in Siskiyou county.

Personal.

NEWTON DUNYON has charge Little Bell mine at Park City, Utah.

P. S. COULDREY has resumed charge Le Roi No. 2 at Rossland, B. C.

J. F. BROAD is manager Sonora Quartz M. Co. at El Tero, Sonora, Mexico.

V. G. HILLS is making a mine examination in San Miguel county, Colorado.

L. D. SIVYER of Los Angeles, Cal., has been examining mines near Mayer, Ariz.

ARTHUR BUCKBEE has taken the management Sinker tunnel near Silver City, Idaho.

H. DUNN has been appointed superintendent Zeibright mine, east of Nevada City, Cal.

A. C. MASSEY has been appointed superintendent Richinbar M. Co. at Richinbar, Ariz.

WM. DEEM has taken the management Golden Gate mines, near Mayer, Yavapai Co., Ariz.

ROBT. LANKA has returned to southern Nevada and will examine properties near Bullfrog.

LEO VON ROSENBERG of New York City has been examining mines near Silverton, Colo.

G. B. D. TURNER, manager West Quincy mine of Park City, Utah, is making a short trip East.

WM. MAGENAU is superintendent mines and smelter for the Luna Lead Co. at Deming, N. M.

J. A. SHINN, of Denver, Colo., has returned there after an absence of ten months in Pittsburg, Pa.

S. M. MCELROY, of Pittsburg, Pa., is examining mining properties in Lake and Summit counties, Colo.

A. P. ROGERS of San Francisco, Cal., has been examining mines near Guazupares, Chihuahua, Mexico.

M. D. DRAPER has resumed the superintendency Minnesota-Connor mine, at Chloride, Mohave county, Ariz.

R. M. ATWATER, JR., of Helena, Mont., is examining the Calumet & Arizona Co.'s properties at Bisbee, Ariz.

J. K. BROWN has been elected manager Leavenworth Mountain Mining & Tunnel Co. of Georgetown, Colo.

A. L. MCEWEN, manager Imperial mine at Cable Cove, Or., is conferring with the directors at Detroit, Mich.

J. H. TALBOT has succeeded the late P. E. Murray as superintendent America M. Co. at Cananea, Sonora, Mexico.

H. H. TRAVIS has been appointed manager Banker M. Co. at Winfield, Colo., succeeding A. E. Stahler, resigned.

F. L. LARSON, superintendent El Globo mine, near Nacozari, Sonora, Mexico, has been spending his vacation in California.

R. J. DAVIDSON of Bath, N. Y., president Oregon Mines Exploration Co., has been visiting their properties at Tipton, Or.

R. G. BURNETT has been appointed manager Doornpoort Diamond Mines & Estate Co., near Pretoria, Transvaal, South Africa.

S. J. GORMLEY has been appointed superintendent Bingham Con. smelter, at Bingham, Utah, in place of W. H. Nutting, resigned.

G. L. MOATS of Salt Lake City, Utah, manager Ohio Lead Mining and Smelting Co., has been attending a directors' meeting at Dayton, Ohio.

G. W. KIMBALL of Placerville, Cal., is superintending drill prospecting for the Western Exploration & Dredging Co. in Burnt River valley, Baker county, Or.

R. E. MILLER, with Crocker-Wheeler Electric Co. in Denver, Colo., has resigned to accept a position with the Westinghouse Electric & Mfg. Co. in their Denver office.

OLIVER HARTLINE has been appointed superintendent British Columbia M. & D. Co., working mines on White Grouse mountain, 15 miles from Marysville, B. C.

JOHN H. HUDSON JR. desires to announce that his address is now with Messrs. W. R. Grace & Co., Lima, Peru, where he would be glad to hear from his friends at all times.

W. E. MITCHEL, a mining engineer of New York City, is in San Francisco, Cal., returning from an investigation of the Montreal and Boston mines at Greenwood, B. C.

JOS. C. ERMAN has taken over the management of the Live Oak C. M. Co.'s property and will hereafter be in charge of that mine as well as the Keystone mine, near Globe, Ariz.

LOUIS B. CARR, of the firm of Carr & Sauer, mining engineers and chemists, Denver, Colo., has returned there from Cyclops, Arizona, where he has been examining mining properties.

C. E. BRAINARD, late manager mining department of Fairbanks, Morse & Co., is now with the Power & Mining Machinery Company, with offices in the First National Bank Building, Chicago.

PLACER MINERS usually consider a "sluice head" for a 12-inch box set on a grade of 8 inches to 12 feet at 20 miners' inches or 30 cubic feet per minute. If five sluice heads are required it means about 150 cubic feet of water per minute.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

It is reported that work is to be started on the Valdez, Sterling & Northern railroad, from Valdez to the Copper River mining district, by A. W. Swanitz.

ARIZONA.

Cochise County.

A concentrator is to be put in by the Cochise Con. C. Co. at Paradise. H. Alexander is manager. The company has been working the Davis group. The Ainsworth shaft on the Mascot claim is sunk at an incline of 60°.

Coconino County.

The surveyor general has approved the official survey of the Sunset lode and Sunset millsite, designated as survey No. 2118 A & B. These claims are in the Warm Springs mining district, on the strip of ground lying on the north side of the Grand Canyon of the Colorado. This is a new mining district which has been opened up in the last few years.

Gila County.

(Special Correspondence).—Work has been commenced on the Live Oak mine, near Globe, by Manager J. C. Erman and twenty tons of copper ore are being shipped daily. A leaching and electrolytic precipitating plant are to be put in.

Globe, Sept. 4.

A 25-ton experimental concentrating plant is to be put in at Globe by the Inspiration M. Co., of which J. D. Coplen is manager.

Graham County.

Superintendent F. C. Alsdorf of the Cuprite Copper Co. at Metcalf reports a good strike in the Cuprite claim 40 feet from the surface on a drift from the main shaft. A new 6 H. P. Fairbanks-Morse gasoline hoist is being set up.

Mohave County.

It is hoped to reach the 300-foot level of the Victor & Virgin mine in the San Francisco district by September 15.

The German-American M. Co. has leased the water of the Blue Ridge Co., near Vivian. The Blue Ridge people are sinking their shaft, and it will be a number of months before the mill will be run. At the German-American mines the work of sinking the shafts on three of the main veins of the group is being pushed. Considerable water is being developed, and the mill is to be started up at once.

Pinal County.

It is reported that a Chicago company has resumed work on the Lake Shore mines in the Casa Grande district.

Santa Cruz County.

The Gringo mine in Temporal gulch, 3 miles from Patagonia, has been sold to R. E. Doan of Los Angeles, who is reported as intending to put in a 50-ton mill to treat the low-grade ore.

Yavapai County.

The Crown King M. Co. is pushing work on the Crown King deep level and the Zika tunnels in the Bradshaw mountains at Crown King. The former has been surveyed to run 7000 feet west and will reach a depth of from 900 to 1800 feet. The Zika tunnel starts 1 mile west of the deep tunnel and runs north on ground of the first south extension of the Zika claim for a depth of 1500 feet and then crosscuts to the Zika and Jack Pot locations where it will form a connection with the deep level tunnel. It has been driven 500 feet. Two 15 by 16 Rand compressors have been ordered. Pending their arrival the work will be driven by hand.——The El Dorado G. M. Co., in Copper basin, west of Prescott, has its working shaft down 200 feet.

Yuma County.

The owners of the Valenxuela mines, 15 miles northwest of Quartzsite, have struck water in the well that they have been boring. The company has the machinery on the ground for a 10-ton smelter and has only been waiting for the discovery of water before setting it up and beginning work.

CALIFORNIA.

Amador County.

The Zeila's new hoist is in operation and the mill has resumed crushing. They are putting in an air compressor to be run by electric power. They will operate machine drills.

Butte County.

J. M. McClung has taken the blue lead mine near Bangor, and is pumping out the water and getting the mine in shape so gravel can be taken out. A. Duggins has charge.

Calaveras County.

The Calaveras Prospect publishes the following list of mines, together with the names of the local superintendents and foremen; Yellow Boy M. Co., C. V. Zinn, J. A. Campbell, Murphys; Chispa M. Co., F. A. Mitchler, Murphys; Ozark M. Co., F. A. Mitchler, Murphys; Othello M. Co., John M. Shepherd, Murphys; Cordellia M. Co., W. L. Driver, Murphys; Hercules M. Co., L. L. Washburn, Murphys; Clary G. M. Co., W. H. Clary, Sheep Ranch; Big Horn mine, J. E. Spencer. Murphys; Big Trees M. Co., G. O. Pearce, Murphys; "49" M. Co., J. M. Evans, Douglas Flat; Bourbon M. Co., W. H. Tulloch, Murphys; Black mining claim, E. Black, Murphys; Carley Bros. mining claims, S. O. Carley, Murphys; May Day M. Co., John Bunney, Murphys; Stonewall and Hidden Treasure mines, Geo. Taylor, Murphys; Caruthers mine, Jeff Raggio, Sheep Ranch; Lucky Strike mine, Northwood Barrow, Murphys; Alhambra mine, John Ross, Murphys; Sonoma mine, Sierra Nevada D. Co., San Francisco.

El Dorado County.

A new hoist has been put on the Clipper mine above Georgetown.——F. Hall of San Francisco has bonded the Marco Varozza property near Smith Flat.——It is reported that a 20-stamp mill will be put on the mine in Coloma canyon which is being operated under the supervision of S. Beers of Butte, Mont.

Mariposa County.

W. Graham of Los Angeles has bonded the Dexter mines, 6 miles east of Coulterville. Harry Argaul has charge of pumping out the water.——The Austin mill at Whitlock has started crushing.——At the Teats mine in Whitlock, J. Nevills, E. Donovan and S. Hogan are mining, and as soon as enough ore is taken out the Teats mill will be started.——The Schroeder Bros. of Saxon's Creek, near Whitlock, intend building a mill on their property.

Nevada County.

The new 10-stamp mill at the Oustomah mine, near Nevada City, was destroyed by fire September 1, a loss of $12,000, on which there is an insurance of $4000.——The pumps have been started at the Banner mine on Banner mountain, near Nevada City. Pipe has been laid for a water supply and a shaft will be sunk to the 1200-foot level. C. M. Belshaw and E. C. Voorheis are interested.

Under the direction of Superintendent J. H. English of the Spanish Ridge mine, in the Washington district, concentrators purchased from the Gold Tunnel mine are to be put in.

Plumas County.

The Plumas-Eureka mine on Eureka peak, near Johnsville, has passed under the control of J. D. Johnston and associates of Newport, R. I., who intend to run a 6000-foot double-track tunnel at a lower level than the old workings. It is reported that a new stamp mill and cyanide plant are to be put up at the mouth of the tunnel.

Shasta County.

Another furnace will be put in the Afterthought smelter at Ingot.

Sierra County.

At Pike City, G. W. Mohler will work the Nobby placer mine this fall and winter.——C. C. Weisenburger is repairing the 10-stamp mill at the Rainbow mine, between Alleghany and Chipps Flat.——As a result of an examination of the Poker Flat quartz mine, near Table Rock, by Jos. Voyle, it is reported that F. P. Roddy will put in a cyanide plant.

Tulare County.

The Josephine mine at White River is putting in a roller mill and other machinery to crush their ore.

Tuolumne County.

A new rock breaker has been put in at the Los Angeles mine, near Sonora, being worked by J. Phillips.——George Stayton is sinking a 3-compartment shaft on his claim, near Jacksonville.

Superintendent Partington has fifteen stamps dropping at the Longfellow mill at Big Oak Flat.——The water company has given notice that the supply will have been exhausted by Sept. 10. Many mines will close as a consequence, and mills will be given a general overhauling and put in condition for a long run when the wet weather sets in.——The New Lead mine, near Phœnix lake, east of Sonora, owned by M. Bottini, has been bonded to H. J. Dykes. The property has been developed to a depth of 120 feet, drifts being run 60 feet east and west on the 100-foot level. A new incline shaft will be put down, and the property will be equipped with a 10-stamp mill.——A company has been organized to work the Columbia mine, situated near Columbia on Experimental gulch, by W. G. Phipps and A. Baier of Columbia, F. Littlehall of San Francisco, and G. B. Morow of Sonora.

COLORADO.

Chaffee County.

Platinum in paying quantities has been discovered near Buena Vista by W. G. Zeigler. In a sample submitted to the United States Geological Survey a chemist found gold, 1.99 ounce per ton; platinum, 0.43 ounce per ton. The samples submitted were taken from claims 2 miles up the Arkansas river.

Clear Creek County.

The Topeka group, in East Argentine, owned by E. Erickson, has been bonded to Eastern parties, who are developing it.——Thomas Rodda of Idaho Springs has secured a bond and lease on the Waukegan from Frank McCready, and is making arrangements to carry on development work during the winter. The Waukegan is near Loveland pass.——The Blue Bird claims, on Republican mountain, have been leased and bonded by D. W. Stewart of Idaho Springs. The property is owned by Wm. Hunt of Georgetown and Nels Frohm of Denver. A crosscut tunnel which has been driven 800 feet will be continued.——The Silver Plume M. Co., with Edward Butts of Chicago as president, has taken an option on the Aspen-Promise group, on Leavenworth mountain, near Silver Plume, and is prepared to carry on development. —— On Republican mountain, near Georgetown, the Joplin tunnel is being driven by the Joplin Tunneling G. & S. M. Co. to develop the Gambetta group. Of the 800 feet to be driven, over 100 feet have been run. B. J. O'Connell of Georgetown is superintendent.— R. C. Bonney, manager of the Sun and Moon mines, has purchased for his company twenty-one mining claims in Pleasant Valley district. This group adjoins the Sun and Moon holdings and will be developed by a lateral, which is now being driven on the Sun and Moon, from the Newhouse tunnel. Bonney's lateral has been run easterly for 1200 feet and is rapidly draining the mountain.——Walter Farragher has started operations on the Queen of the West, in the East Argentine district, recently secured under lease by Thomas Cunningham of Georgetown.

Custer County.

It is claimed that the continuation of the Bassick contact has been struck in a 100-foot crosscut from the Vulcan tunnel of the Walcott G. M. Co., near Silver Cliff. The existence of the Bassick contact has long been disputed. The tunnel is to be continued under the old shaft, giving a depth of 500 feet. The company intends building a mill on the east side of Tyndall mountain.

Eagle County.

Rich gold strikes have been made 18 miles southeast of Eagle by James Murphy and H. W. Ennen and R. B. Davis. They have a lease on the Lucy mine, where the strike was made. The ore is found in the granite 500 feet below the quartzite. It carries oxidized iron sprinkled with free gold.

Gilpin County.

The Powers mine, in lower Russell district, has shipped enargite to the Denver smelters. The second-class ores are shipped to the concentrating works. Increased shipments of this class will be made from the 200-foot east workings to the old workings, which will improve the ventilation, after which the working force will be increased and regular shipments will follow.——The Benzie Investment Co. announces that it will resume operations on the Ingalls property, on Gunnell hill, near Central City, and that a large plant of machinery will be put in.——G. W. Mabeet, Sr., and other Denver parties are arranging for the resumption of work on the Virginia property, up Chase gulch, near Central City.

Work has been resumed on the Polaris group on Colorado hill, in the Pine Creek district, by J. A. Peterson of Idaho Springs and J. L. Walters of Apex. The main shaft on the Polaris is 70 feet deep and is to be unwatered and retimbered and arrangements are being made to sink it deeper.——The Sherman & Macon M. & M. Co. is developing its claims on Silver creek, near Apex, with a tunnel which has been driven 600 feet and is to be extended 400 feet farther. Charles Sperry is in charge.——The Pet shaft of the Golden Rod M. & M. Co., near the head of Silver creek, is down over 200 feet and is to be unwatered by a crosscut tunnel being driven to tap it.——The Pine Creek G. M. & M. Co. is unwatering its Bonanza shaft on Oregon mountain, near Apex, with W. S. Barrick in charge. The shaft is down about 70 feet, and as soon as the water is out they will timber and continue sinking. The Pine Creek Co. is building a shafthouse on its Rochester shaft, with the intention of putting in machinery. This shaft is down 65 feet and the company intends to sink it to the 100-foot point and then drift and crosscut to open up the ore body.——At the property of the Evergreen G. & C. M. Co., Superintendent J. L. Walters has been grading for a new road and a new shaft building to be put up east of the main tunnel. The new shaft building is to be 30x60 feet in dimensions and the equipment will consist of a 30 H. P. hoisting engine, 80 H. P. boiler and a Cornish pump. The shaft on which this plant is to be put in is down 75 feet and is to be continued several hundred feet, so as to get below the ore bodies of the Evergreen property, which have already been opened up in the tunnel and other shaft workings. The main tunnel is in 485 feet, while the other tunnel is in 215 feet.——The Wheeler mill on North Clear creek has been leased by H. B. Gilbert & Sons for the treatment of ores from their lease on the Star of Gilpin mine in Russell district.——In the shaft of the Homestake mine in Russell district sinking operations are being carried on at a depth of 330 feet. Stoping in the 300 west level is developing a high-grade concentrating material in sight, from which shipments are being made.——A new shaft building 28x50 feet has been built on the Ralls County mine on Quartz hill, Nevada district, and an 8½x10 hoist and 50 H. P. boiler have been put on. The main shaft is down 700 feet. The shaft has been repaired in good shape down to the 300-foot level, at which point work for the present will be carried on, the intention being to repair the balance of the shaft at a later date.

Gunnison County.

The Belzora-Bassick M. & D. Co. plans to drive a 2700-foot crosscut tunnel into Sacramento mountain, near Pitkin. This is intended to cut the Sacramento, Monte Vista and Lillie Dell veins.——The Taylor Park M. Co. is building a 100-ton cyanide plant to treat the output of the Enterprise mine in Tellurium gulch, near Tin Cup.

The vein in the Camp Bird shaft, near Bowerman, is improving with depth. The shaft is 130 feet. The mill has completed the treatment of 500 tons of ore. A test is being made on seventy-five tons by cyanide at the Quartz Creek mill at Pitkin.——Adjoining the Camp Bird, the Netted Gem M. Co. is sinking a shaft and driving a tunnel.

Work is being pushed on the mill being built by the Raymond Consolidated Mines Co. on Ohio creek, near Pitkin. They expect to have it finished by November 15.——Wm. Friend, operating the Grand Prize group, near Pitkin, will start a new level at a depth of 106 feet.

Lake County.

(Special Correspondence).—J. A. Shinn, who has been in Pittsburg the past ten months, endeavoring to interest capital in his mining and railroad enterprise, has returned to Leadville with S. M. McElroy, who is interested in the enterprise, and it is believed the big tunnel will be cut through the hill from Empire gulch, on the Leadville side, to Four Mile, on the Fairplay side of the mountain. This tunnel will open up some undeveloped country and will be used as a transportation as well as a mining tunnel. It is understood that the Westinghouse Electric & Manufacturing Co. of Pittsburg has interested itself in the enterprise and will back the railroad end of the scheme. If the railroad is built it will connect with the Colorado & Southern at Fairplay and run through to Leadville.

Leadville, Sept. 2.

The lower section of the ore channels between the Penrose and the Coronado is to be thoroughly explored, as the pump station at the bottom of the Penrose shaft, 100 feet long by 16 feet high and 60 feet wide, is completed. Two large compound and one triple expansion pumps are being set, with a combined capacity of 2500 gallons per minute. When the pumps are working smoothly the 1200-foot drift to the Coronado will be

driven as quickly as possible. When the drift reaches the Coronado it will be 100 feet below the bottom of the shaft, which will be sunk to the level of the drift to make connections. When the connections are made the Coronado ground will be drained. Little water will be lifted from this shaft, as it will be handled at the Penrose. The Sixth Street shaft is the half way mark between the two properties, and from the upper levels of this property large quantities of iron have been shipped, but below the 600-foot point no work has been done. The Penrose drift will cut under the shaft 300 feet, and it is the general belief that the same ore shoot found in the Coronado will be exposed in the Sixth Street shaft. By the driving of the drift the downtown section will be drained.——At the Mammoth placer, in Big Evans gulch, the drill hole discloses two bodies of ore, one at the 450-foot level and the other at 600 feet. The shaft is down 400 feet and making good progress, and the water so far has not impeded sinking.

In Iowa gulch, near Leadville, the Ella Beeler has driven a tunnel in 600 feet and rails are being laid to the breast, and the ore body that was recently opened will be thoroughly prospected.——The Doris is shipping iron and manganese, also some carbonates that were recently opened.——The Ready Cash from the breast of the tunnel, 400 feet, is shipping a good grade of ore.——A new tunnel has been started on the North Star and will be driven 500 feet.——The Auroras Nos. 1 and 2 are to be opened up by a tunnel driven from the Ready Cash.—— The Moyer from both shafts is shipping 1300 tons per month of iron, copper, lead and zinc. All of the surface improvements, including new boilers and hoisting plant, have been put in at the Tucson, a continuation of the Moyer shoot to the east, preparatory to sinking the shaft another lift of 350 feet. When this is completed the shaft will be 950 feet deep and under the ore shoot.

Sinking has been started from the 400-foot level of the Silver Chord winze in the Yak tunnel. This is a shaft 4x8 feet and equipped with hoist and pumps, and will be sunk 200 feet farther.——The 420 foot level of the Ballard shaft at Leadville has been reached. The shaft is to be enlarged to 4x9 in the clear and retimbered to the bottom.——Lomeister & Lynch have leased the Little Nell on Carbonate hill, Leadville, and resumed drifting from the bottom of the shaft, a depth of 500 feet. They hope to catch the Doddridge ore shoot.

Work has been resumed with two shifts on the Mt. Elbert property, 2 miles west of Twin Lakes.——The Manhattan M. &. M. and the Mt. Elbert T. & M. Cos. have resumed work, and arrangements have been concluded by which the Twin Lakes G. M. Co. has turned over, under lease, their mining property on Mt. Elbert to Chas. J. Fox, et al.

Ouray County.

The Atlas M. & M. Co. are making a test of the ore produced from their property near Ouray, having leased the Governor mill and put in electric power. President J. P. Sidwell is at the mine.

San Juan County.

(Special Correspondence).—Three years ago the operators and miners in San Juan county made an agreement which was satisfactory to both sides. This agreement expired on Sept. 1, and there is some rumor of there being trouble in the camps surrounding Silverton, but the more conservative element on both sides does not anticipate any serious difficulty, and it is believed and hoped that an adjustment of all differences can be made without a clash. During the big strike last year in other camps the agreement in the Silverton district between the operators and miners avoided a strike. It has been intimated by some that there will be no agreement signed this year. The following is the scale submitted by the Mine Owners' Association: Battery--Huntington and Chilian millmen, $3.50 for eight hours or $4 for twelve hours. Jig Men—One to five single jigs, without helpers, $3.25 for eight hours or $3.75 for twelve hours. Jig Men—More than five single jigs, without helpers, $3.50 for eight hours or $3.75 for twelve hours. Table Men—$3.25 for eight hours or $3.75 for twelve hours. Vanner Men—$3.50 for eight hours or $4 for twelve hours. Canvas Plant—$3 for eight hours or $3.25 for twelve hours. Engineers—$3.50 for eight hours or $4 for twelve hours. Firemen—$3 for eight hours or $3.30 for twelve hours. Crusher Men—$3.25 for ten hours or $3.75 for twelve hours. Blacksmiths—$4 for ten hours. Blacksmiths' helpers—$3.25 for ten hours. Roustabouts—$3 for ten hours.

Silverton, Sept. 4.

The tunnel at the Auburn claims, near Middleton, northeast of Silverton, has been driven over 450 feet, under the direction of A. V. Shaw. Progress is to be increased in speed when arrangements have been made to handle the water.——The new Hamlet mill at Middleton is handling from fifty to sixty tons of ore daily and an average of three carloads of concentrates are being shipped to the smelter each week. Canvas tables are to be put in.——O. Brendle, of the Bullion Bar M. Co., is working properties in Maggie gulch, near Silverton, and is making preparations to put in a compressor and air drills.——The Highland Mary mine, near Silverton, is being operated by the Gold Tunnel & Railway Co., under the supervision of W. D. Cole.

At the Galty Boy claims, in Dry gulch, north of Silverton, the work is being done by the Ross M. Co. A 600-foot crosscut tunnel has been run, 700 feet of drifting has been finished and a 200-foot upraise is being made. A 6-drill air compressor is to be put in.

T. J. Hurley, manager of the Ruby Basin M. Co., and the Natalie-Occidental Co. of Silverton, has bought machinery for water power and electric plant to run the Ruby concentrator mill and operate the Ruby mine by electricity. The Ruby mill treats from sixty to sixty-five tons of ore from the mine daily, making from fourteen to fifteen tons of concentrates, carrying on an average 50% lead containing silver and gold values. He states that he is driving work in the Natalie-Occidental and will probably construct a large mill on these properties another season, as well as enlarge the mill of the Ruby Basin Co.

The Silver Ledge mine, near Chattanooga, is shipping zinc concentrated by magnetic separators. Carmichael & Kramer of Silverton are working the mine. The mill is equipped with water power, and operations have to be suspended each season on account of the freezing up of the water supply pipes. The Ledge management is endeavoring to have the electric company extend its line from Red Mountain to Chattanooga and supply the Ledge mill with electricity.

San Miguel County.

The greater part of the Smuggler-Union mines at Telluride has been leased by the owning company to J. H. Robeson of Denver and E. J. Carter, the present superintendent of the property, for a term of years. Their leasehold comprises all of the territory lying between the Bullion tunnel and the third level, a block of ground 600 feet high by several thousand feet in length, including the New Pandora mill of 60 stamps. The new operators will require 200 men for the mine and mill.

Summit County.

G. C. Smith of Breckenridge is opening up good lead and silver ore in the Charlie Ross property, at the head of McCullough gulch.

At this time of the year most of the high-bar placer mines in this county are running at half speed on account of shortage of water. To obviate this difficulty, G. L. Kingsbury, manager of the Banner Placer G. M. Co., had several artificial ponds constructed 3500 feet west of and 200 feet above the placer pit. These small lakes fill during the night and next day there is an abundant supply for the two hydraulic giants. A small self-acting boom reservoir at the head of the pit fills and discharges itself every few minutes during the day and night. This "booming" sweeps everything before it down to the bedrock or hardpan to the "wings" of the first sluice, where the stream is contracted, and the material is forced through the 4-foot wide sluiceway, the bottom of which is lined with angle-bar steel riffles. An undercurrent separates the black sand from the balance of the waste and delivers it to the concentrating shed, where concentrating tables reduce the bulk of the sand to a grade of concentrates suitable for smelting. The tables are driven by electricity generated by a water wheel.

At the Jessie mine near Breckenridge 20 stamps are running on good ore from the upper and lower tunnel workings. —— The main crosscut tunnel of the Mary Verna mine at Frisco is in 240 feet. —— D. W. Fall is working a lease on the Maggie May and J. K. & F. properties on Gibson hill. A shaft is sunk. —— The North American mines' main tunnel at Curtin is in over 240 feet ——At the Novelty group near Breckenridge, now owned by J. G. Detwiler and the Summit County Mining Exchange, a horse whim is being put in and a shaft house put up. They intend to sink the main shaft 100 feet deep and then commence taking out ore for shipment, continuing to sink at the same time.

Teller County.

The output of Cripple Creek mines for August was as follows:

Plant.	Tons.	Av. Value.	Value.
Smelters	10,000	$60 00	$ 600,000
Portland	7,500	29 00	217,500
U. S. R. & R.	25,000	30 00	750,000
Economic	7,500	30 00	225,000
Dorcas	3,500	33 00	115,500
Wild Horse	1,500	4 50	6,975
Anaconda	2,000	5 00	10,000
Sioux Falls	1,550	2 00	3,100
Totals	58,600		$1,928,075

Sinking has been resumed from the 270-foot level of the Modoc mine on Bull hill, near Cripple Creek, by Manager F. H. Frankenberg. The shaft has three compartments and is to be sunk to a depth of 1000 feet.

Carrington & Eby, lessees of the Silver Belle & Mohawk Belle properties on Raven hill near Cripple Creek, are putting in crushers and rolls with a capacity of twenty tons to crush the ore before amalgamation.—— The hoist of the Last Dollar mine on Bull hill has been repaired and work resumed.——R. P. Russell has obtained a three-years' lease on the Cardinal on a southwest spur of Gold hill.——Water has caused Hansbrough and associates to stop work in the lower levels of the Morning Star claim of the Acacia. Work is being done on the 400-foot level until the water subsides. The Morning Star has a 400-foot shaft, and 170 feet from the shaft a winze has been sunk 250 feet, or to a total depth of 650 feet. It is proposed to continue the winze for 100 feet.

High-grade gold ore is said to have been opened up at a depth of 100 feet in the Agnes property, on Beacon hill, near Cripple Creek. Therson Bros. are developing the vein.——A five-year lease has been taken on the Red Rock and the Iron King lode claims of the Colorado City & Manitou Co., on the saddle between Ironclad and Tenderfoot hills. A 15-ton daily cyanide plant will be put in for trial purposes.——At the Home claim of the Cedar Hill G. M. Co., on Ironclad hill, Gardner, Jones & Co. are preparing to unwater the shaft and resume sinking to the 200-foot point.

IDAHO.

Blaine County.

The upraise at the Hillside mine near Bellevue has been finished and sinking is being continued in the shaft. The new works are showing good galena ore. A boiler, engine and hoist are to be put in.

Boise County.

A cyanide plant is planned to treat the ore from the Red Jacket ledge of the Equitable Co., in the Black district, near Boise.——Manager J. J. Overbillig of the Twentieth Century Co. is working day and night shifts drifting for the main ledge.——J. W. Edgerton intends developing the Nelson property, in the Black Hornet district, near Boise, recently taken over by the Conservative Development Co. He intends putting up a reduction mill.

Elmore County.

The 10-stamp experimental mill at the Tahoma mine at Atlanta is said to have proven a success, and twenty stamps are to be added to the mill, which will first amalgamate and then concentrate and cyanide the ore.

Idaho County.

It is reported that the Penn-Idaho G. M. Co. of Boise has filed articles of incorporation and will acquire mining property near Big creek formerly owned by D. T. Davis. Development work is to be pushed to determine the proper reduction process adapted to the treatment of the ore, and a mill will be built next summer. The property will be managed by J. B. Eldredge, who is also manager of the Independence.——At the Twentieth Century property, near Roosevelt, preparations are being made for continuous development through fall and winter. Dynamos and electric fixtures with capacity of 700 lights and the stamp mill machinery are being put up. The cable for the aerial tramway from the main working tunnel, Toltac No. 3, to the mill has arrived. The Toltac No. 3 tunnel is in 600 feet.

Nez Perces County.

The Lewiston-Clarkston Co. is preparing to run a high-power line up the Snake river, 25 miles above Lewiston, to furnish power to mining properties and the G. H. Kester marble quarries. Negotiations for the first power have been opened by J. M. Edwards, president of the Gold Crown Co., the Eastern stockholders of which have decided to start with a stamp mill with a capacity of 10 tons per day.

MICHIGAN.

Houghton County.

The Champion's experimental crushing mill at Freda is designed to test the efficiency and economy of rock crushing as against rock stamping. For the test in economy each unit of the machinery is to be driven by an independent individual electric motor. An individual meter will be attached to each of these motors, by which the electric consumption may be measured at each unit. For the test in efficiency the principles of the crushing system are such that samples will show exactly what copper is being recovered, what non-productive pulp is being discharged and what copper is being lost at each stage of the work. The rock for this plant will be crushed in the rockhouse at the mine in crushers which will have a maximum opening of 4 inches and a minimum opening of 3 inches. The rock at the mill will feed from the bins to a shaking grizzly, and in this process the barrel copper will be picked out. The bars in the grizzly screen will each have a face of 2½ inches, with spaces between of 1½ inch. All material above 1½ inch will feed to a gyratory crusher, whose jaws will have an opening of approximately 1½ inch, thus bringing the product uniformly to that maximum size. The entire product will then be sized in a series of cylindrical revolving screens, graded to sizes varying in stages of ¼ inch, and all copper released by the crushing in the gyratory will be extracted in this process. The sized material will then be crushed in stages of ½ inch and the released copper extracted and automatically discharged, while material not containing copper in commercial quantity will be discharged at each stage. The first stage of crushing after the rock leaves the gyratory will be in the Anaconda type of rolls, with heavy springs on the axis, so that any chunks of copper feeding to it may be allowed to pass through without obstructing the work. After this initial crushing in rolls, the various stages will have rolls with rigid axes.

The Tecumseh will have two shafts under way this fall. The first of these has been started. The second will follow the diamond-drill exploration to be undertaken, 1000 feet southwest of the first location.

The annual report of the Wolverine mine at Kearsarge shows that there were hoisted from the various shafts of the mine 336,780 tons of rock as against 328,412 tons hoisted for the preceding year, a gain of 8368 tons, despite an interruption of two weeks by reason of a strike of the trammers. Of this rock 321,813 tons were stamped, making a discard of only 14,967 tons. The mineral return for 1905 was 11,982,345 pounds, against 12,152,690 pounds for the year preceding, while the product of copper was 9,729,971 pounds, against 9,300,695 pounds for the preceding year. The cost per ton of rock hoisted was $1.47 a ton, against $1.50 a ton last year, a saving of 3 cents a ton. This presents the apparent anomaly of greater depth and decreasing cost. The cost per ton of rock stamped shows no change from 1904, the charge being $1.51 a ton. The cost of the refined copper laid down at the mine was 5.098 cents, as against 5.329 cents last year, a saving of .231 of a cent a pound. The total cost per pound of the copper laid down in New York figures to 6.222 cents a pound, the cost of smelting, freight and marketing charges with those of the New York market being 1.124 cent a pound. The total cost of copper last year was 6.458 cents a pound, being .236 of a cent more than the price for which the finished product was obtained this year.

The Calumet & Hecla struck the Kearsarge lode, containing good copper, at No. 21 location, within 200 feet of the Osceola boundary. It has been searching at this location for the past two years. The lode was cut at a depth of about 100 feet.

At the plant of the Michigan Smelting Co. in West Houghton, in the regular course of work, there was taken from one refining furnace working on Copper Range Consolidated output 292,000 pounds of refined copper, cast in ingot bars, in 7 hours. During the process there was an interruption of half an hour, so that the actual time of casting was 6½ hours. This work was done at the rate of 750 pounds of copper every minute. In operating the furnace and casting machinery 6 men were employed, while 4 men were loading the copper as the finished ingots were delivered to the loading platform from the conveyor.

MISSOURI.

The district output of zinc ore for the first eight months of 1905 has been 323,842,350 pounds, as against a production of 345,145,670 pounds during the corresponding period of 1904. The ore brought $7,272,750 as against $5,724,185 in 1904. The lead output since January 1 has been 39,829,720 pounds, which sold for $1,166,130. During the same time last year the output was 43,769,160 pounds, which sold for $1,193,420; a decrease of 3,939,440 pounds in production and $27,290 in value. The total for both ores for the first eight months of the year is $8,448,780

against a total value of $6,917,600 for the corresponding months of 1904; an increase of $1,531,180.

MONTANA.

The mine owners and miners of Montana have reached an agreement on the wage scale for the coming year. The new schedule is to continue until Oct. 1, 1906. The wages for skillful men range from $3.60 down to $3 a day for underground work; for outside work they are from $4 down to $2.50. Five holidays are mentioned.

Broadwater County.

The concentrator on the East Pacific at Winston has been started and runs successfully. There are 20,000 tons of concentrating ore on the dumps, besides large bodies of concentrating ores in the mines which are blocked out. A cyanide plant may be added.

Fergus County.

Prospecting is to be started with a diamond dril on the Fergus-Hilger land on Dog creek, northeast of Kendall. A. S. Wright, W. H. Fergus, H. M. Rae and David Hilger are interested in the company. —— The mill at the Gold Reef mine at Gilt Edge has been temporarily closed until the cyanide plant is finished. L. U. Loomis is manager.

Granite County.

Rich silver ore is being opened up in the Fraction lode of the Hope mine at Philipsburg. J. R. Lucas is superintendent.

Jefferson County.

It is reported that John Rothfuss intends putting up a 100-ton concentrator at the Jacquemin properties in the Elkhorn district. He has been making large shipments to the East Helena smelter.

Lewis and Clarke County.

The Bald Butte Co. mines, 4 miles from Marysville, are in charge of L. S. Ropes. R. M. Awater of Helena is consulting engineer. Twenty of the forty stamps in the mill are dropping on the company ore, two shifts each day, and eight of the sixteen concentrating tables are running. About 2000 feet from the entrance to the lower tunnel a shaft has been sunk 400 feet, giving the company a depth of 1000 feet. Crosscutting for the veins from the bottom is now in progress. There are two veins, the Albion and the Genesee. All the drilling is done by hand. The company is impounding the tailings from the mill. It is employing forty-one men, thirty-six of whom are in the mines.

Madison County.

The new 5-stamp mill at the Tesla mine near Pony has been started under the direction of C. E. Beebe.

Missoula County.

(Special Correspondence).—The Amador M. Co., which is building a railroad 12 miles long from the town of Amador to the mines, expects to have the line completed soon. The road will be equipped by the Northern Pacific Railroad Co., and as soon as the road is finished the Amador expects to begin shipping ore to Butte for treatment at the rate of 100 tons a day to start with.

Missoula, Sept. 3.

Silver Bow County.

(Special Correspondence).—F. A. Heinze of the United Copper Co. is operating a copper property on Knight island in Prince William sound. ——The United Copper mines in the Butte district have increased their output. The Corra mine has been raised from 300 to 600 tons of ore per day, and the Belmont, one on which Heinze spent $200,000 in development work, now yields 100 tons a day. Ore bins are being built at the Belmont, and as soon as completed the output will be more than doubled.——The North Butte M. Co. has taken up the bond on the Miners' Union claim, adjoining the Speculator, and has purchased the outstanding interests. The North Butte now owns the Miners' Union, Jessie, Edith May and the Speculator. The company is producing 800 tons of ore daily, and has a long-time contract with the Washoe for the treatment of its ores. The North Butte will sink an additional shaft in order to increase the output. Any funds necessary for sinking the new shaft will be provided from the earnings.——The by-products of silver and gold in the copper ores of the Anaconda Co. amount to $3,000,000 annually. Last year the company produced more than 100,000,000 pounds of copper, 4,000,000 ounces of silver and $300,000 worth of gold. This year the copper production of the company will be 115,000,000 pounds.

Butte, Sept. 4.

Hoisting has been resumed at the Neversweat mine of the Amalgamated at Butte, after a month of shaft retimbering.——The Pittsburg & Montana Co. is making matte and shipping it to the smelter of the Montana Ore Purchasing Co., where it is being treated in the blast furnace. The matte carries a copper product of 15%. The Pittsburg Co. did not intend to attempt to operate any of its furnaces until the arrival of its new blower, bought from the Mountain Copper Co. of Keswick, Cal., a short time ago, but its ore bins were overflowing and it had no place to put the output of its mines except on the ground, which would necessitate handling it over again.——The hoisting engine bought by the Reins C. Co. for the Combination mine is working. The shaft will be deepened 400 feet, which will give it a total depth of 1200 feet, after which the veins will be crosscut and mining of ore resumed. The company has two pumps at the 800-foot station, each of which will throw 700 gallons of water 800 feet per minute, and will use other pumps while sinking. The upraise started from the 800 to the surface, 40 or 50 feet north of the shaft, has broken into the opening on the 600 and will be continued upward.——At the property of the Raven Co., north of Butte, development work by way of the 1200-foot station of the Buffalo is progressing rapidly.

The Little Annie mine, west of the Goldsmith No. 2, northwest of Walkerville, has been sold to the Cobban Realty Co. of Butte. The mine was owned by C. Ramsdell of Deer Lodge.

NEVADA.

Lincoln County.

W. H. Bainbridge, superintendent of Ascott M. & M. Co., intends resuming work on the Ascott mine, near Searchlight, during September.——The Wallace G. M. Co. is to resume work at its claims at Capitol Camp, 7 miles southeast of Nelson, under the direction of D. Catlin.——The Quartette shaft at Searchlight is 40 feet below the ninth level and is to be continued to a depth of 1000 feet. Drifting has been started on the ninth and is being continued on the seventh levels.——It is reported that a 10-stamp mill and cyanide plant is to be put up at the Cyrus Noble mine, at Searchlight, by Manager J. J. Prendergast.——Sinking has been begun on the Commonwealth mine, near Searchlight.

White Pine County.

(Special Correspondence).—An organization of Butte, Mont., mining men has secured twenty claims near Ely close to the property of the Giroux & Nevada M. Co. and has organized the Butte & Ely Copper Co.

Ely, Sept. 4.

NEW MEXICO.

Grant County.

L. P. Deming is sinking a new shaft on the Pacific mine at Pinos Altos to provide better air. The shaft will be sunk to a depth of 400 feet and is down 150 feet. —— The Colorado Fuel & Iron Co. is again working a large force on its iron mines at Fierro.

Sierra County.

Work is to be resumed on the Wicks mine, near Hillsboro.——The owners of the Snake mine, near Hillsboro, have let a contract for 100,000 feet of lumber and work will soon be commenced on a 50-ton reduction plant.

Socorro County.

In the Key mine, in the Magdalena mountains, near Kelly, owned by the Mine Dev. Co., at a depth of 400 feet, while making a crosscut east from what was supposed to be the footwall of the ore, high-grade lead carbonate has been found by C. T. Brown.

OREGON.

Douglas County.

The Oregon Securities Co., at Bohemia, has completed arrangements for building an aerial tram from near the summit of the ridge between City creek and Champion basin to the Musick mine. This plan of equipment was decided on by Superintendent Archer when he took charge of the property, instead of continuing the crosscut through the ridge, and then building a surface tram from the City creek portal to the Musick. Under the new arrangement ore mined at the Musick will be loaded on the aerial tram, transported about 3000 feet and will be delivered into a bin over an upraise made from the lower Champion tunnel level, which will discharge by gravity into a receiving bin 500 feet beneath. From this bin ore will be loaded into the cars operated by the surface tram, drawn 1000 feet through the crosscut tunnel and then 3600 feet down the incline to the 30-stamp mill. Champion ores which are being mined on the crosscut level will be loaded direct into the cars that are moved by the surface tram. The crosscut, which has been driven 1000 feet into the mountain, is 10x10 feet in the clear, has room for a double track and will accommodate the large electric motor put in by the company for traction work on this level. At the Oregon Securities mill twenty stamps have been dropping this summer on Champion ore.——A rich placer strike is reported on Twelve-Mile creek, in the western part of this county. This new placer find is said not only to comprise the creek bed, but also its banks and even the high ground bordering thereon. This new discovery is in the Salmon mountain, Johnson creek and Sixes mining belt in the Coast Range mountains.——At the last meeting of the Bohemia Mine Owners' Association, F. J. Hard, A. Y. Churchill and Frank McIntyre were chosen a committee to investigate the possibilities of having a smelting plant built in the district.

Grant County.

The Sheridan shaft, near Granite, has been unwatered and sinking and drifting has been started.

Josephine County.

A 3-stamp mill and water power plant is being put in at the Gold Pick mill on Bolen creek, near Holland, by Manager Frank Fowler.

Lane County.

At the Great Northern mine, in the Blue River mining district, the aerial tram recently put in is a success. Within the past few months a new mill and bunkhouse have been built by Manager C. L. Inman.

Malheur County.

Reports from the Mormon Basin district state that the Summit mill, under the management of P. G. Wells, is operating steadily; the output is so satisfactory that at a recent meeting of the owners it was decided to increase the capacity of the mill to forty stamps. At the Gold Coin group the hoist has been completed and the reduction plant is ready for operation.

UTAH.

Beaver County.

The Peck concentrator, which, after a long series of experiments has been found suitable to work at a profit the dump of the Horn Silver mine of Frisco, has begun its regular run, and the management expects to put through from now on not less than 200 tons daily.—— Superintendent Gott of the Skylark Copper Co., operating at Blue Acre, in the Beaver Lake district, in his report to Manager McMullen of Salt Lake for August, says that the shaft now being sunk is down 124 feet and the bottom is in ore. The vein is on a contact of limestone and granite and carries values in copper, lead, silver and gold.

Juab County.

Ground has been broken on the Tetro property at Eureka preparatory to sinking the new shaft 400 feet to the east of the entrance to the old tunnel. A shaft with a single compartment and manway will be sunk 700 feet.

A station is being cut at the 400-foot level of the May Day mine, at Eureka.

Piute County.

It is reported that telluride ore is being taken from the incline shaft of Wm. Robottom's mine, near Junction City. The shaft is down 90 feet.

Salt Lake County.

The Bingham Mary M. Co. has been formed to work the Commonwealth and Mary claims of Bingham. S. Bamberger of Salt Lake City is president and J. H. Bean secretary. An electric hoist is to be put in and shaft sinking started.

The Uintah, M., M. & D. Co. has bought the Castro group at Bingham from N. Castro. Manager L. C. Moore will continue the tunnel, which has been driven 700 feet.

Sevier County.

The Mt. Baldy M. Co., operating in the Gold Mountain district, near Richfield, is driving a main working tunnel which will tap the vein at a depth of 500 feet. C. W. Watts is president.

Shoshone County.

H. Berteaumaux of Spokane and G. A. Henkle of Sprague have bought placer properties on Gold creek, near Orofino, from P. Sawyer.——Another condemnation suit has been started by P. Larson and T. L. Greenough to obtain a right of way for the Morning tunnel No. 6. E. J. Clark, W. P. Wood, D. F. Clark and M. J. McHugh, owners of the Midnight claim, which Larson & Greenough desire to traverse, are the defendants. A right of way for 560 feet through the Midnight claim is sought, the tunnel being 1000 feet long and 12 feet high. This is at a depth of 2100 feet. The appointment of three disinterested persons to assess the damage resulting is asked. This is the second suit of this kind brought in Idaho. Other condemnation proceedings were instituted several months ago by Larson & Greenough to secure a right of way for the same tunnel through the claim owned by Hedlund & Baillie of Mullan. The court decided they were entitled to a right of way, and three persons are now appraising the damage. The tunnel has been driven 8250 feet, and is in the Youlike claim 2100 feet beneath the surface. It is intended to drive it 1310 feet farther, giving a working depth of 2500 feet. The Midnight claim is located between the vein in the Morning and Evening and the mouth of the No. 6 tunnel. The complaint states that the mine cannot be successfully completed or profitably worked by any other tunnel; that the right of way across the Midnight is useful, beneficial and necessary for the draining, working and development of the mine; that no damage can result to the Midnight claim, but on the contrary, the tunnel will be an advantage to the claim.

Summit County.

The new hoist of the American Flag Co. at Park City has been started by Superintendent W. M. Curtiss.

Tooele County.

It is reported that Manager Keifer of the Herschel mine, at Mercur, will put in a mill.

Washington County.

John Green reports that the new shaft of the Blue Jay Extension Co., 18 miles northwest of Stateline and in Washington county, is down 65 feet, with sinking to be continued.

WASHINGTON.

Okanogan County.

A double cable aerial tramway is being put in at the Grand View mine near Loomis.

Snohomish County.

The drift on the Imperial mine at Silverton is in 650 feet and will be continued until a cross ledge which crops on the surface is cut. The greater portion of the ore runs as high as 15% in arsenic, for which the company receive nothing when the ore is shipped to the smelter. ——At the Bonanza Queen mine at Silverton a contract has been let to sink a winze from No. 2 tunnel to make connections with the raise now being driven from No. 3 evel.

Stevens County.

J. L. Magney, manager of the Heckley mines on the east slope of Heckley mountain, 12 miles east of Northport, in the Metalline mining district, reports that the group has 285 feet of tunnel, 180 feet of shaft, 65 feet of open cut and 500 feet of stripping work. The ore is galena and zinc. The company is preparing to move a concentrator from Deer Park, B. C., to the Heckley mine.

Whatcom County.

A big strike of free milling ore is said to have been made on the Columbia group of the North American mine in the Slate Creek district, 60 miles by trail from Bellingham. T. F. James is manager.

WYOMING.

Carbon County.

It is reported that the Penn-Wyoming Copper Co. intends adding furnaces to increase the present smelting capacity of 350 tons daily to 1000 tons daily, and an auxiliary steam plant at the smelter to be used when water power is not available; also a 1000-ton concentrating plant at the mine. They are working the Ferris-Haggarty property at Dillon. The present concentrating plant is producing 300 tons of a 28% product daily. ——At the Doane-Rambler mine at Rambler the lower levels are to be opened up and sinking continued. A large pump has been put in at the 645-foot level. J. L. Powell is superintendent.——The Battle Lake Tunnel Site Co. is working the mine. It is reported that they intend putting in a new water power plant. Preparations have been made to build a dam at the outlet of Battle lake.——Manager Aaron Slothower intends putting in a hoist and continuing the main shaft of the Investors' M. & P. Co. at Rambler.

FOREIGN.

AUSTRALIA.

New South Wales.

The half-yearly statement of the Broken Hill Proprietary shows a profit for the six months ended May 31 of £147,671. Net assets £423,905, and profit and loss account shows a credit balance of £580,470; £16,278 has been expended in construction during the half-year, of which amount £5,499 has been on account of zinc concentration plant and sulphuric acid plant. As the result of modifications in the furnaces at Port Pirie, satisfactory results have been attained in the recovery of metals. Connection has been made between McBryde shaft and Delprat shaft at the 1000-foot level, opening communication from Delprat shaft to not far from the southern boundary—a length of 2150 feet. Delprat shaft has reached a depth of 1120 feet. Cost incurred in prospecting, £22,076. Zinc concentration plant in full operation three months, and this worked satisfactorily, producing 12,851 tons of concentrates for the half-year; contracts are signed for the sale of concentrates at the rate of 40,000 tons per annum, extending to the end of 1907. The erection of the necessary plant for the manufacture of spelter, definitely decided to be situated at Port Pirie, is being pushed ahead as much as possible. The zinc concentration plant has a producing capacity of 1200 to 1400 tons weekly; this quantity is sufficient to meet all requirements for own manufacture, in addition to contracts. Since reporting, in February, 1903, the estimated quantity of ore in sight was 4,250,000 tons; have extracted 1,400,000 tons. In view of latest developments, a fresh survey has been made, and, according to recent estimates, the quantity of ore in sight amounts to 3,200,000 tons, of usual quality. Average prices obtained during the half-year: Lead, 12s 3d per ton, and silver, 49-64d better than during the past half-year. The past half-year completed the twentieth year of the company's existence, and within the time 7,747,306 tons of ore treated, producing 733,025 tons of pig lead, 4576 tons of copper, 7201 tons of antimonial lead, 129,740,728 ounces of fine silver, and 82,933 ounces of gold.

Western Australia.

As a consequence of favorable bore-hole prospecting, the management of the Boulder Main Reef is preparing to sink the main shaft from the 1400-foot level to the 2500-foot level.

CANADA.

The following announcement has been made by the Canadian authorities regarding duty on white lead: "Provided that dry white lead purchased on or before the 6th day of July, 1905, at any place out of Canada for importation into Canada, on evidence to the satisfaction of the Minister of Customs of the purchase and sale having been so made on or before the said day, may be entered for duty at the rate of duty in force immediately before that day, notwithstanding an increase of custom duties under this act, but this proviso shall cease to have force and effect after the 15th day of September of this year." July 6th was the date of delivery of the budget speech.

BRITISH COLUMBIA.

Some time ago the British Columbia parliament enacted a law forbidding the employment of Chinamen in mining underground. The Wellington Colliery Co., desiring to test this law, continued to employ Chinamen in underground work, whereupon an agreed case was submitted to the courts and passed finally to the privy council in London, England, the court of last resort. The judicial committee of the privy council has handed down a decision in favor of the colliery company. The committee sustained the contention of the company that it could send its employes to any portion of its property. Similar acts, relating to both Chinese and Japanese, have been disallowed by the Dominion Government.

Boundary District.

At the Emma mine at Summit the main incline shaft is now down 150 feet, where crosscutting is being done.——Work has been resumed on the Jewel in Long Lake camp with seven men, working under J. H. Smith.

Within the last year the Granby Con. M., S. & P. Co., Ltd., has purchased thirteen additional mineral claims in Phœnix, at a cost of $432,000, the last of which was the completion of the Gold Drop group, purchased for $225,000. The claims purchased were as follows, with their respective amounts: Monte group of four claims, $15,000; Monarch and Tamarack group of four claims, $180,000; Gold Drop group of four claims, $225,000; No. 13 claim, $12,000. It is the intention to open up the Gold Drop at once, by running a raise from the No. 3 tunnel to the surface, and quarrying the ore and dropping it down the raise. Superintendent Hodges states that he expects shortly to begin work on a surface tramway from the Gold Drop to one of the Snowshoe's Central Pacific Railroad spurs, for shipping purposes, the arrangements now being made with the Snowshoe Co. for that purpose. When the tramway is built to this spur ore bins will be built.

Rossland District.

The output for the week ending September 2 was 6540 tons. The Crown Point, after an idleness of several years, has shipped a carload. Shipments for the week were: Le Roi, 3590 tons; Center Star, 2250; Le Roi No. 2, 150; Le Roi No. 2 (milled), 400; Spitzee, 120; Crown Point, 30; Jumbo, 400; total for week, 6540, and for year, 225,653 tons.

Slocan District.

The Bosun mine, between New Denver and Silverton, has been purchased by the Monitor & Ajax Co. of New Denver, which controls also the new zinc concentrator at Rosebery. The Bosun is developed by five adit tunnels on the lead, with a vertical depth of 365 feet and a total length of 1800 feet. The lowest tunnel is 1000 feet long and is connected by raises with No. 2, 130 feet above, which is 800 feet long. Eighty feet above it is No. 3, which is 1000 feet long. No. 4 is 85 feet higher and 500 feet in length. No. 5 is 60 feet above No. 4, 60 feet below the surface at the face and 500 feet in length. The lead is a large fissured zone containing quartz, galena and zincblende. It is announced that the works at Rosebery are completed.——The Monitor Co., of which M. Gintzburger of New Denver is manager, has everything in readiness at the mines and reduction works for operations.

Vancouver Island.

Consul Dudley of Vancouver writes that the Britannia mine, 30 miles from Vancouver, has started shipments of ore and concentrates to the Crofton smelter. The mine lies at an elevation of 3500 feet above the beach at the head of Howe sound. An aerial tramway, nearly 3 miles in length, has been built to bring the ore from the mine to the crusher, which has been built upon the side of the bluff that rises from the shore, at an elevation of 100 feet. From the crusher the ore travels by gravity to the concentrator. The tramway has a capacity of 100 tons per hour. The concentrating plant has sixty tables. The concentrates are carried by gravity to bins at the shore, so arranged that three cars may be loaded at one time by simply opening the chutes and allowing the concentrates to run into the cars. The cars will be brought upon a transfer barge and, when loaded, will be towed across the Gulf of Georgia to Vancouver island, 40 miles, where they will be run on rails to the Crofton smelter. The contents of the cars will be dumped into the bin and the smelting and refining of the concentrates will be carried on day and night. The motive power of the tramway, the crusher and all other machinery, including the compressed air plant used to operate the drills, is electricity, generated on the spot. A small stream, with a fall of several hundred feet, gives power to the generator.

MEXICO.

Durango.

The Parral Miner reports that the Lustre M. Co. at Santa Maria del Oro, Durango, have been running the slag from their smelters into iron moulds of suitable shape for building purposes. These slag building blocks or bricks are cast in iron moulds 8x16x15 inches, with a taper of ⅜ inch all around to facilitate removal from the blocks. These blocks come from the mould smooth and shiny on the edges and rough, with tendency to blister on the top, while the bottom is reasonably smooth, as the mould is set on a heavy iron plate which serves as a bottom. The rough top is found to be an advantage, as it holds the muds or lime in building and helps bind the wall. There is no tendency to split or crack as might be expected in a basic slag. The company has built one house, 22x18x14 feet with 24 inch walls laid in mud, and is completing a second building 38x18x20. The slag blocks are laid up in lime mortar. The slag carries 55% silica and 20% iron.——The Inde Reduction Co. has blown in their La Roca smelter. Their present output is two tons daily.——La Cruz Mineria have completed their 25-ton smelter and will treat their own ores in the future.

D. M. Burns, general manager of the Candelaria mines in the San Dimas district, is having plans prepared for a hydro-electric plant in that district. A mountain waterfall will be utilized, and electric power will be supplied to the Candelaria and other mines and to reduction plants in the San Dimas district.

Jalisco.

The Lupita M. Co. of Colorado Springs, Colo., operating in the Navidad district, has purchased the Socorredora mine on Agujas mountain.——Ore rich in silver and gold has been cut in reopening the Barranca mine in the Ameca district. A force of 125 men is employed. The Barranca mine was purchased by E. J. Callahan for the Bonanza M. Co. A reduction plant at the mine is being built and new machinery will be added.

Commercial Paragraphs.

THE contract which R. W. Christian, gold dredger operator and inventor, has entered into with the Allis-Chalmers Co. gives that company the exclusive rights to his patents, and also his services as engineer in designing and constructing gold dredgers which the company may make embodying his inventions.

THE Rapid-Economy Stamp Mill Co. of San Francisco, Cal., reports a lively demand for their Richards' Rapid-Economy stamp mill. They have a contract to equip the Castle Mont M. Co.'s property in Tuolumne county, Cal., with a number of their stamps, and report the shipment of one of their 3-stamp batteries to F. H. Elder for his mine in Humboldt county, Cal.

N. C. BONNEVIE, president Denver Ore Testing Co., Denver, Colo., has contract for making plans and building a 50-ton stamp mill for the Sound Democrat mine at Animas Forks, near Silverton, Colo., and 50-ton Elspass mill for Max B. Fitch, manager the Southwestern Lead & Coal Co., Socorro, N. M. Both these parties had their ore tested by the Denver Ore Testing Co., and from the tests decided the kind of machinery to use in their new mills.

THE Trenton Iron Co. of Trenton, N. J., have recently built, or are building, Bleichert aerial tramways for the May Day G. M. Co. and the Bonnie Girl M. & M. Co., Hesperus, La Plata county, Colo.; the Howell Hinds Old Hundred mine, Howardsville, Green Mountain M. & M. Co., Silverton, Grand Mogul mine, Gladstone, Ross M. Co., and the Gold Prince mine, Silverton, San Juan county, Colo. It is expected that all the above will be completed within the present season.

STEAM hose in being dragged around rocks, etc., is liable to kink. Kinking breaks the hose from the outside, when the hose, then being unable to stand the necessary pressure, bursts. This kinking is said to be overcome in the flexible steel-armored hose as the nature of the armor maintains a uniform internal diameter. The steel armor of the flexible steel-armored hose entirely covering the inner rubber hose, and being interlocking, prevents an open rupture, with the result that sufficient steam pressure is maintained to continue the use of the hose. A drill or other machine can thus be continued in use with a damaged hose until it is convenient to replace it with another piece. Full description of this new hose may be had from the manufacturers, the Sprague Electric Co., 527 West Thirty-fourth street, New York.

Trade Treatises.

"Smelting Furnaces and Accessory Equipment" are attractively illustrated and described in Catalogue No. 122 of Allis-Chalmers Co., Milwaukee, Wis. The treatment includes blast furnaces for lead and copper ores, hot blast stoves, water jackets, forehearths, slag, matte and bullion pots, charging apparatus, blowers, engines and electrical apparatus.

As an exponent of recent hoisting practice, Catalogue No. 126, of the Allis-Chalmers Co. of Milwaukee, Wis., on "Hoisting Engines and Accessories," is practical and interesting. Besides illustrating many recent examples of fine hoisting installations, it contains much information and data on hoist problems. Its typographical appearance is in accord with the high standard already set.

Bulletins Nos. 1600 and 1601 of the Allis-Chalmers Co. of Milwaukee, Wis., describe tests and records of the 30,000,000-gallon pumping engine installed in the Chestnut Hill high-service station of the Metropolitan Water Works, Boston, Mass., and of the 15,000,000-gallon vertical triple-expansion pumping engines installed in the Baden high-service station of the St. Louis, Mo., Water Works.

"The Automobile Washstand-Turntable," manufactured by the Link-Belt Machinery Co., Chicago, Ill., is the subject of a trade treatise which shows that this appliance facilitates the handling of motor cars in garages and manufactories by enabling the car to turn as on a pivot toward any objective point, thus rendering every part of the garage easily accessible, and reducing the space ordinarily required for maneuvering cars to an extent which greatly increases the capacity of the garage. It permits the car always to face the door, thus avoiding the inconvenience and risk of accident which occur in backing out, especially when the approach is narrow or on a grade.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING AUGUST 22, 1905.

797,711.—JAR FASTENER—Abramson & Bennett, San Francisco.
797,839.—SWITCH—C. J. Carlson, Spokane, Wash.
797,841.—CHAIR—C. Conn, Bremerton, Wash.
797,721.—AGITATOR—M. J. Covell, Los Angeles, Cal.
797,796.—HOSE COUPLING—E. Devlin, San Francisco.
797,767.—WINDOW TIGHTENER—G. H. Dyer, San Francisco.
797,730.—ESCAPEMENT—F. Gundorph, San Francisco.
797,959.—MIXING DEVICE—Hulvorsen & Walls, Vashon, Wash.
797,736.—PENHOLDER—P. L. Keller, Petaluma, Cal.
797,737.—BUTTER CUTTER—N. W. Kline, Long Beach, Cal.
797,901.—ASSAY FURNACE—A. M. MacDuffee, Chloride, Ariz.
797,778.—WHEEL—D. C. McCan, Los Angeles, Cal.
797,779.—WHEEL—D. C. McCan, Los Angeles, Cal.
797,743.—SHOE STRING FASTENER—J. A. McCoy, Sisson, Cal.
797,709.—DIRT SCRAPER—P. J. Petterson, Seattle, Wash.
797,618.—WEDGE—F. P. Sharp, San Francisco.
797,627.—JACK ARM—E. B. Stone, Oakland, Cal.
797,638.—HANDLE—J. L. Thomas, Winlock, Wash.
797,831.—BOTTLE—M. T. Wright, Port Orford, Or.

FOR THE WEEK ENDING AUGUST 29, 1905.

798,386.—FAUCET—S. F. Baker, Santa Barbara, Cal.
798,317.—PLOW—J. Beard, Westport, Cal.
798,393.—SHINGLE MACHINE—W. L. Connett, Sweet Home, Or.
798,323.—CHUTE—C. F. Cormack, San Francisco.
798 576.—LOCK NUT—I. W. Exley, Colville, Wash.
798,278.—QUARTZ CRUSHER—L. C. Graupner, San Francisco
798,334.—FISH TRIMMING MACHINE—C. P. Hale, San Francisco.
798,192.—SIPHON HEAD—D. Landau, San Francisco
798,297.—SMOKE PURIFIER—Lawton & Reynolds, Grants Pass, Or.
798,195.—FIRE PROTECTOR—Locher & Predom, Auburn, Cal.
798,288.—SASH HOLDER—G. Malcolm, Oakland, Cal.
798,299.—DOOR KNOB—B. Phelps, Seattle, Wash.
798,299.—SEWING MACHINE—J. O. Rollins, Tuolumne, Cal.
798,541.—DUPLICATING APPARATUS—G. M. Stroud, Portland, Or.
798,308.—THILL ATTACHMENT—W. J. Thomas, Inglewood, Cal.
798,311.—BUGGY TOP REST—E. Wiet, Sacramento, Cal.
798,150.—CARBURETOR—S. B. Wolgamott, Tancred, Cal.
798,312.—SMELTING FURNACE—H. L. & N. Wrinkle, Keeler, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

TOOL ATTACHMENTS FOR SEWING MACHINES.—No. 798,299. Aug 29, 1905. John O. Rollins, Tuolumne, Cal. This invention relates to attachments for sewing machines, and particularly to a form of removable tool hanger and means for driving the same from the machine treadle. Its object is to provide a detachable carrier for rotary tools, which may be applied to machines already in use and which will drop below the table to permit of its being run from the main drive wheel without interfering with the table or requiring changes therein, and to provide a novel and efficacious means for operating the tools from the treadle of the machine and without necessarily running the sewing arm. It consists in the combination with the frame casting and operating treadle of a sewing machine, of a detachable arm arranged to be secured thereto, means including a bolt passing through the frame casting and plates on the bolt upon each side of the frame for detachably securing said arm to the side of the frame casting, a direction pulley and a flexible connection passing over said pulley between said arm.

FISH TRIMMING AND SPLITTING MACHINES.—No. 798,334. Aug. 29, 1905. Cress P. Hale, San Francisco, Cal. The object of this invention is to provide a practical labor-saving device which will automatically remove the tails, fins and head of large-sized fish, such as salmon and the like, and which will split the fish along the back to allow the removal of the backbone. The invention comprises in fish-dressing apparatus, the combination with fish-conveying means, of a table on which the fish is delivered therefrom, a rough-shaped carrier extending in the direction of movement of said conveying means and operatable at right angles thereto and across said table, means for delivering the fish from the table into said trough, and a cutter to one side of the path of the trough to sever an extremity of the fish.

Dividends.

Bunker Hill & Sullivan M. & C. Co., Idaho, dividend No. 96, $150,000, payable Sept. 4; total paid since Jan. 1, 1905, $2,625,000; total to date, $4,896,000.

MINING AND SCIENTIFIC PRESS.

Whole No. 2354.— VOLUME XCI. Number 12. SAN FRANCISCO, CAL., SATURDAY, SEPTEMBER 16, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

The Prospector, Etc.

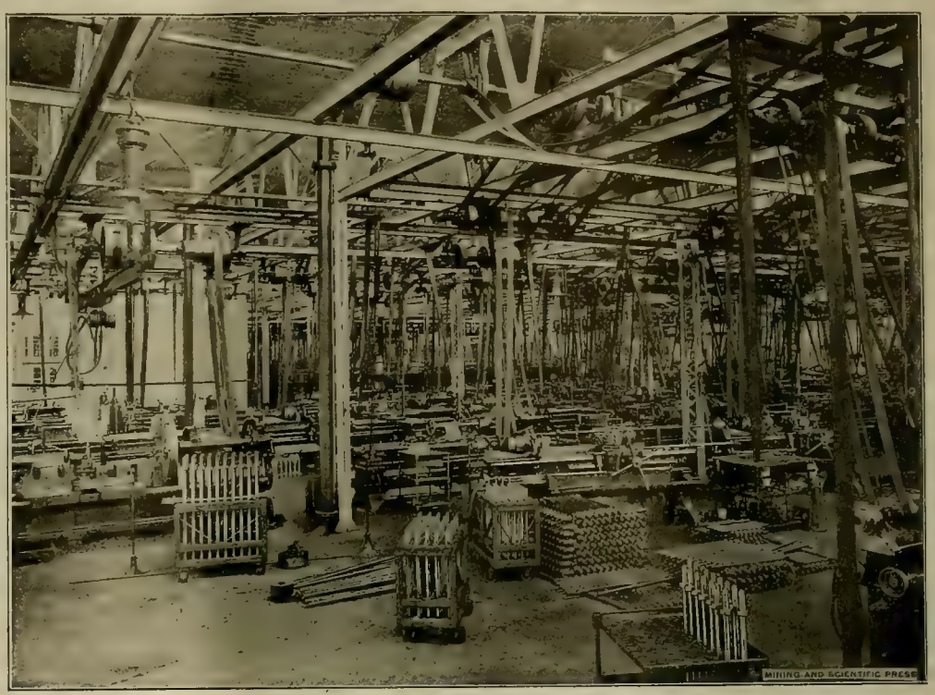
In a recent lecture on "The Laboratory and the Gold Mine," by Prof. S. L. Bigelow of the University of Michigan, emphasizing the need of mining and scientific research, and the absolute requirement of technical skill in mining, he said that time was when the treasure seeker in the mountains needed only a pan in which to wash the sand to determine if the prospect was a good one, but that nowadays the first requisite was the installation of costly machinery and that the day of the prospector is over.

It is singular how this latter idea clings to the minds of so many people; possibly it is because of their environment. The professor was right in recounting the achievements of mining and metallurgical science and in stating that knowledge of the sciences connected therewith is absolutely necessary for success; but he was wrong in assuming that "the day of the prospector is past." It is not, and it would be a sorry day for the mining industry if it were. The prospector with his pan, his scanty outfit and his patient, humble work is still the avant courier of the mining industry of America. He is still the sturdy pioneer that blazes the way and makes the initial discovery that renders possible the mining camp and all the busy life that clusters round a great mining property. As the acorn holds within its tiny cup the potentiality of the mighty oak, so in the kit of the prospector is the germ of the great subsequent investment—the development of the mine, the purchase of machinery and the outlay of vast sums of money.

This is not always easy to be realized by any one not acquainted with the eternal conditions that necessarily make it so. It is one of the things, to explain which is unnecessary to one that can understand it and useless to one that can not.

No man can thoroughly understand it if he forever lives his life where there is no unoccupied Government land, and hence no possible area for the prospector to wander in. For wanderer he is, and he must have an area of public domain to roam over. Forever filled with an unrest and a spirit of divine discontent, forever hopeful of finding something better than before, he and he alone is the real mine discoverer. He is by no means extinct; in his methods he differs little from his predecessors; in his results he is more fortunate in these advanced days of scientific mining, of which the professor quoted represents in many ways an honored adjunct. He has his sphere; the prospector his, and, with all due deference to the professor, the prospector is at least as important. Were it not for the prospectors, some of the professors would be without business. The prospector is as the voice of one crying in the wilderness, "Prepare ye the way of the Lord!" or words to that effect.

Nor is the professor particularly happy in his suggestion that the installation of costly machinery should be a primary proposition in the development of a mining property. That should be about the very last thing done on the property, and in a well managed mining proposition occupies the final place in the whole scheme. From the prospector's find to the installation of costly machinery is ordinarily a long and evolutionary process, and the ordinary modes of such evolution can not be hastened, reversed or disturbed without considerable disregard of the regular rules of business.



Drill Department, Ingersoll-Sergeant Co.'s New Plant.

Foundry, Ingersoll-Sergeant Co.'s New Plant.

Court Between Foundry and Pattern Storage Buildings.

THE NEW INGERSOLL-SERGEANT PLANT AT PHILLIPSBURG, N. J. (See Page 193.)

WITH impulse wheels to which water passes in planes at right angles to their shafts, it is desirable, in order to avoid changes in the directions of water pipes, that direct connected wheels and generators occupy the same room. This is the arrangement at the Colgate, Cal., Electra and Santa Ana, Cal., electric power houses. The area of a wheel room may frequently be reduced at stations operating direct current, horizontal pressure turbines, under low heads, by placing the wheels at the bottom of the canal, which has one side of the station or generator room for a retaining wall. Vertical wheels direct connected to generators must be directly under the main room of their station, and may be in a canal over which the station is built, in a wheel room that forms its lowest part, or in a wheel pit, and supplied with water through penstocks, as at the Niagara Falls electric plants.

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IN connection with the expansion of American business in Russia is to be noted one of the first fruits of President Roosevelt's mediation between Russia and Japan. In cordial appreciation thereof, the Russian Czar has ordered a discontinuance of discriminating duties on American manufactures in Russia, which takes off from 20% to 30% duty on all kinds of American machinery imported into Russia, and which will thus tend to largely increase the American mining machinery trade with Russia.

THE operators of the large coal mines on Vancouver Island, B. C., appear to have gained a victory in the test case which was tried to determine whether the law of the Dominion Parliament, making it unlawful for mine operators to employ Oriental labor underground, was good law. The case has been carried up from one court to another, eventually reaching the Privy Council in London, the British court of last resort. This high tribunal decided in favor of the mine operators. An ultimate decision was reached much more quickly than is usually possible in the United States.

TO except mines or mineral lands from the operation of a townsite patent, it is not sufficient that the lands do in fact contain valuable minerals when the townsite patent takes effect, but they must at that time be known to contain minerals of such extent and value as to justify expenditures for the purpose of extracting them; and if the lands are not known at that time to be so valuable for mining purposes, the fact that they have once been valuable, or are afterwards discovered to be still valuable for such purposes, does not defeat or impair the title of persons claiming under the townsite patent.

A National Need.

The Canadian Government is about to accede to the requests of Canadian mining men and establish a National Department of Mines at Ottawa, under the direction of a Minister of Mines. The idea is a commendable one. As a cold business proposition Canada will make money by it. Such governmental department will pay for itself ten times over in the first year of its existence. Such a government department will foster and aid the mining industry of the Dominion in many ways.

For many years the necessity for a national Cabinet Department of Mines and Mining has been urged as a requisite part of the executive branch of the United States Government. The objections against the measure have been met, and the arguments for so salutary a step are now unanswered because unanswerable. The only objection noted of late is that the supervision of the mining industry can be left to the several States and that the general government need not be burdened with such proposed federal supervision. Such argument is born of ignorance and has no excuse for existence. If the mining industry were solely a State matter; if here and there throughout the nation there were only a sparse and sporadic evidence of its existence, then, as in similar cases, it might well be left to State supervision. But it has become the great basic industry of the nation. Many things the several State governments can have justly delegated to them for sole control: in the case of the mining industry it is due to its dignity and importance that it be accorded the fullest measure of federal recognition. In our system of government the federal power is dominant, and when it stamps the seal of paramount authority upon an industry, it lifts it to a height of industrial importance denied to anything controlled by State measures. To such dignity would the mining industry be raised by the creation of a Cabinet of Mines and Mining.

But it is not a matter of "dignity" so much as a plain present business requirement. The importance of an industry that last year produced twelve hundred millions of dollars is manifest, and justifies such Cabinet creation. It has always been the wise policy of the Government to create Cabinet departments in accordance with the growth and requirement of the nation. In the early years of the Republic the Cabinet of the President of the United States had but four officers. As we advanced it became necessary to have a Secretary of the Navy; later, the nation needed a Postmaster-General. Doubtless in those days there were men who shook their heads and thought it was unnecessary and extravagant to have so many Cabinet officers. But in 1848 it was found necessary to create a "Department of the Interior," and any one who has had anything to do with land or mines in the last half-century knows how overcrowded and overdone is the little section of that Cabinet department that is devoted to those matters. Since the first recognition of mining in the United States a little desk in an obscure corner of the Interior Department is all that is accorded the great industry that made the nation what it is and maintains its strength and prestige through the years.

In 1889 it was found needful to create a Cabinet Department of Agriculture. In 1903 was created a Department of Commerce. Every dictate of justice, economy and good business requires that there be created a Department of Mines and Mining, an officer as member of the Federal Cabinet. As shown, the President's advisers and assistants have grown in number with the growth of the country. The time has come when the industry that has made all others possible be given its due representation in the executive branch of our Federal government. It would be a good investment in every way.

And in this there is no plea for aid nor call for assistance; no hint at fostering care or protection; no request for favor or help of any kind. The American miner is perfectly able to take care of himself and asks no governmental help. He does think, however, that the Government exhibits a lack of understanding of its own true interests in its neglect to help itself. What mining is in 1905 is only an indication of what it can be made to be. We have illimitable mineral resources; abundance of capital; the highest quality of technical skill. There are many present limitations on all these because of the lack of proper governmental representation. Men who have a clear conception of national requirements see this; a broad-guage policy requires that the deficiency be supplied. In former arguments for the creation of a Cabinet Department for Mines and Mining, this journal has gone into details illustrative of the pressing need from a national standpoint of this measure. When the MINING AND SCIENTIFIC PRESS began the effort there was considerable apathy. There is a little left, and it is this indifference alone that has prevented the mining men of the United States from having a Cabinet Department years ago. Concert of action would secure a Cabinet Department of Mines and Mining inside of two years. Whenever the mining men want it they can have it by giving the national legislators to understand that votes count, and that mining men the country over know their friends.

NO kind of engineering has developed so fast as electrical engineering. The electrical engineer has an unusual advantage over other engineers in the fact or existing condition that in his line everything lends itself to exact calculation, and a completed machine or any of its parts may be submitted to the most searching electrical and magnetic tests, because such tests, unlike those applied by other engineers, do not destroy the body tested. In mining, tunneling, earthwork, building, making railways or canals, the engineer is supremely dependent on the natural conditions provided for him, and these conditions are seldom twice the same. The rock is different, the ore is dissimilar, the ground is not alike. There are no simple laws known to the engineer about the way in which currents will act upon sand and gravel; and engineers who have had to do with such problems are continually appealing to nature, forever making tests and observations, and bringing to bear upon their work all the knowledge and habits of thought that their past experience has given them. But the advantage cited in the case of an electrical engineer is sometimes set off by the concomitant fact that because of this as a finished product the electrical engineer must not overlook the need of training in the exercise of his judgment in actual, practical work.

THE growing importance of mining is being variously illustrated. Uncertainties in industrial stocks, the glut of cheap money, the strenuous competition in mercantile and manufacturing as contrasted with the profits of intelligent mining work, induce investments tremendous in the aggregate. Noticeable, too, is the increase in the number of students who in the different universities take up the "mining course." With requisite training and experience, the graduate of a mining college can be a good miner or mining engineer, the chief advantage of his college education being the "right start" he has secured; but in this matter nothing can take the place of experience, and this can only be had by actual work and responsibility. This influx of young men who in entering a mining college for a four years' course dedicate their lives to the profession of mining is also illustrative of the recognized importance of the mining industry, by reason of the fact that in mining, as in other important industries, it is the young man who has charge of affairs, and to the properly qualified man the mining industry affords fine opportunity for a prosperous career.

THE Supreme Court of California decided that any one who connects himself with the title of a mining corporation may take advantage of the law of that State prohibiting the directors of mining corporations from selling or encumbering its mining grounds unless ratified by the stockholders. In the case of Williams vs. Gaylord, 186 United States Reports, 157, the Supreme Court of the United States has decided that such decision is binding on the Federal courts; that is, a State may require the consent of the stockholders of a foreign mining corporation as a necessary prerequisite to the sale or encumbrance of the mining ground owned by it within the State, as such a requirement is not a regulation of the internal affairs of the corporation, but has reference to the conduct by it of its business.

The Deadly "Knocker."

A letter from a little town in northern Idaho says, as usual, that there is nothing needed there but capital—that the indications made manifest by the development work already done show conclusively that all that is required is capital to make three or four big mines. Very likely; indeed, almost positively so. The same assertion is made to this journal over and over again in the course of a year, and usually what the correspondent says is the truth. But it is not the whole truth. Such correspondent from northern Idaho, or southern Oregon, or eastern California or western Colorado, the same as other correspondents from many other promising localities throughout this west half of America, omits one important requisite not usually possessed by the denizens of a promising mineral region, namely: co-operation, which involves the absence of local antagonism.

It is, too often, the experience of would-be investors in a deserving mining prospect that some one on the ground—some local resident—will often do his best or worst to "knock" the sale of his neighbor's property, sometimes from pure cussedness, other times because he himself has a property that he wants to sell, and sillily knows no better way to recommend it than by decrying his neighbor's ownings. One or two such male specimens can kill a camp or hold back a really deserving mining locality.

It is within the writer's personal experience to be approached on his visiting a place that "needs nothing but capital," and confidentially told by a leading local light that the property under consideration was "n. g.," and that "no one but a damned fool would buy or bond it," meanwhile affording the information that he had a really fine proposition, just what was wanted, and might be induced to consider suitable offer therefor. This is not an uncommon experience. Of course, the almost inevitable result is that the visitor leaves on the next stage—and sometimes has reminiscent remarks not wholly favorable to further inquiries concerning that particular locality.

That this is the acme of folly goes without saying, but it is just what is being done over and over again in a hundred deserving localities.

Such people might with great benefit take a leaf from the ledger of real estate men's policy. If a "stranger" visits Brownstown or Silverville, and talks of buying a lot, the local real estate dealer to whom the "stranger" talks doesn't tell him that he has the only lot in town worth buying and the other fellows are only false alarms. He sensibly credits the visitor with the possession of ordinary intelligence (which is usually safe), and contents himself with effort to sell the lot in question, telling the truth (which is good enough, and most folks believe it). Should the visitor finally buy a lot from another real estate agent in the same town, the first one talked to says, usually: "That is a good lot, too; indeed, next to the one I showed you, I believe I would recommend it for your purpose."

Were he to start in telling the would-be buyer that that lot was badly located; that the property just there would depreciate, and that the whole was worthless, he would do no worse for the place of his habitation than the man who "knocks" the sale of a mining prospect in his locality.

"Then," it may be asked, "would you advise that an innocent purchaser be kept in ignorance of the situation? Is it not common honesty to let an investor know the defects and shortcomings of a property? Is it not the duty of a resident, acquainted with the facts, to so inform one uninformed?"

If there be swindling or false misrepresentation going on it is only right that the poor innocent promoter or mining engineer (who of course knows nothing), be told of his folly, but, generally, it is not with any such high ideal of his duty to his fellowman that the "knocker" does his deadly work. He "knocks" because his own narrow envy and little lust for lucre blinds him to the injury he is doing his locality. He is not fooling the promoter nor mining engineer into believing what he says about his own property, but he is helping to throw suspicion upon any honest statement of others, for in nothing is confidence more easily destroyed than in anything relating to the purchase of a prospect.

This is not a lecture nor a sermon, nor even to be considered as advice, but is, perhaps, a harsh way of saying what has been said herein before in more courteous terms, viz., that nothing is ever made and much is often lost by false and foolish statements made by local residents about their neighbors' property.

Many a good sale has been spoiled; many a deserving locality is dead or dying, because of the lying tongue of some resident idiot who is denied the sense that God gives to geese. Such a locality is unfortunate in possessing such an undesirable specimen of inhabitant, and if ever a boycott was justifiable it is in his case.

THE appreciation in the price of silver is of interest from either a mining or monetary standpoint, solely that it produces more profit at its present price to the miner. Indeed, in some cases where silver is a product, there is more money for the miner with silver at 62 cents than when it was $1.34 an ounce, thanks to improved metallurgical methods, gerater facility for transportation, and decreased cost of supplies. So far as the monetary question is to be considered, the parallel of anomaly is considered coincident. With silver at 50 cents an ounce, or 25 cents, or 62, as at to-day's quotations, the business of the world would adjust itself to the fluctuation. The currency or its value is unaffected by the current price of silver, for, in the United States, the silver dollar is in the last analysis merely a government note stamped on silver. The material counts for nothing in giving it circulation value, any more than does the paper on which national bank notes are printed. Should silver go to $1 per ounce, or drop to 25 cents, our currency would remain unaffected, provided the total amount of unexportable money in circulation here was kept within the amount that could find employment at par.

THE Transvaal, South Africa, Government has appointed a commission of twenty-four members to inquire into and report on the present practice in the matter of conveying persons in mine shafts, more especially with reference to winding ropes, their structure, material, preservation, examination, best method of attaching rope to load, and the reliability and adaptability of safety catches and appliances in shafts. There are five printed pages in the schedule received at this office, covering the entire subject in an exhaustive manner. The commission asks for technical testimony from any and all who are acquainted with the subject sufficiently to make their evidence of any material value. They would likewise be pleased to have manufacturers of devices connected with the subject furnish drawings, models and plans of such devices, with full descriptions of their workings. It will be necessary for each manufacturer submitting drawings or models to grant permission to construct the appliance in question for test purposes. The schedule may be seen at this office by any one interested. Anything sent in connection with the subject should be addressed P. O. Box 1132, Johannesburg, South Africa, and reach the secretary there not later than January 31, 1906.

IT sometimes occurs in statistics of ore shipments from mining districts that the figures would indicate decreasing values. But that is simply illustrative of how delusive statistics can be. It is the ordinary history of every mining district that after the first two years the ore shipments showed a lesser average value, manifestly because decrease in freight and increase in smelting or milling facilities made it possible to ship ore that in first conditions wouldn't pay for shipment or treatment. True statistics rightly elaborated would almost invariably bear out this latter view. A district might have shipped $100 ore two years ago, and now be shipping ore that goes only $20; but of the $100 ore only 20,000 tons were shipped, while of the $20 ore 200,000 tons is going out, the fact being that the camp is now shipping $4,000,000 value of ore, where two years ago it was shipping but $2,000,000.

THE owner of a ledge, lode or vein may follow it upon its dips or pitch beyond his side lines and into the adjoining claim, provided that the apex of the lode is upon the claim of the one who seeks to follow it; provided, further, that the lode is a continuous one, and that the end lines of the claim are parallel. With any one of these three conditions non-existent, the Federal mining law will not permit the owner of the lode to follow it beyond his own lines.

Quarreling With the Creator.

That "divine discontent" which impels desire to better one's financial condition is always commendable, but we have no sympathy with those who content themselves with futile complaint of the "unequal distribution of wealth," and who talk as though some one was doing them out of their share. The man who attacks the possessor of money without having the ability to acquire some himself is merely attempting to institute a quarrel with the Almighty because in the distribution of talents the gift of acquiring wealth was denied him. For a money-getter is merely a man who has ability in that direction and who exercises it. He can no more help making money than the man devoid of such a gift can help being without much of it. It is as useless to "kick" at the unequal distribution of the money-making talent as at similar unequal distribution of the inventive talent, or the musical talent, or the poetic talent, or the scientific talent, or the talent that makes an efficient mine manager. The world of invention is open to every one, and the fame and profits resultant from successful invention are the prizes of him who can win them; yet it would be ridiculous for any one to inveigh against Edison or any other great inventor because his mental endowment was not equal to producing such great inventive results.

It would be equally ridiculous for one to utter outcry because of his inability to write like Kipling or Conan Doyle or Winston Churchill. A "kick" against Tennyson or Shakespeare or Burns because of inability to write such poetry as they wrote would be as logical as this eternal bleat about the "monopoly of money power" by those who have no money-making ability.

As well declare against a Bessemer or a Roebling; a Hewitt or a Melville; a Oyama or a Roosevelt, or any men in any age made famous by deserved success, by the exercise of natural gifts. Of as much real purport to decry the achievements of the electrical or mining engineer because the success that has followed their intelligent efforts is not shared by the envious witness of the well-earned fame that fills the earth. Of course if it be bad to have men who can invent or write poetry, or make money, or create success of any kind; if the ability to do these things be a "monopoly," then let us all decry and defy this monopoly of talent and take steps to have such monopoly in any line destroyed. Why should Patti be paid $2000 to sing a song when the writer couldn't get a thousand cents for as many ditties? Of what justice is the fact composed that permits Kipling to get $500 for a short story when many of us couldn't get 5 cents for the longest kind of a yarn? How shameful a fact and full of menace to mankind is the sad spectacle of an Edison getting $50,000 for an electrical device that adds $50,000,000 to the wealth of the world, when we ourselves are unable to think up an improvement in a hen coop!

What an outrage on the natural rights of man for some miscreant to invent a cyanide process, or a water-jacket furnace, or a concentrator, even though such devices add thousands of millions of dollars to the world's wealth, where the railer at such wealth hasn't sabe enough to see pay ore in an outcropping! Let us take away the talent for doing anything well from the possessors thereof and drop everything to the dead level of mediocrity. It is an outrage to which no free man should submit that any one should be able to get wealth or renown because of individual talent or effort when such success institutes so damaging a comparison between relative mentalities!

Mind will always rule matter; brains will always win; intelligent and honest effort in any line, whether wealth, poetry, science, literature, music, mining or engineering, will invite success, and it is inane for any one to lose time in envious carping at those who substitute perspiration for inspiration, and who work at their chosen avocation first for the joy that a true worker finds in congenial work, and second for the material success that it brings.

CONCENTRATES.

ROSIN dissolved in alcohol will give a flux that will not corrode in soldering wire or electrical connections.

IN generating steam at 125 pounds pressure from feed water at 62°, about 25% of the total heat required is needed before steam temperature is reached.

COPPER can be welded by being first treated with a solution of nitrate of potassium and a cyanide, after which it can be welded either to itself or to iron or steel.

A MAN can stand a temperature of 122° F. and work therein when the air is comparatively dry; but in air saturated with moisture 104° F. would prove fatal to human life.

THE generally accepted value of a mining property is based to a great extent upon assumed knowledge of what it will pay as distinctive from what it may pay, with a fair allowance for future possibilities.

PALLADIUM is not in much demand. It is used to a limited extent by makers of chronometers, surgical and optical implements. It is found in connection with platinum and also with nickel in Canada.

THE best wooden tanks for metallurgical purposes are made of redwood. Pine, spruce, fir and other resinous woods are less suitable. Steel and galvanized iron are also successfully used in cyanide work.

AS BETWEEN adding quicksilver to the mortar of the stamp mill or simply on the plates, it depends largely on the ore. The personal experience of "Concentrates" favors the addition of mercury to the mortar.

THE Idaho statement does not show sufficient cause for contest. To constitute a valid contract (one that can be enforced by law) five things are necessary—competent parties, sufficient consideration, mutual assent, lawful subject matter and time of performance.

TO CASE HARDEN set screws, make a mixture of equal parts pulverized prussiate of potash, niter and salammoniac. Heat the screws a dull red, roll in this powder, then plunge them in bath of four ounces salammoniac and two ounces prussiate of potash dissolved in one gallon soft water.

REGARDING belt creep, it is to be said that for a common leather belt, running under ordinary conditions, the creep should not exceed 1%. This is usually styled "legitimate slip," but is an actual loss of power and can not well be prevented by patent pulley coverings nor belt tighteners.

A "PURE ZINC SULPHIDE" would contain 66⅔% zinc and 33⅓% sulphide. Leadville, Colo., zinc ore will average about 42% zinc. Carbonate of zinc will carry about 50% zinc. Zinc ore is reduced to a metallic state by distillation. A zinc ore carrying less than 20% is not commercially profitable.

COAL of good quality is widely distributed through Alaska and, with increased transportation facilities, will be utilized. The lignitic coal on Cook's inlet is now being mined in a small way for local use. The short seasons and absence of harbors have deterred the coal development of the peninsula.

THE Philadelphia & Reading Railway, in Pennsylvania, is believed to be the biggest coal carrying corporation in the United States. It annually carries about 9,000,000 tons of coal. There is probably no other railroad system in the country that does so much business and makes so little profit.

BAUXITE, the raw material from which aluminum is most economically manufactured, is produced in the United States to the extent of about 20,000 tons annually. About the same amount is imported. Cryolite is not mined in the United States; it is almost solely produced at Ivigtut, Greenland.

INVENTION does not always constitute discovery. It is not difficult to invent or devise a machine that will serve a useful purpose, though that would not be a discovery, which is quite another matter. When one can make a discovery in mechanics or science, he has achieved something rarely vouchsafed to the most gifted.

IT is possible to live and breathe and work for some hours under a pressure of two and one-half atmospheres (about 37½ pounds per square inch), but a greater pressure would tend to produce paralysis. The pressure under which men worked in the building of the St. Louis, Mo., bridge was one of over four atmospheres (63.7 pounds per square inch).

MINERALS, crude or "not advanced in value or condition by refining or grinding, or by other process of manufacture," are admitted free of duty into the United States. Zinc ore as mined comes under that head. The duty on zinc in blocks or pigs is 1 cent per pound; in sheets, 1¼ cent; manufactured, 35% ad valorem. Zinc sulphate comes under the latter heading.

SILVER cyanide may be prepared by precipitating the nitrate with alkaline cyanide. It is a white powder; specific gravity 3.94, which on being heated melts and loses half its cyanogen. It is converted into chloride by chlorine water, or hydrochloric acid. It may be prepared by dissolving silver chloride, cyanide, carbonate or oxide in a solution of potassium cyanide.

A RECIPROCATING ENGINE which is turning over slowly, with the throttle valve just off its seat, or with by-pass open, and having all its oil cups open and regulated, can be brought up to speed seventy-five turns in two and one-half minutes. If the engine is cold all over and has all its oil cups shut tight, and all its auxiliaries quiet, fifteen minutes would be a quick start.

OSMIUM is of the platinum group and is reduced by alloying the residue which remains when platinum is dissolved in aqua regia, with zinc, lead or tin. The osmium-iridium thus passes into a finely divided state, and, when heated in a current of oxygen, splits up into osmium tetroxide and iridium. Osmium may then be obtained by treating the osmium tetroxide with any reducing agent.

THERE are numerous disinfectants and purifiers of water. The one in every way the best is chloride of silver. The addition of two milligrams of this chloride to a liter of most impure water will completely sterilize it, the purified water permanently remaining so disinfected. Tincture of iodine—three drops to a quart—will sterilize water, but the water will taste of iodine, and the sterilization will not last an hour.

TIN is mined and smelted crudely and spasmodically at Santa Barbara, Guanajuato, Mexico. The country rock is rhyolite; the ore formation is cracks in the rhyolite filled with clay. It averages about 0.5% metallic tin. It is a tin oxide. It is smelted in small native charcoal furnaces. About 40% of the ore contents is the result. Roasting or reconcentration are ineffectual, and the impurities are insoluble in acids.

ALL silver ores, however complex, can be treated by amalgamation after a preliminary roasting with salt; but this, while adding greatly to the expense, gives rise to an additional loss by volatilization, and in most cases unless an ore can be amalgamated direct—that is, unless it is fairly free from base sulphide minerals—and the gangue is mainly quartzose or earthy, it is preferable to adopt either a smelting or a lixiviation process.

A PLACER LOCATION, even though taken by legal subdivisions, is required by law to be staked or marked on the ground. In the case of Mitchell vs. Olive (84 Cal., 409, 24 Pac. Repts., 164) it was held that: "The location of placer claims, using the names of persons as co-locators who are not intended to have any real interest, but who are to convey the rights after location (commonly called dummy locators), is a fraud upon the Government."

HIGH extraction of values from ores is always desirable, but the expense of obtaining high percentages of extraction may prove greater than the net result justifies. There is usually a point where the greatest profit results, and this, from a commercial standpoint, is the point the metallurgist should strive to reach. It is always permissible and proper to increase the percentage of extraction, but if it be done at a loss of profit there seems nothing to justify the effort.

SO FAR AS "inducements" are concerned, the present Arizona charter law regarding foreign and local corporations therein is certainly very "inducing." There is no annual tax, or tax on the amount of capital stock, no annual statement is required, no examination of the affairs of the corporation is called for or permitted, and the Legislature which has made the Territory itself the sole medium through which this business is transacted has not reserved the right to repeal a charter.

THE quantity of water discharged through the nozzle of pipe under known head may be approximately determined as follows: Extract the square root of the head in feet and multiply this by 8.03. The product will equal the spouting velocity in feet per second. Multiply the area in feet of the nozzle at the mouth by this velocity and the result equals the cubic feet of water discharged per second. Thus a 6-inch pipe under a 400-foot head will discharge $\sqrt{400} = 10 \times 8.03 = 160.6 \times 0.19635 = 31.533$ cubic feet per second.

WHEN attempting to operate the decantation process in cyaniding the pulp should not be too thick. There should be abundance of solution with the slimes if success is to be obtained at all. Some kinds of material can be worked somewhat thicker than others. For instance, extremely fine sands, so fine as to be considered slimes, may be settled with a less percentage of moisture than talcose slimes. Practical sense must be used in these operations, for there is no rule, but the result of experience, which may be safely depended upon.

IN a noted construction of concrete the specifications for mixing and placing required in part the following: "The sand and cement shall be thoroughly mixed dry, then sufficient water added to make a plastic or wet mortar, and the whole thoroughly wet again. The broken stone having been previously wet down, shall then be added, and the whole mass thoroughly mixed until every particle of stone is covered with mortar. The concrete thus mixed should be immediately placed in position and rammed until excess mortar shows over the entire surface.

AS HAS BEEN many times previously stated, questions to which these brief paragraphs are answers cannot be published for two reasons—want of space and natural disinclination on the part of the inquirer to have such publicity given him. The questions themselves would transcend our limits, and even the answers have to be boiled down to the briefest space consistent with accuracy and clearness. Unless the journal is set in finer type it is not likely that more than the condensed answer can be given. An attempt some years ago to use smaller type in these pages brought so much adverse comment that the present style of large type was continued in use.

IN an estimation of copper by potassium permanganate the copper in solution rendered slightly acid with hydrochloric acid is reduced by sodium sulphite or sulphurous acid previously nearly neutralized with sodium carbonate and precipitated as cuprous thiocyanate, boiled and filtered and washed thoroughly with hot water onto a filter, the funnel inserted in the neck of the precipitation flask and a boiling 10% solution of caustic soda passed through twice, and the alkaline thiocyanate resulting rendered acid with sulphuric acid and titrated with decinormal permanganate.

IT is hard to say just what should be the measure of responsibility of a contractor in carrying out a piece of work that was planned by some one else, circumstances entirely determining the rights in the case. The contractor generally prepares his own plans and submits his working drawings to the engineer in charge for approval or change. Contract drawings cannot always be considered available as working drawings. It is always best to have a thorough preliminary understanding between contractor and engineer before the actual work begins. A little extra time and expense at the start will save considerable of both later on.

IT has been more than once suggested that in the smelting and refining of zinc gold slimes a furnace built somewhat along the lines of the Bessemer converter would do the work with less cost and inconvenience than that occasionally made necessary. It has been suggested that instead of heating a large number of crucibles, the precipitates, mixed with requisite fluxes, be melted on an open hearth, this hearth to be supported on a hinge and maintained in a horizontal position by a hydraulic jack. After completion of the melting it would be but necessary to open a tap and allow the slag to flow slowly into a cone, the melted gold to be received in a mould.

FIR, PINE and other resinous woods are not as suitable for the construction of tanks as redwood, for several reasons. Pine, etc., always contain pitch, and if from any cause the pitch is driven from the wood leaks are almost certain to result, and pine does not stand changes of temperature as well as redwood. If the settling tank leaks, it is probably due partly to faulty construction of the tanks. Oakum is a better material to use in calking tanks than candle wick, as it swells and has a decided tendency to fill the space completely, thus stopping leaks. In a hot and dry country like southern Nevada pine tanks cannot be as satisfactory as either redwood or metal.

FLUMES in very cold countries may be kept from freezing by placing them on the ground, covering the tops and allowing them sufficient grade to give the water a rapid but quiet current. All sharp curves must be avoided, and also any inequalities of surface which would have a tendency to create any overflow, splashing, or any other disturbance of the water, for at such points ice will promptly form and soon result in serious trouble. If it becomes necessary to carry the flume across a gulch on a trestle, it must be made as nearly water tight as possible, for if it drips the cold will soon form large icicles, which may so overload the strength of the structure as to cause it to fall.

THERE are mining engineers who are paid $25,000 annual salary, and that is not considered the limit, as some distinguished members of the profession are credited with receiving more than that. Such a salary is by no means an unusual one among railway men, some of whom receive $50,000 a year. As to whether any man can make himself worth that amount of money to any concern per year, it may be said that while no one might "earn" that amount in the ordinary acceptation of the term, yet where a man by knowledge, experience and judgment can save or make, say a million a year, to the company he represents, 5% of that would represent his salary, and there are many broad gauge engineers, miners and railway men capable of such showing.

THE height of a mill from the concentrator floor to the point where the ore enters the building depends generally upon the series of processes through which the ore must pass, and varies from 60 feet to 100 feet in a gold mill. The latter includes delivery bins above the breakers, tandem breakers, storage bins, with abundant space

at every step of the process. It is a common mistake to allow too little vertical height, for instance, between the battery or plate floor and the concentrator floor. Twenty feet is not too much, as, if hydraulic classifiers are to be used, all of this room will be utilized. It also admits of the use of mercury traps and allows plenty of grade to launders. If cyanide works are to be included below the concentrators, the vertical height required may be as much as 160 feet.

BY CAREFUL experiment it has been determined that in plain mortars permeability depends upon the voids in the sands. A mortar not poorer than 1 cement to 2 sand will not leak, no matter what kind of sand is used. Mortars consisting of 1 cement to 4 sand will be impermeable if made of a normal mixture of sand—an unsized sand, having the normal variation in size of grains—and any mortar will become impermeable if the water in contact with it carries solid matter in suspension. A coating of neat or clear cement ¼ inch thick will render any mortar impermeable. Where soap and alum are used in cement mortars to render them impermeable, they do not at once become so. Generally speaking, it is more satisfactory to make a higher grade mortar—use more cement, which insures a better result at little, if any, increased cost.

NATURAL AND HYDRAULIC CEMENTS are produced by a simple process of eliminating the carbonic acid from clay-bearing limestone at a temperature of 1000° F. Portland cement is the result of exact chemical and mechanical mixture of lime, silica, alumina, magnesia and sulphuric acid in due proportions, calcined at a temperature of 2000° F. When mixed with water, Portland cement becomes a plastic mortar. Concrete is a mixture of cement with sand, gravel or broken stone. "Armored" or "reinforced" concrete is when steel is added to strengthen the mass. The steel is in bars, beams or wire netting, the cement being usually poured around the metal and allowed to set in a mould. "Slag" cement is the product obtained by pulverizing, without calcination, a mixture of granulated basic blast furnace slag and slacked lime.

IN electrical precipitation of gold from cyanide solution, the solution is permitted to flow through a mass of hard fragmental carbon, packed round the porous cup of an electrolytic cell and connected as the cathode of a circuit of and EMF of 15 volts. The anode consists of a carbon plate immersed in a solution of caustic soda contained by the porous cell. Upon passage of the current the gold is deposited in pulverulent form through the mass of the cathode. The two compartments are then emptied of their solutions, a carbon plate silvered and rubbed with plumbago substituted for the carbon aniode, and the current connections are renewed. A strong solution of potassium cyanide is then made to flow successively through the anode and cathode compartments, in the order named, and the recovery of the gold in the regular form is effected.

THE "Great Bonanza" which occurred in the Consolidated Virginia mine and extended into the California mine, on the Comstock Lode, was discovered, according to official record, in February, 1873, though there is little doubt that the probable existence of a valuable body of ore had been previously obtained through the medium of a drift run in a tortuous manner from the shaft of a neighboring mine. The find was made in Consolidated Virginia ground nearly 2 years before the Big Bonanza was struck in a drift run on the 1200 level of the Gould and Curry mine. In places this ore body was 320 feet in width. It was about 800 feet high and 1200 feet long. It was without exception the most valuable ore body ever discovered in modern times. Others have been found and worked out which were of larger size, but no other has produced so much in gross value or yielded so large a net profit.

CYANIDE MEN are divided in opinion as to the relative merits of sodium cyanide and potassium cyanide, but several prominent practitioners favor the former. By its use they claim the solutions are less liable to fouling; a saving of 20% is effected in freight expense, and its greater purity renders it more efficient. Absolutely pure sodium cyanide is equivalent to about 132% potassium cyanide. It is impossible to state even approximately the requisite proportion of cyanide, zinc and lime to be used per ton of ore, for each local situation involves so many different factors as to be a separate problem. In a broad way, it might be stated that 3¾ pounds potassium cyanide, 1 pound zinc and 4 pounds lime per ton of material treated would be a possible average. In cyanide treatment of slimes this approximation would be modified. Perhaps for the latter 5½ pounds potassium cyanide, 1 pound zinc and 14 pounds lime would be nearer the general requirement. No exact figures could be furnished without accurate knowledge of the local conditions.

THERE is a Congressional law for the incorporation of labor unions, should any of them desire to avail themselves of its provisions. Most of the labor leaders advise against such incorporation. Several trade unions in the different States are incorporated. The question involves complex discussions of policy, of responsibility in the case of suing and being sued, that cannot be even briefly brought out in a "concentrate." It may be said that incorporation would not make the members of a union more responsible than they are at present, except as the union might possess property or money. The mere act of incorporation of a body of men united not for the purpose of pecuniary profit would not ordinarily create any more collective financial responsibility than previously existed on the part of the individuals composing it. Purely as a matter of opinion, it is believed that incorporation would have a steadying influence upon a trade union, and bring its most conservative and cool-headed men to the front. Essentially, incorporation is a privilege, and not a duty.

THE substitution of oil for water in cooling cylinders of gasoline engines does away with any risk of damage to the engine by the freezing and expansion of the water jacket. Small engines can be cooled with oil by replacing the water tank with an ordinary hot-water heat radiator. For engines of medium size a special radiator is used in the form of a vertical boiler containing small tubes open at both ends. The top of the boiler is covered by a cone and short stack into which the exhaust from the engine is conducted to induce a draft through the tubing. The hot oil is fed into the top of the boiler and the cooled oil drawn off at the bottom to circulate back through the jacket of the engine. Large engines require the addition of a small centrifugal pump to keep the oil circulating rapidly. This form of cooler has been successfully applied to engines of over 40 H. P. It cannot freeze, requires no attention, and works well under any climatic conditions. The tank, connections and jackets are sealed air tight, so that no waste of the oil can take place, and the original supply will last as long as the engine.

LEAD can be imported in three ways: In lead-bearing ores, on which there is a duty of 1½ cent per pound on the lead contained; in lead bullion, containing more or less of the precious metals, on which there is a duty of 2⅛ cents per pound on the weight of the bullion, and in refined pig lead, on which there is a duty of 2⅛ cents per pound. The first article—lead-bearing ore—is smelted and refined by the bonded smelter in bond, and, after the lead contents of the ore have been ascertained by the Government assayer, a quantity of lead equal to 90% of the ascertained contents of the ore is locked up in the warehouse by the Government official, which lead has been taken from a general lead pile existing in the smelter, and if this 90% of lead is exported the Government cancels the bond. On the second class—that is, lead contained in lead bullion—the Government locks up in the bonded smelter 90% of the weight of the bullion, and if this 90% is exported the bond is canceled, the same as is done in the case of lead extracted from lead ores. The third class is foreign refined pig lead imported in the shape which can be immediately used by manufacturers.

THERE have been so many methods described for determining the free gold in ores that to give "a new one" is not easy. There is a test, however, not in common use, where say four pounds of ore are crushed to pass a 60-mesh sieve, and panned down in an ordinary miner's pan. With placer gold six pounds are taken for the test as representing $\frac{1}{500}$ of a cubic yard of gravel figuring that 18 feet of gravel in the bank weigh a ton, a cubic yard being thus figured at one and one-half ton. A small piece of gold weighing 123 grains is beaten out so as to form a shallow dish, shaped like a watch glass, and amalgamated on the inner surface. The pannings after having been weighed are transferred to this dish by gently sluicing out the pan through a small funnel held vertically over the dish, the latter being immersed in about an inch of water. The black sand residue in the gold test is then gently agitated or rubbed over the amalgamated surface with the finger. The dish is afterward dried in the sun, or on a sand or water bath, and calculated from the increase of weight. A prospector would want to have a small case with a number of bottles to hold pannings when it was not convenient to make the test at once. Any gold adhering to the dish is of course scraped off before making the next test.

THE problem of transmitting 100 H. P. a given distance requires consideration based upon stated conditions, viz., drop in the line, power wasted in the line, pressure, cost of copper employed, relation between cost of copper and power wasted in transmission, and attendant data. To transmit 100 H. P. 1 mile with 10% drop, if the engine or turbine shows 100 I. H. P., then the dynamo transforms 95% into electrical energy. When 95% enters the line 90% is delivered at the other end. The power delivered at the distant end of the line is 95 H. P., minus 9.5 H. P., 85.5 H. P. The process is not complete as yet, although the power is now at hand, ready for use. It is necessary to transform it again into mechanical energy. This transformation involves a loss of from 5% to 10%, the balance left being the difference between 85.5 — 8.55 = 76.95 at 10% loss in the motor, or the difference between 85.5 — 4.275 = 81.225% at 5% loss in the motor. The efficiency of transmission in any case, with 100 H. P. at one end, and the loss throughout in dynamo, line and motor of 10% apiece, respectively, will be about 77%. The 100 H. P. is thus reduced to 77 H. P. from the beginning to the end of the system. The actual transmission can be readily accomplished if the cost is not prohibitive, but in instances where this threatens to be the case certain means must be employed to raise the efficiency and reduce the cost of installation.

SAN MIGUEL, COLO., cyanide treatment does not vary much, if any, from that of other localities, variance in cyanide practice being a question of ore rather than locality. At the Liberty Bell cyanide works the upper vats are drained under suction, lime being added in the proportion of four pounds to the ton of sands. A weak solution running about three pounds of cyanide to the ton is then pumped on to displace the water retained in the sands. This is washed to waste until cyanide shows and run through the waste solution 2-inch box. At a strength of one pound per ton it is diverted into the weak solution box. After several days of treatment the upper vat is drained and lowered to the vats underneath and the sands washed with strong solution containing six pounds of cyanide per ton. The treatment lasts four days and the strong solution is displaced by weak washes and water until the strength falls to .7 pound per ton, when the vat is ready to sluice out. The strong solutions have a total alkalinity equal to about five pounds lime per ton, of which about half is due to cyanide and half to dissolved lime, so that the solutions are considered to be virtually a saturated solution of caustic lime. The cost of cyaniding 4000 tons per month is about 65 cents per ton; the consumption of cyanide is about one pound per ton of ore treated. The zinc consumption is .035 pound per ton. The extraction averages about 67%, the residues containing about 85 cents per ton.

IN the determination of gold and silver in copper bullion the following is considered to be a good method: The first and most essential point is the preliminary amalgamation of the copper to be assayed. This is effected by shaking one assay ton of the copper with 25 c. c. of water and 5 c. c. of a solution made by dissolving 50 grams of mercury in H NO_3 and diluting to 1 liter. The copper is then treated with 200 c. c. of dilute H NO_3 (475 c. c. to 1 liter), and when the violence of the action begins to diminish, the beaker containing the solution is placed on a hot plate. When action has ceased the solution is heated to boiling and diluted with 150 c. c. of hot water. Any undissolved copper or mercury may be disregarded, as their presence will not affect the results. The solution requires a turbid appearance, owing to the formation of mercuric sulphide, which, by the action of the hot nitric acid, is converted into the insoluble double sulphide and nitrate of mercury. The precipitate is filtered off, the first portion of the filtrate being passed through the filter a second time. The filter is washed and the beaker wiped out with a small piece of filter paper, which, with the paper in the funnel, is dusted with finely divided test lead, and placed in a 2½-inch scorifier, the bottom of which is covered with test lead. From the filtrate the silver is precipitated as chloride, but since silver chloride is soluble, in mercuric nitrate solution, a large excess of sodium chloride is needed, viz., sufficient to convert the mercuric nitrate into chloride in addition to precipitating the silver as chloride. The solution is filtered cold, the paper and precipitate washed, sprinkled with test lead, scorified and transferred to the scorifier containing the gold. The papers are burned, the ash covered with test lead, scorified and cupelled with the usual precaution. In scorifying, it is best to start by heating gently without the addition of borax, the assay being gradually melted, but prevented from scorifying until all indications of spitting have passed; the borax is then added, and the temperature raised until scorification begins.

THE use of any flux beyond what is actually required involves expense in its own cost and in the increased production of slag and expenditure of time, labor, fuel and crucibles consequent upon its addition. Owing to the basic nature of acid treated slimes, a flux of acid character is obviously required. A mixture of ground fused borax, not burnt or calcined, and sand well fills this requirement—the first to occasion fluidity, the second to protect the clay liner. The use of soda as a flux in an already basic material appears unnecessary, the small amount of alkaline oxide needed for the formation of a homogeneous slag being supplied by the borax. Bicarbonate of soda is objectionable, on account of the high percentage of gas it evolves upon fusion. Powdered glass instead of sand has been used, but since the function of the latter is to supply an acid flux and protect the liner, the introduction of such a complex silicate as glass containing unnecessary bases is not wholly advisable. Fluorspar is occasionally used for producing fluidity, especially of sulphates present, but is not deemed absolutely necessary. The effect of smelting a charge with an insufficiency of acid flux and excess of sodium oxide is to produce a corrosive slag, which, on cooling, may be dark and opaque, from suspended base metallic oxides displaced from combination by sodium oxide, and which may even deliquesce on exposure to the air. In dealing with unfamiliar slimes it is considered advisable to run three or four preliminary trials on the actual material to be smelted on a working scale, and under working conditions, with sufficient borax and varying proportions of sand and manganese dioxide and to note on pouring the quality of the bullion produced, the fluidity of the slag as evidenced by its appearance on pouring, and by the freedom or otherwise from gold prills, and the corrosion of the liner. A matte or base looking bullion indicates too little manganese oxide, while too much manganese oxide yields an infusible slag, or one containing much silver. If the proportions and temperature are otherwise correct, addition of borax increases fluidity, while corrosion of the clay liner indicates the need of more sand. Too much sand yields a viscous slag, but, of course, this cause of viscosity can not operate if corrosion of the liner also takes place.

Mining School Graduates.

TO THE EDITOR:—In a recent bulletin of the Department of Mining and Metallurgy of the University of California, Prof. S. B. Christy has presented a discussion relating to the general educational problems now confronting mining schools in this country. The paper, "Present Problems in the Training of Mining Engineers," has attracted considerable notice, due to certain general and pronounced views which it presents, and to the writer it suggests a number of ideas with which he is not entirely in accord. With no spirit of mere criticism or antagonism (for the writer is personally acquainted with Prof. Christy's views and is in accord with many of them), are the following remarks made. The general subject treated is of immense interest to all engineers and all engineering schools, and is not alone of importance to mining and metallurgy.

IS THERE AN OVERSUPPLY OF ENGINEERING GRADUATES?—After giving figures from census reports and elsewhere, Prof. Christy concludes "that there is a legitimate field for not much over 300 mining school graduates each year." The value of this statement must depend upon the point of view. Are mining and other engineering schools to graduate only men who enter the distinctive professions indicated in outline by their college studies? If we assume with Prof. Christy that all graduates are to strictly follow their respective professions, even then the writer cannot agree with his statement as quoted. It does not follow that all graduates will follow by their life work their college course of study, nor is it desirable that they should. A large output of graduates must produce competition, giving the important places to those best fitted, and must force the less adapted ones to positions heretofore filled by the so-called practical and more or less untrained man or out of the profession altogether. Competition must produce greater endeavor and activity and the writer can see in this only good for the profession as a whole. A student, because he has been given a degree, should not be led to believe that therefore he is fit. A college training in mining at best only fits a man for the start and does not insure, of itself, his success. We need a large output of graduates in all the engineering professions in order to procure always the necessary amount of the proper talent.

ENGINEERING SCHOOLS CAN TRAIN MEN FOR GENERAL BUSINESS AND PROFESSIONAL USEFULNESS.—This leads me to state that it is well, for another reason, to have a larger output of graduates from the engineering schools than seem to be directly needed in the strictly, technically professional pursuits; and it further seems to me that engineering teachers, in shaping the college course of study and the requirements for graduation, should remember that the engineering school may have a wider mission and broader sphere of usefulness to the whole community than the developing of but one type of man. A broad engineering training founded upon a sufficiently broad cultural course of study, the two closely blended throughout the student's life, may admirably fit a man for many business responsibilities where his technical knowledge will be of the first importance and assistance to him. American corporations are learning that it is to their interest to select for their directing forces men of business and legal capacity who are also technically informed. Surely no one will deny that many lawyers are handicapped in treating important problems of the day by their lack of personal knowledge of the fundamental principles of technology. I do not mean to imply that everybody should have a technical training, for then would I be going to another extreme, but I do imply that because a man has studied in colleges as an engineer is no reason why he must try to be one. When that training is wisely broad he will be equally fitted to seek his adaptability to one of many spheres of usefulness; and when he is in earnest he will find his place; and therefore I hope that the number of graduates may always be relatively large.

Whether or not there are too many mining or other technical schools and whether they are all of sufficiently and equally high grade is another and very different question, which the writer is not called upon to discuss. What effect the steadily increasing numbers of technical graduates may have upon their average wage, and whether engineering courses of study are sufficiently broad and cultural in their tendencies, are further questions of importance raised by the preceding remarks, but they also do not require attention in this letter.

ELEMENTARY AND FUNDAMENTAL SUBJECTS AND THEIR RELATIVE IMPORTANCE IN ENGINEERING COURSES OF STUDY.—In conclusion I wish to express some opinion regarding what Prof. Christy calls "Fundamental Subjects," because the writer does not exactly agree with him as to the relative values of these fundamental subjects to the different engineering professions; and I venture to speak on this topic because I believe I am not alone in the following friendly criticism of certain statements of the professor's which I herewith give verbatim:

"If we can secure for the American mining student a foundation training broad, deep and thorough in mathematics, physics and chemistry, he needs little else to make him invincible. The mining engineer must have a broader basal training than either the civil or the mechanical engineer, even though he specialize less. Mathematics, physics and chemistry are necessary for all engineers; but for the civil engineer mathematics is fundamental, for the mechanical engineer physics is equally so, while for the mining engineer we must add not only physics, but also chemistry, with the closely related allies, mineralogy and geology."

Before Prof. Christy's bulletin went to press, the writer had the privilege of discussing with its author the meaning of the above quotation, and he realizes fully that for brevity and force of expression the author was obliged to sacrifice some truth. Upon its face the quotation is too severe to civil, mechanical, electrical and sanitary brothers of the mining graduate. It is true that one type of the mining man requires perhaps more chemistry and mineralogy or geology than his brethren, namely, the metallurgist or prospector, but for pure mine construction and operation it is not true. All phases of engineering are sufficiently broad to require a scholarly engineer to be strongly versed in the three so-called fundamental subjects of mathematics, physics and chemistry. The engineer of structures must certainly know his mechanics and the laws of physics, and chemistry bears a vital relation to the manufacture of steel and cement; the sanitary specialist must know his chemistry and bacteriology; the electrical and mechanical devotees decidedly their physics and chemistry. In short they must be well rounded students, and no one can definitely say that they require one elementary subject more than another, and certainly in his life work the student cannot afford to follow such a statement in the selection of his studies and the amount of time he applies to them. Engineers are just like other men in that they generally are not masters of their own destinies. Few men follow the line of work they thought themselves most adapted for or interssted in while at college. I know a number of successful mining engineers who studied only in a civil engineering school. The reverse is also true. Lawyers, after their college days, have transferred their attention to technology with the most flattering success.

These remarks lead me to my final statement, which, I think, may well deserve serious consideration by professors of mining in this country. The statement applies to no particular school; it applies equally and with justice to three schools of mining with which I am thoroughly acquainted, all three of the highest rank; and I have every reason to believe that the statement may be generally applied to most mining schools in this country.

What is a fundamental subject? To me mathematics, physics, chemistry are elementary because they underlie those fundamental subjects with which every designing engineer should be conversant whatever his specialty, whether mining, electricity, sanitation, etc.

What, then, are fundamental subjects for the designing engineer? Those subjects which deal with the physical and chemical properties of materials, the behavior of materials under stress and in the presence of fire and other destructive agencies—in short, which deal with their life and their adaptability to particular designs. Mechanics, a complete study of the strength, elasticity, peculiarities and manufacture of the materials of engineering, and the methods for the analysis of the stresses and the means for the design of the simplest types of engineering structures, are fundamental. Unless a man enters metallurgy pure and simple, he has much need for all of these fundamentals. The mining man who is concerned with the getting of ore out of a large mine, the ore once found, is a structural engineer and should know how to build dams and retaining walls, steel head frames and buildings; he may even want to build a water works and a sewage plant, not to speak of a railway spur. Beside, tunneling and shaft sinking on a large scale are civil engineering subjects, despite what may be said by an opposing advocate. The writer does not intend to decry or limit mining in these statements. That he could not do, for he realizes that the mining engineer has the broadest kinds of problems to solve. But he does mean to say that mine construction and operation are almost always structural problems, and with the present engineering curricula the civil engineering graduate seems to have had for such work the fittest training. How many fresh mining graduates are familiar with the first principles of modern steel construction or the building of a high gravity dam? Their ideas are general, but not quantitative. This explains why civil engineers are often quickly successful in mining fields and why many mining men with whom I have talked agree to these statements. I am not trying to prove that a civil engineer makes a better mine constructor than a mining graduate, for such a position would contradict my first remarks. But I do say that what we want always, as the result of all engineering instruction, is a broadly trained man in his elementary and fundamental studies just because he cannot be sure of his future specialized field. That is why I think that most of our mining schools err in devoting time to chemistry and metallurgy at the almost complete expense of necessary knowledge of structural materials and the design of steel, stone and sanitary structures.

CHAS. DERLETH, JR.,
Professor Structural Engineering, University of California, Berkeley, Cal.
Sept. 5, 1905.

The "Economic Geologist."

TO THE EDITOR:—At last the "economic geologist" has appeared, and the horizon of the miner, and the mining investor, is clearing rapidly. Scarcely a cloud remains to mitigate "the roseate hues of early dawn" of a new and facile era in mining.

A slight feeling of confusion and doubt will have to be confessed upon first meeting the title, and its true meaning was only determined after earnest thought and a process of elimination—a negative process, so to speak. Webster and other authorities were consulted. At the first blush it seemed that the term "economic" referred to the relation, in a matter of business, as between these gentlemen and those who desired their professional services; that arrangements could be made which would be economical for the latter, as it were.

But this idea was eventually dismissed as undignified as pertaining to anything quite as awesome as an "economic geologist," and it was evident that the term conveyed a deeper and subtler meaning. The dictionaries say, "economic:—relating to the management of a household; regulative; family, domestic; frugal, careful; economic use of money or time, etc." The last definition given was puzzlesome for a time, but how could anyone use anything quite as passive to the human conception as geology? We could appreciate that a knowledge of geology could prevent many an error in mining operation, for instance, but the economic geologist apparently uses the geology economically. It is, or has been, with him, a purely domestic, frugal, regulative matter, in which his frugal instincts have been applied.

No: the "economic" is not passive. "Management of household, domestic, careful." In these we must find the true meaning. It can only mean an active participation in the great scheme of the universe, throughout the geologic ages, ruled by the great principle of economy. These economic geologists of to-day are assuredly the reincarnation of the acting committee on geology throughout the eons of the creation. They may be pictured, at that period, as advising against the employment of costly cataclyptic forces to effect a given purpose when air and water currents could be made more inexpensively to do the work by merely rearranging a few mountains, or, similarly, advocating the use of groynes instead of messing around with ruinous dredging, etc. — sort of consulting engineers and economists.

Theirs then, to-day, are the secrets of the deposition of the mineral wealth of the earth, which probably accounts for the ease and assurance with which they make apparently extravagant statements, and define conditions, in a manner totally impossible to the mere ordinary human being, however learned. Their source of information is unquestionably supernatural.

But to the outward appearance they are said to be not altogether unlike the ordinary human animal, and, in order probably to disguise as far as possible their supernatural origin and powers, are similarly said to possess many purely earthly characteristics and weaknesses. Any community having the mineral interests of their district at heart should not fail, as early as possible (for the supply will probably be limited), to secure one of these "economic geologists." When secured, the community could proceed to play Jacob to the E. G.'s angel until the blessing is obtained in the shape of definite information as to where the E. G. and his fellow economists stowed away the better class of ore, locally. MINER.

Rossland, B. C.

Tunnel Expenses.

TO THE EDITOR:—I enclose you a report from my superintendent on the expenses of tunneling with a box electric drill:

RUNNING EXPENSE FOR JUNE, 1905.

179 gallons of gasoline, at 25c	$ 44 75
5 gallons of engine oil, at 80c	4 00
½ gallon of motor oil, at 80c	40
2 gallons of coal oil, at 35c	70
1 pound of compression grease, at 25c	25
950 pounds of powder, at 13c	123 50
1500 feet of fuse, at 65c per hundred	9 75
300 caps, at 75c per hundred	2 25
300 candles, at 2½c	7 50
750 pounds of blacksmith coal, at 1c	7 50
124 feet of air pipe, at 30c	37 20
124 feet of 12-pound track, at 35c	43 40
Hauling supplies	11 78
Repairs	51 92
Incidentals	25 00
Payroll	582 50
Assaying	22 00
Total	$974 40

Made 24 set ups with drill, drilling 1061 feet in 202 holes, breaking 827 cars rock, making 124 feet of headway in main tunnel. Average cost per foot, $7.86. Drilled more holes and less number of feet

than in May. Rock much harder and distance gradually getting farther to run out the rock, therefore more expense. The item of assaying is a new expense this month. Tunnel, 8x8½ feet, and 800 feet in.

E. P. MITCHELL.

Santa Barbara, Cal., Sept. 1.

Placer Mining in Alaska.*

NUMBER V.

DRIFTING AND TIMBERING.—Drift mining, whether the workings are approached by shaft or adit, can be most economically conducted by adopting the system which proved successful in California. The mine is opened by a main tunnel or runway, 6 by 6 feet, which generally requires timbering with logs 8 by 8 inches, 6 feet long, the sets having 5-foot centers. This runway is continued out to the end of the block of ground which it is proposed to work, say from 50 to 100 feet in ordinary Alaska operations. It is assumed that the runway occupies the longer dimension of the ground and approximately the center of the pay streak, say 75 or 100 feet in width. From the main tunnel drifts are run transversely each way to the outer edges of the pay. These generally do not require timbering in frozen ground. Fig. 12

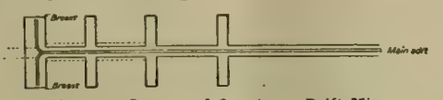


Fig. 12 —System of Opening a Drift Mine.

illustrates the system of main runways and drifts. The gravel can now be breasted out, a face being carried the full width of the pay and the work being continued in two or more of the drifts, as desired, the breasts being always carried toward the shaft or adit mouth. The drifts may be timbered either with sets, where ground is heavy, with single posts and caps in moderately firm ground, or left entirely untimbered, as in solidly frozen ground. Fig. 13 shows

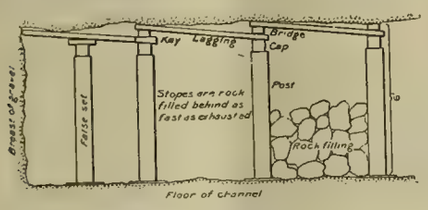


Fig. 13.—Hidden Treasure Drift Timbering.

the manner of timbering closely and rock filling behind when breasting out faces of loose gravel in the Hidden Treasure gravel mine in California. The sketch is made up in part from the report of Ross E. Browne (the ancient river beds of the Forest Hill divide, Tenth Ann. Rep. State Min., Cal., 1890, p. 452) and in part from the writer's own observations. The system of filling behind with quartz stones is impracticable for Alaska mining. Instead of this, timbers should be pulled and the ground allowed to cave. This form of timbering is in use in the drift mines of Solomon hill, Klondike, except that instead of separate base blocks sills are used. Fig. 14 shows a portion of the drift operations which were prosecuted on Solomon hill in the early years of the Klondike exploitation. The plan of the workings is here reproduced by courtesy of G. T. Coffey, manager of the Anglo-Klondike Mining Co.'s operations. The drifting operations in the southern portion of the ground are still in progress.

The main adits are timbered with 4-inch timbers, in sets with 5½-foot centers, at a cost of $1.75 for framing and putting in per foot of tunnel run The entire cost of driving the tunnel 5½ feet high, including steam thawing, excavating, tramming, timbering, and laying track of 12-pound rail, was $6 25 per foot. Transverse drifts were run from the main adits, and the ground was always breasted out in the direction of the adit mouth. The irregularity of the workings in a portion of the ground is accounted for by the fact that a certain amount of unsystematic work had been done previous to the purchase of the ground by the present company.

The ground is solidly frozen and had to be thawed by steam points. The rate of speed with which the work was carried on may be judged from the fact that two men, working a shift in running a straight tunnel after the points had been left in fourteen hours, averaged 5½ feet, including taking out the points, putting in timbers, keeping up the track, and driving in other points to a distance of 5 feet. The average height to which the gravel was taken out in a representative block was 4 feet. The cost of mining was $5.50 per square yard of area worked. In drifting out the ground it was found that three points in a face 6 feet wide, allowed to thaw twelve hours and then withdrawn, the ground being "sweated" twelve hours longer, would thaw all the ground. The sluicing was conducted in the ordinary way of piling up the dump and afterwards caving and hydraulicking with a nozzle into the boxes. The actual working cost of washing was about 18 cents per square yard of area worked.

(TO BE CONTINUED.)

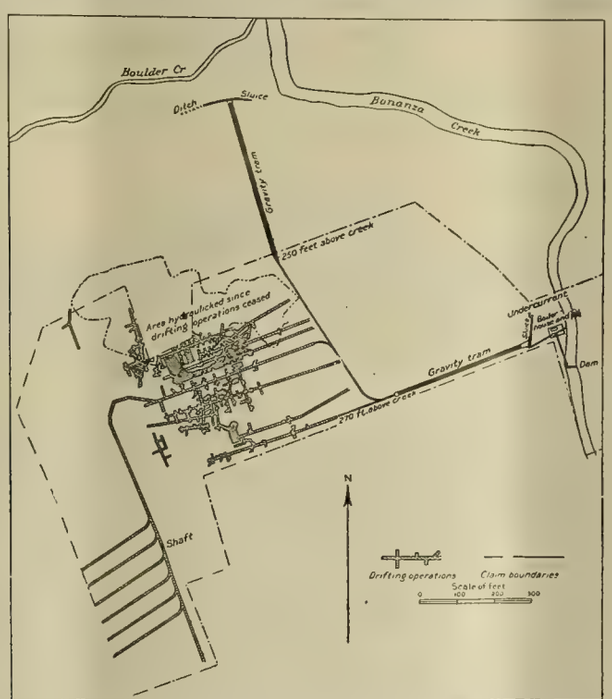


Fig. 14.—Plan of Drifting Operations, Solomon Hill Mine, Klondike.

*Bulletin 263 U. S. Geological Survey.

Production of Antimony in 1904.

Several obstacles combine to prevent the profitable exploitation of antimony ores in this country. These obstacles are set forth by Dr. E. O. Hovey in a report made for the United States Geological Survey on the production of antimony in 1904. In the first place, the reduction of antimony from its ores and its alloys with other metals is a difficult, complex and expensive process, and successful smelting depends upon peculiar conditions. Foreign ores are abundant and cheap. The price of the metal is comparatively low. It is apparent, therefore, that domestic ores do not repay the cost of transportation, and it is not surprising that the production of metallic antimony in the United States from domestic ore during 1904 was practically nothing. Only 25,000 pounds, valued at $396, were reported. Small as was this production, however, it is an advance over 1902 and 1903, when absolutely no domestic ores were reported.

Although the United States has practically no output of metallic antimony from domestic ores, a large quantity of hard lead or antimonial lead is produced here in the process of smelting impure silver lead ores. In 1904 the production of this alloy was approximately 21,752,000 pounds, with an antimony content ranging from 2 13% to 32%, and amounting to about 5,142,000 pounds. Hard lead is used in the manufacture of the several alloys of antimony. Its price ranges about 20 cents per 100 pounds less than that of soft lead. The total amount of metallic antimony obtained from domestic and foreign ores and from hard lead was 3057 short tons in 1904, valued at $505,524.

During 1904 the quantity of antimony ore imported into the United States and entered for consumption was 2,288,518 pounds, valued at $50,414, whereas in 1903 the quantity was 2,714,617 pounds, valued at $54,316, a decrease in quantity, but a slight increase in the average price per pound.

During most of the year 1904 the price of antimony varied but little from 7 to 8¼ cents per pound for Cookson's, 6¼ to 6⅞ cents per pound for Hallett's, and 5⅝ to 6¾ cents per pound for the United States, Japanese, French, Hungarian and Italian brands. Toward the end of the year, however, the effect of the increased demand caused by the Russo-Japanese war began to be felt and prices began to rise. Interest in the market fell off toward the end of December, and the closing quotations were 8¾ to 8⅞ cents per pound for Cookson's, 9 to 9½ cents for Hallett's, and 7½ to 8 cents for other brands.

Antimony is a white, very brittle metal, of laminated or crystalline texture. It fuses at a low temperature and readily vaporizes. It is not used in the pure state, but it forms several valuable alloys and compounds. The most important alloys of antimony are type metal, britannia, pewter and anti-friction metals. Type metal consists, essentially, of lead and antimony, often with the addition of small quantities of tin and nickel or copper. Britannia is a white-metal alloy of antimony with tin, copper and bismuth, and is much used for tableware. Pewter is a similar alloy, but it contains a smaller percentage of antimony than britannia. There are several anti-friction alloys which usually go under the name of babbitt metals. One of these consists of 50 parts of tin to 5 of antimony and 1 of bismuth, but other proportions are in use. The addition of antimony to lead hardens it, and the addition of a small quantity of bismuth gives the alloy the property of expanding at the moment of solidification from a molten state, thus producing a perfect cast from a mold.

Among the useful chemical compounds of antimony may be mentioned tartar emetic, a double tartrate of potassium and basic antimony, which is employed for medicinal purposes and as a mordant in dyeing vegetable fibers; a mixture of antimony trisulphide and antimony trioxide, which forms a flame-red pigment, known as antimony cinnabar, used somewhat in painting; and antimony pentasulphide, which is used in vulcanizing rubber and gives a red color to the product.

The report from which these notes are taken is published as an extract from the Survey's forthcoming volume "Mineral Resources of the United States, 1904." Those desirous of obtaining a copy should address the Director of the Geological Survey, Washington, D. C.

The Ventilation of Mines.

NUMBER V.

WHAT IS ADEQUATE VENTILATION?—The amount of ventilation required in mines to keep the air in such a state of purity as will enable the workmen to maintain good health depends greatly on circumstances, which may be very different in different parts of the State, and even in different parts of the same mine. The object of ventilation is to remove vitiated air and supply fresh, and it clearly depends on the amount of vitiation how much fresh air must be sent in to replace it. Where there is much blasting being done with heavy charges of explosives, or where there is much foul air emanating from the "country," a much larger quantity of fresh air is required than when little blasting is done and foul air is absent. Also when the temperature of the rock itself is high, and the workings consequently hot, it requires a much stronger current of air to be sent through them to cool them down than when the places are naturally cold. It is evident, therefore, that no fixed rule can be laid down to say that any absolute quantity of air is an adequate amount for a given mine, unless such a large amount is specified that it will be quite sufficient for the worst places in it. In other words, an unnecessary quantity must be forced into good places in order to comply with a fixed rule based on what is required in bad places. Otherwise, if for example an average amount for the whole mine, or group of mines, or district is fixed by regulation, the good parts of the workings will still receive more air than is required and the bad ones less than is needed, if the rule is strictly carried out. It is evident, therefore, that rules governing the amount of air to be put into a mine should be based on the condition of its various parts, and not on the number of men working in it, there being no necessary connection between the number of men and the state of the ventilation. When mechanical ventilation is employed, the supplying of an unnecessary amount of air becomes a serious matter from an economic point of view, as the horse power required to increase the ventilation is not in proportion to the increased quantity, but to

its cube, that is, to double a given quantity, eight times as much horse power is needed; to treble it, twenty-seven times; and so on. The cost, therefore, rises very rapidly, and the supply of more air than is necessary is a direct waste of money. The end to be aimed at, therefore, is to put into the mine such a quantity, and to distribute it through the workings in such a way that every man shall receive so much as will thoroughly ventilate the place he is in according to its individual requirements. One place might require 100 cubic feet of air a minute, another 200, and yet another 400. Also a fully sufficient average quantity to give a good supply to every man engaged might be entering a mine, but through improper distribution it might not reach all parts, some places being exceptionally well ventilated and others receiving very little air. Various attempts have been made to fix a definite standard of quantity as constituting adequate ventilation, without great success when the regulation comes to be carried out in practice.

(TO BE CONTINUED.)

Ancient Gravel Channels of Calaveras County, California.

NUMBER II—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

The Mokelumne Hill channel system is the most complicated of the several systems occurring in this county. Nine distinct channels have been identified by the writer in this district, each of separate age, and each having its own peculiarities and characteristics. The channels range in elevation through a distance of 250 feet. That is, the lowest of these old river beds is not less than 250 feet below the highest channel in the vicinity. Relative altitude is not an indication of the respective geological age of these channels, but, generally speaking, the higher channels are older than the lower ones, and in some cases the older streams have been crossed and cut out by the later rivers, and what is true of the Mokelumne Hill system in this respect applies to all of the ancient river channels of California.

The earliest channels of the Mokelumne Hill system are high above the neighboring ravines and gulches, and these have been exposed at numerous places, as on French hill, a mile northeast of Mokelumne Hill, and on the north end of Stockton ridge, in Happy valley and elsewhere, but the latest channels have cut their ways down into the bedrock, and are considerably below the level of the drainage of the modern streams. The channels of intermediate age are often found to have been cut, for most part, in the lava which caps all of the ancient channels. One of the most recent channels of the Mokelumne Hill system is what is known as a volcanic channel—that is, composed almost wholly of volcanic cobbles, boulders and other debris, often forming a cemented agglomerate. The latest of all the channels of this system is that known as the Old Woman's Gulch channel, and is 250 feet lower than the Corral Flat channel at Mokelumne Hill, but since that ancient stream was formed and filled by volcanic mud and an agglomerate of andesitic material, the Mokelumne river has cut its channel down through hard greenstone and other crystalline rocks, at least 500 feet below the ancient stream under Old Woman's gulch. This fact in itself indicates an enormous lapse of time since these old rivers were living streams.

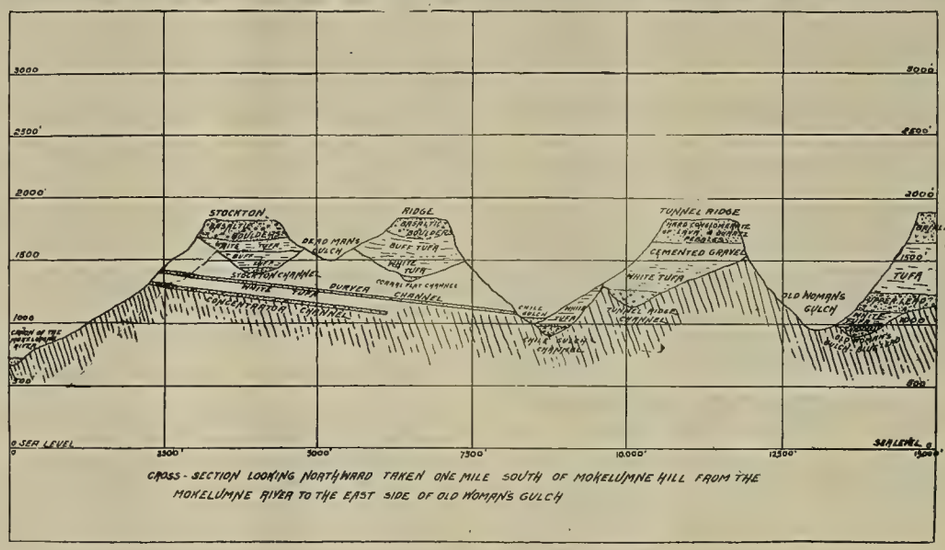
The channels lying high up on the hills and ridges, and which were easily attacked by the miners, have, to a great extent, been worked out, but the deep streams lying below the drainage have offered some obstacles to the development of mining operations, the principal one being the abundance of water usually encountered in these deep streams. Although the canyon of the Mokelumne river affords abundant opportunity to cut under the old channels, they nearly all flow away from the river, and it is not generally thought the results of mining will justify a tunnel of sufficient length to reach the old streams at a point where any advantage would be gained. Thus a tunnel driven from the canyon of the Mokelumne river to reach and drain 2½ miles of the Old Woman's Gulch channel must be at least 3 miles in length, an undertaking too expensive to be given serious consideration until something more definite is known concerning the probable result of such an enterprise. There are two leads in the Old Woman's Gulch channel—a bedrock channel, and a later higher channel having for bedrock a volcanic ash, indicating two periods in the formation of this stream. This is a feature not uncommon with a number of channels in this county. In some instances the upper leads have been worked at considerable profit, chiefly, however, by hydraulic methods. It is also known that a large portion of the Chile Gulch channel still remains intact, but the same disadvantages—abundance of water and uncertainty of results—handicaps exploration by means of long tunnels driven through bedrock. The accompanying sketches illustrate the relation of these ancient streams to the modern drainage.

The high channels have, to a great extent, been worked out, though doubtless there still remain remnants of these which would pay handsomely could they be discovered. It must be remembered that these older streams were generally smaller and more sinuous in their course than those formed later, and that these earlier streams were intersected at various places by the later streams. As these old river beds are for the most part buried beneath 200 to 500 feet of lava, it is not an easy matter to pick up a stream which has been cut by a later one, when there may be a breach 1000 feet or more in width intervening between the worked out end and its possible continuation. In some instances the later stream has cut into the earlier one at a low angle and for some distance, at least the two coincide in the direction of their flow, thus making it far more difficult for the miner to pick up the continuation of his river bed where once cut out. In the early days when these high channels were worked extensively claims were small—16 feet square in many cases in the Mokelumne Hill district, particularly on Stockton ridge. The channels were from 250 to 350 feet deep under the lava cap and numerous small circular shafts were sunk to find the channel, and although sunk fifty years ago these shafts are still open. In order to work to advantage many small claims were consolidated and in this way rich gravel deposits were worked. All claim owners worked as rapidly as possible to remove the gravel before those owning neighboring claims could appropriate a portion of that which did not belong to them—a practice not at all uncommon in those days, and conflicts were numerous and sanguinary. Little attention was given to the geology of these deposits, and judging from the cement literature of that day they had the most vague and erroneous ideas of the origin and character of the old rivers.

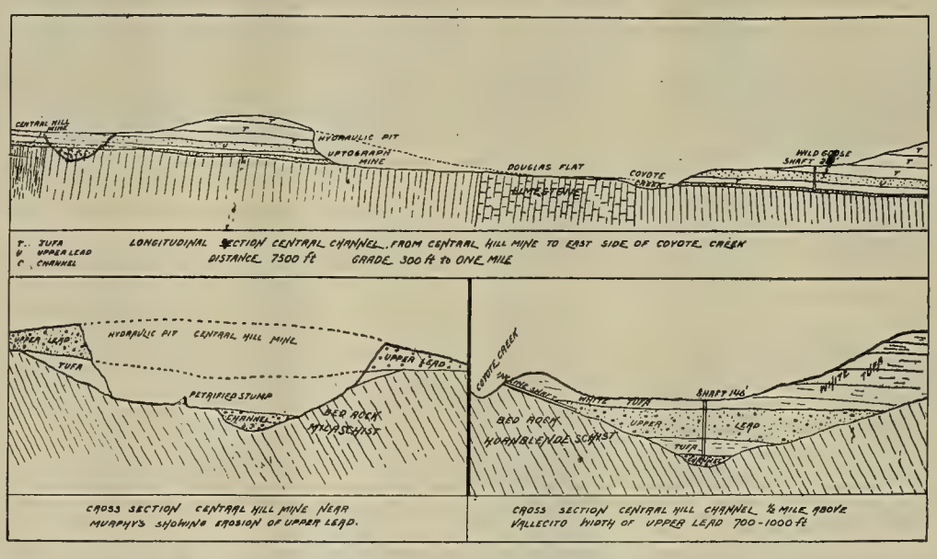
The respective courses of the several ancient rivers is shown on the accompanying map, which was made from data carefully obtained. There are, as previously stated, some uncertain points which still remain unsettled. One of them is the probability of a channel occurring on the east side of Chile gulch about a mile south of Mokelumne Hill. Another interesting and much disputed point is the course of the channel rising in Section 1, T. 4 N., R. 11 E. This has two branches flowing northward with heavy grade for half a mile, when it flattens, and for more than a mile the grade is nearly flat. It is cut out by the Old Woman's Gulch channel, but work done in the Chile Gulch channel about ten years ago at this place discovered a narrow channel flowing westerly, nearly opposite the point where the stream in question is cut by the later Old Woman's Gulch channel, and it is believed by the writer to be the continuation of this small river. It is undoubtedly cut by the Concentrator channel a little farther west.

The Concentrator and Duryea channels came from the direction of Volcano and Rancheria, in Amador county, passing near the town of Jackson, and there being intersected by the Mokelumne River canyon. A remnant of these channels appears on the high hills between Jackson and Stockton Hill, and they then pass under Stockton ridge, as shown on the map.

The Fort Mountain channel system rises in the region north of Calaveras county and flows southwesterly toward San Andreas. This system is joined near this town by the system of old veins coming from the direction of Murphys. In the early days of placer mining in this county there were a number of noted places where large amounts of gold were obtained for comparatively little labor; these were at Mokelumne Hill, San Andreas, Murphys, Cave City and Vallicita. In each of these instances the gold came mostly from the ancient rivers at places where they had been cut by the modern gulches and where the gravels were easily accessible.



CROSS-SECTION LOOKING NORTHWARD TAKEN ONE MILE SOUTH OF MOKELUMNE HILL FROM THE MOKELUMNE RIVER TO THE EAST SIDE OF OLD WOMAN'S GULCH



LONGITUDINAL SECTION CENTRAL CHANNEL FROM CENTRAL HILL MINE TO EAST SIDE OF COYOTE CREEK
DISTANCE 7500 ft GRADE 300 ft to ONE MILE

CROSS SECTION CENTRAL HILL MINE NEAR MURPHY'S SHOWING EROSION OF UPPER LEAD.

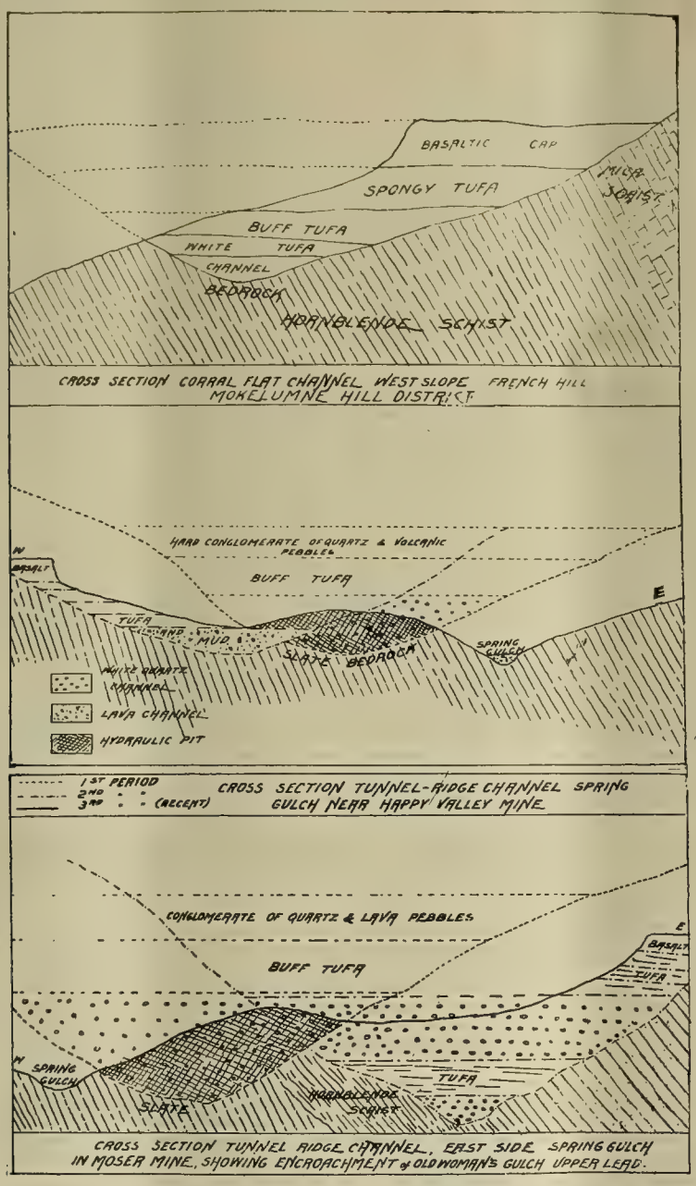
CROSS SECTION CENTRAL HILL CHANNEL ½ MILE ABOVE VALLECITO WIDTH OF UPPER LEAD 700-1000 ft

In a number of instances the old river beds, where favoraby exposed, were hydraulicked, and large profits resulted. In others the gravel was drifted and sluiced with good results. At Vallicita a drain tunnel was run under the flat and many thousands of dollars taken from a comparatively small area. Similar conditions were found in the vicinity of the place known as Cave City, at that time a settlement of several hundred miners, now only a memory, with two or three dilapidated houses.

At San Andreas most of the gold was obtained by drifting the rich gravels. Water was troublesome but was handled by long, though shallow, drain tunnels. In one instance the owner of a claim known as the Plug Ugly required a drain in order to work his mine. Such a drain would naturally prove a benefit to the claims lying above on the same channel, so he solicited financial aid from these claim owners, which was refused. He ran the drain himself, worked out all of his ground but a few feet and then stopped, leaving this nearly impervious barrier to dam up the water on to the claims above. They remained idle for years, for, contrary to expectations, the clay in the gravel held the water back and the mines could not be worked unless the drain was continued or power-

ful pumps put in to control the water. After several years a compromise was made and by paying a stipulated sum the drain was run and work was continued.

It would be expected that these ancient channels would have been largely worked out many years ago, but such is not the case, for there still remains a large amount of unworked ground in the channels of this county. Not only is this a fact, but there is more activity in this class of mining in Calaveras county at present than before in many years. At Douglas Flat, San Andreas and Mokelumne Hill particularly, active mining is being done by a number of companies, beside which there is a large amount of prospecting and development in progress. Although there are 40 miles of ancient unworked channels in this county, the great drawback to the more vigorous development of these deposits probably lies in the fact that by far the greater portion of the ground is covered by agricultural patents. It seems strange that agricultural patents could be obtained on land of this character, but it has been accomplished, and in some instances, at least, the means to defray the expense of obtaining the patent and to pay for the land was secured by working the gravel beds for the gold they contained.



Semi-Electrolytic Process of Gold Assay.

In the ordinary process of assaying by cupellation and parting, the former operation is accomplished with a loss of gold, while the latter is incompetent to remove the last traces of silver. When the whole assay is experimentally carried out on absolutely pure gold, mixed with absolutely pure silver, the final error is a constant one, and the proper allowance may be made. But in practical work other metals besides silver and lead are liable to be present (although in small amounts), and by their difference in specific gravity they cause the results to vary. A. Bock finds that if a plate of gold be placed as anode in an electrolytic bath filled with nitric acid of the specific gravity 1.2, opposite a platinum cathode, the liquid rapidly becomes opalescent and opaque. On interrupting the current, the electrolyte clears again and a precipitate of gold is deposited, but the cathode remains uncoated. The action is, therefore, mechanical in its nature; the anode is disintegrated by the evolution of oxygen and the current of electricity, without being actually dissolved. If, however, the cell contains water, but be faintly acidified with nitric acid, the electrolyte does not become cloudy, the weight of the gold remains unchanged, while the silver and all other soluble metals in the anode (except lead) are deposited on the cathode or dissolved on the liquid. Bock's process of gold assay depends on this phenomenon; and the following example, which shows its accuracy, also indicates the method of carrying it out in practice. Two pieces of fine gold, weighing 500 milligrams, were each melted with 1300 milligrams of silver in previously warmed graphite crucibles. After cooling, the buttons were hammered, rolled and melted once more to ensure uniformity of composition—the yield in each case was exactly 1800 milligrams of alloy. The second buttons were rolled out, parted in the usual manner, then immersed in a bath composed approximately of 1 volume of nitric acid (sp. gr. 1.2) diluted with 6 volumes of water, and submitted to an electric current, the strength of which was "about that employed in copper analysis." After ten minutes, the platinum vessel containing the rolls of gold were rinsed out with water, placed in boiling water for a few minutes, again washed, and the gold dried and ignited in an earthen crucible. The total weight of metal recovered was exactly 1000 milligrams. When the legal alloy of 900° fineness is being examined, not more than 900 milligrams of silver should be added to each 500 grams, lest the pieces of gold become too porous and break; but the process is generally as accurate as in the case of fine metal. In melting this alloy, it is well to use nearly new plumbago crucibles, so that the carbonic oxide produced may prevent oxidation of the copper. As lead is not dissolved by the above process, when this metal appears in the pieces of gold, they must be treated in a fresh bath of nitric acid with the direction of the current reversed; but under no circumstances must the change of polarity be made in the one platinum dish. The new method occupies practically the same time as the old one; it is, taken altogether, a little cheaper, and it forms an easier way of preparing samples of pure gold to act as standards.

The New Ingersoll-Sergeant Plant at Phillipsburg, N. J.*

The new plant of the Ingersoll-Sergeant Drill Co. at Phillipsburg, N. J., is completed. It is a large and modern establishment devoted to the manufacture of rock drills, air compressors and pneumatic tools. The design of this entire plant, to the minor details of floor arrangement, was the work of the Ingersoll-Sergeant Co.'s own engineers and draughtsmen. The intent has been to obtain maximum efficiency with minimum expenditure of time, power and manual effort.

There are twenty separate buildings, each of structural iron, brick and concrete construction. While each is a unit complete in itself, the several shops are so arranged as to form a single unit, which is capable of further extension along the original plan.

Within and between the buildings dozens of Pawling & Harnischfeger traveling cranes (which have helped to make Milwaukee famous) are in readiness. The foundry alone has ten of these cranes and here, as in all other buildings, the cranes can control the entire floor area, whether in the main building or in the wings.

The facilities of the plant are such that castings from the foundry are advanced from one process to another almost automatically, and each part is so accurately constructed as to be interchangeable.

In the center of the group of buildings and connecting with each is a subway of concrete and steel construction, which carries piping and wiring for compressed air and electric power transmission, water supply, lighting and hot water heating.

Everything in this subway is on the unit system and can be altered or enlarged as required. The piping is bracketed to the walls and the wiring enters the various buildings through multiple conduits. In the shops electric plugs—each with its steel cover-plate—are conveniently located near the supporting columns, so as to connect readily with the many Crocker-Wheeler direct connected motors with which lathes, drills, planers and other shop tools are run. Compressed air connections for pneumatic tools are made in a similar manner at convenient points.

The shop heating system, whose main stem also traverses the subway, is supplied by two De Laval steam turbine two-stage centrifugal pumps, each of 50 H. P. The boiler which supplies steam to these is equipped with Foster superheaters.

In the engine room of the central power plant are an Ingersoll-Sergeant-Corliss compound condensing two-stage air compressor and an Ingersoll-Sergeant class H compound condensing duplex air compressor; three 300 K. W. Crocker-Wheeler direct current generators, each driven by 450 H. P. Cooper-Corliss compound engines, and a 100 K. W. generator driven by a 150 H. P. engine, both of the types last mentioned.

The boiler room has a capacity of ten boilers, arranged in double batteries, which will give a total capacity of 2500 B. H. P.

The rock drill department has a floor area of 125,000 square feet. Hundreds of workmen are busy at dozens upon dozens of planers, lathes and machine drills, while thousands of parts, from the rough casting to the finished jacket or piston, are piled in orderly rows convenient to the workman's hand. Everywhere are jib and traveling cranes, and none of them seem idle. Motor drives and line shaft drives are arranged on parallel systems, designed to give the greatest efficiency in the least possible space consistent with good results. This rock drill building is of one story construction with saw-tooth roof arrangement, thus insuring an equality of light everywhere in the shop, and an almost perfect system of natural ventilation.

Near at hand but in a separate building is the drill testing department, fully equipped to give the drills a practical test through all of the varying conditions of actual operation. Every drill turned out by the company has to pass through the hands of the experts in this department, and any defect in construction or irregularity in operation marks the drill at once for thorough overhauling. Whenever a new type of drill is designed by the firm, as in the case of the "Little Jap" drill recently put upon the market, tests covering a period of months are made at the company's quarry, near the old plant at Easton, Pa. These practical tests are of course supplemented, in the case of all drills shipped to the trade, by the severe "service tests" in the department just described.

The air compressor erecting shop is an interesting feature of the plant. In this the complete compressors are subjected to no less severe tests than those which the rock drills receive, and the operatives are men of many years' service and experience with the company. The compressor erecting shop is 325 feet long and 45 feet high. Connected with this shop are the compressor manufacturing departments, each situated in a wing of the main building. As in the rock drill shop, a noteworthy feature is the large number of parts which are going forward to completion.

The foundry building is 500x160 feet, and has an equipment of four cupolas and eight coke ovens,

*See illustrations on front page.

besides a full complement of mammoth traveling cranes. The cupolas range in size from 68 inches to 86 inches, and each is supplied with a motor driven blower set.

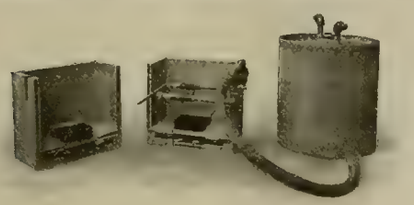
The foundry floor is 18 feet below the main plant level, thus facilitating the handling of coke, pig, sand, scrap, etc., for the storage of which huge bins are conveniently located under the standard gauge railroad spur, which adjoins the foundry building on a level with the main plant. In the shop yards are over 5 miles of standard gauge and "industrial" track for transportation of material between the buildings.

The pneumatic tool department, now at the old plant at Easton, Pa., will shortly have a building of its own at the new works. This branch of the company's business has grown rapidly of late.

Already a considerable settlement is springing into existence around the new plant, and many of the 2000 or more operatives will doubtless build or buy in this vicinity, to be near their work.

McGill Lubricator.

Herewith is illustrated the McGill lubricator, com-



posed of a wooden box 15x15 inches in the clear, made in two sections, to be easily separated and put together. In lubricating flat hoisting cables, the box is taken apart and placed over the mouth of the shaft on two pieces of wood, the rope being allowed to pass through the center of the box. The oil is kept in a galvanized storage tank and is forced out by means of compressed air through small apertures on each side of the rope, thereby lubricating the under as well as the upper side of the rope at the same time. In oiling, the rope is always lowered. A few inches below these apertures in the box there are two brushes, one on either side of the rope, which cleans the rope of any surplus oil. The waste or surplus oil is caught and used over. By the use of this lubricator the manufacturers claim it is a saving of time as well as in oil. It is made and sold by the Hendrie & Bolthoff Manufacturing & Supply Company, Denver, Colo.

Treatment of Copper Rock at Quincy Mills, Hubbell, Mich.*

Written by C. K. HITCHCOCK, E. M.

The rock treated at the Quincy Mills is a moderately hard amygdaloid, coming from the Quincy mine, which is working upon the Pewabic lode. It contains at present about 1½% of native copper and varying amounts of quartz, calcite, epidote and the zeolites filling the amygdules. Since the specific gravity of the copper is far in excess of any of the other constituents of the rock, it will be seen that the difficulties in milling arise more from the low grade of the rock than from the nature of the separation. As is the case in all low-grade milling operations, a fraction of a per cent of the valuable mineral, more or less, in the tailings represents a relatively large variation in the amount saved compared with the original amount in the rock, and, of course, means much in the profits of the operation.

During recent years efforts have been made to reduce, as far as practicable, the loss in the tailings. Without going into details concerning the experiments and tests in this line, the method of treatment will be described as it is to-day. It will suffice to say that the efforts to reduce the loss in the tailings have been made in three directions:

1. In obtaining the most economical machines for treating the material.
2. In re-treating material heretofore sent to waste.
3. In making the tailings poorer by increasing the amount of the heads, thereby decreasing the richness of the same.

After experimenting for several years, the result at present is: The substitution of Wilfley and new standard tables for the old two-deck revolving round tables; the separation, grinding and further treatment of a middle product from the roughing jigs, and the increasing of the amount of slime copper (No. 3 grade), at the expense of its richness, to a point where the increased smelter charges offset the saving of copper. Besides these, of course, changes of detail in treating the material have been made. The saving of float copper, however, still remains to be effected. The float copper is not due, as in the case of friable ores, to the crushing operations so much as to the shape of the piece. It does not matter so much how small the particle, so long as it is comparatively thick and compact. But the copper occurs in the mine in many places in thin sheets, much like foil, and this, when broken up small, will float off in the wash water, in spite of all care taken. The production of fine copper in stamping, however, has been greatly reduced by introducing a mortar discharge, by means of which copper which has been freed from rock, and which is too large to pass through the mortar screens, is taken directly from the mortar while stamping continues. Formerly this copper remained in the mortar, subject to the stamping which it could not escape. Frequent shutting-down of the stamp head was then necessary to allow for cleaning the mortar, which is now greatly reduced, resulting in a saving of time. Improved facilities for shipping the mineral to the smelter might be added to complete the list.

The two mills are on the shore of Torch lake, Houghton county, Mich. The older, or No. 1, mill contains five stamp heads, and the new one, No. 2, contains three. Although the treatment in No. 2 mill in particular is described here, the method used in No. 1 differs only in minor details. No. 2 mill measures 217x132 feet in size, of steel frame, and is situated on a side hill, so that nearly all material is handled by gravity. The storage bins extend the entire length of the building and are 22 feet wide and 26 feet deep at the front, holding when full about 2000 tons. The bottom was constructed by filling in poor rock until it took the natural slope from the back to the front, and by then laying a plank covering over this filling. The foundations of the stamp heads are built up of concrete and timber from the rock foundation. Power is furnished by a 16x36-inch engine. Water is supplied at the rate of 16,000,000 gallons per twenty-four hours by a vertical, triple-expansion pump of E. P. Allis make, and is maintained at a constant head by pumping it into an open iron supply tank, provided with an overflow. Formerly the water was furnished to each mill by a separate pump; but now the two systems are connected, so that a break-down of either pump will not necessitate a shut-down of either mill.

The copper rock, having passed through 4-inch grizzlies or through 10x20-inch jaw crushers at the mine, is dumped directly into the bins from the railroad cars. About 3350 tons per day are treated by the mills, which represents the output of the mine, exclusive of such masses of copper as are cut up underground, and such smaller masses as may be easily cleaned in the rock houses at the mine. The rock is then fed from the bins to the stamps by means of a chute. These stamps were all furnished by the E. P. Allis Co., but a Nordberg mortar has been substituted for the third head in No. 2 mill. They make 100 strokes per minute, at 120 pounds steam pressure. At present each head is stamping over 500 tons of rock per twenty-four hours, which is crushed until it will pass through the ⅝-inch mortar screens. Such pieces of copper, however, as can not be reduced sufficiently in size to pass through the screens are from time to time removed directly from the mortar by means of the mortar discharge. This is done merely by allowing the pieces of copper to pass through an opening in the mortar against a stream of incoming water strong enough to prevent the discharge of the smaller pieces of rock. The copper thus obtained is called No. 1 grade of mineral. Such material as does pass through the screens is conducted over a hydraulic classifier, which consists of a square box attached to the launder in such a way that the material must pass over a strong rising current of water. Whatever is heavy enough to pass down through the classifier against the stream of water is also collected as No. 1 mineral. The other portion passes into trommels, and those pieces which are too large to pass through the trommels—that is, over ¼ inch in diameter—are returned to the stamp by means of a bucket elevator to be crushed finer. These trommels are of perforated sheet iron with ¼-inch holes and are 5 feet 10 inches long by 2 feet 3 inches in diameter at the small end and 3 feet 5 inches at the large end. They make fifteen revolutions per minute. The material passing through the trommels is conducted over other hydraulic classifiers which separate out, as above described, No. 1 mineral and allow the remainder to go to the roughing jigs. There are two trommels to each head and each supplies material to three sets of four jigs each, each jig having two sieves and each sieve being 2x3 feet in size. The jigs are all run at 133 strokes per minute with a ¾-inch stroke.

The plant is so arranged that each set of four jigs receives the same grade of material, and the supply to each can be regulated by a gate placed in the launder; but the material treated by the individual jigs of each set is classified by being fed against a rising stream of water, so that the first sieve of the first jig, being 8 mesh, receives the coarsest material; the second sieve, 10 mesh, less coarse; and so on with the first and second sieves of the second jig, which are respectively of 12 and 14 mesh and receive finer and finer sizes. The third and fourth jigs of each set treat the overflow from the first and second jigs respectively, and the sieve in each case is 2 meshes per linear inch finer than the sieve whose overflow it treats. Whatever does not go to the roughing jigs is considered slime and passes on through an overhead launder to the settling boxes, which feed the slime tables. The tailings of the third and fourth jigs of each set go to the wastes and launder.

A middle product is obtained from both sieves of the third jig of each set—that is, the jig treating the overflow from the jig which treats the coarsest material. This middle product is drawn off through a ¾-inch pipe entering a little above the sieve, an operation which is accomplished by admitting air through another pipe at this point. This material runs in a launder to a Chilian mill in mill No. 2 and to a Huntington mill in mill No. 1, where it is reground and treated as will be described later. As the jigs run with considerable suction, a large amount of hutch work is obtained. This is treated on the finishing jigs and tables.

The finishing department consists of two sets of three 2-sieve jigs and two Wilfley tables to each head. These jigs are of the same size as the roughing jigs, but are of a more recent design, in that the motion is imparted to the plunger by means of an eccentric, instead of the rocker arm, whereby the motion is more easily regulated. They are run at 165 strokes per minute, with a ⅝-inch stroke. The material coming to each set passes over a hydraulic classifier, the overflow from which feeds the two sieves of the first jig, the same as in the case of the roughing jigs. Stuff too fine for treatment on the jigs passes into a settling box, whence it is fed to a Wilfley table. The overflow goes to waste. Whatever goes through the hydraulic classifier, together with the hutch work from the first finishing jig of each set, contains all the silver that is saved. Formerly No. 1 mineral was picked over by hand for silver, but this is now found not to pay.

The overflow from the first finishing jig is treated by the second jig, and the overflow from this, in turn, is treated by the third jig. The overflow from this last goes to waste. The hutchwork of the second jig is collected in a box and is called "No. 2 mineral." That from the third jig is too poor for a finished product and is re-treated on the slime tables. The concentrate from the Wilfley tables mentioned above is called "No. 3 mineral."

The slime department consists of nineteen Wilfley tables, a set of jigs and four new standard tables. The Wilfley tables are of the standard size and treat twenty-five tons of material a day. The new standard tables are used to furnish the finished product, while the Wilfleys discard the tailings. As stated above, the material coming to these tables is stuff that is too light for treatment on the roughing jigs. Before reaching the tables it is received in six settling boxes—two to each stamp head. These boxes are 11 feet by 5 feet 6 inches in size, rectangular in plan but pointed in elevation, with a depth of 3 feet 9 inches. They are elevated about 10 feet above the floor and the tables are fed by small closed launders. Each settling box feeds three Wilfley tables. The tailings from the tables go to waste, but the heads from each group of six Wilfley tables are collected and by means of a centrifugal pump are sent to another settling box, from which a new standard table is fed. The heads from these new standard tables are collected and are called "No. 3 mineral" or "slime copper." The tailings are returned to one of the first-named settling boxes for retreatment on the Wilfleys.

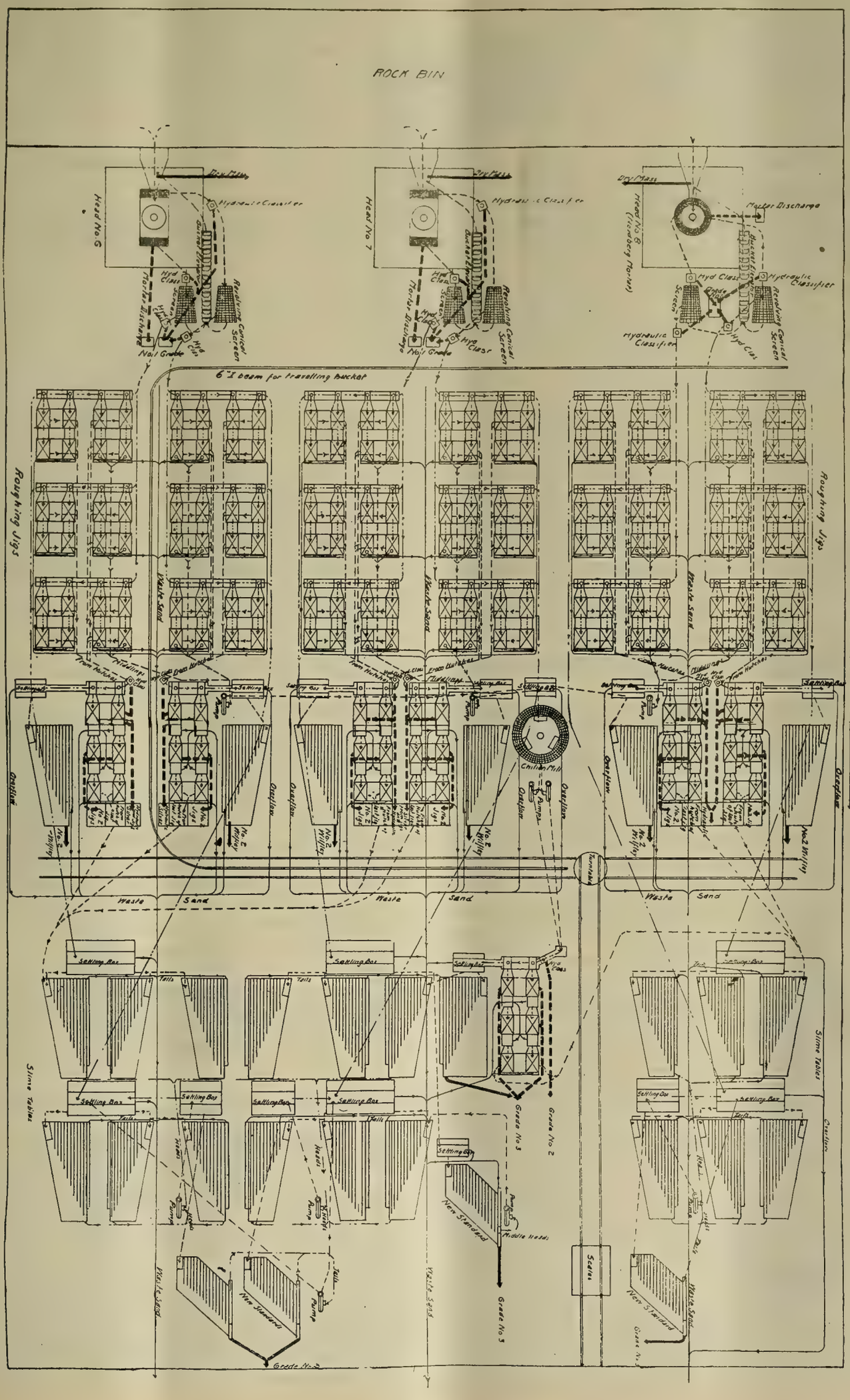
The Chilian mill mentioned above as treating the middle heads from the roughing jigs has a 6-foot mortar with 10-mesh mortar screens. It is run at twenty-five revolutions per minute and treats sixty tons of material per day. The crushed material passes from the grinder over a hydraulic classifier to a set of three 2-sieve jigs, precisely similar to the finishing jigs.

The product of the classifier is "No. 2 mineral," the hutchwork from the first two jigs is "No. 3 mineral," and the hutchwork from the last jig is re-treated on the slime table. The fine overflow passing the jigs is treated on a special Wilfley table, from which the heads are saved.

Until recently the different grades of mineral were packed in separate barrels, as has long been the custom in the Lake Superior region, and shipped to the smelter by rail. This is a primitive and expensive method of shipping mineral where any considerable amount is to be handled and has now been abolished at the Quincy mills. The mineral is shipped in bulk in special cars by rail to the smelter, which is situated a short distance east of Hancock, on Portage lake. The different grades are now collected from the concentrators in a bucket which holds 400 pounds and which is suspended from a traveler running on a 6-inch I beam overhead. The contents of the bucket are emptied into small cars holding from 2½ to 4 tons each, depending on the grade of mineral. The cars enter the mill on the ground floor, where they are filled and made up into trains which are hauled by an electric locomotive—like those used underground at the mine—to the old mill, where the contents are dumped into bins. In the old mill the collecting bucket empties directly into the bins. These bins are large enough to hold two days' supply and are divided into compartments for the different grades of mineral. The empty mineral cars are brought in and spotted on a 54-foot set of railroad scales, the compartments of which correspond to the compartments in the bin. Each grade may now be run separately into the cars without any necessary movement of the latter, and at the same time the amount of mineral is

*School of Mines Quarterly.

FLOW-SHEET OF No. 2 MILL



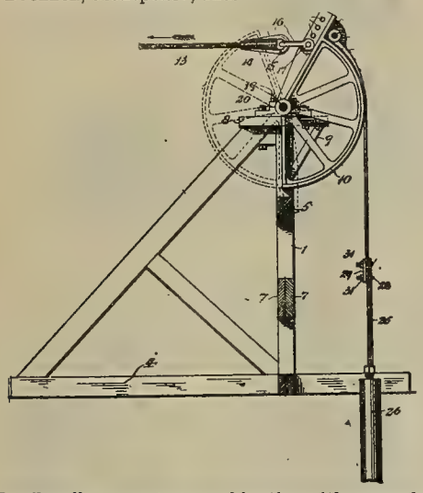
weighed directly or by difference. A further advantage is secured over the old barrel method in that there is a greater elimination of moisture before the mineral reaches the smelter. When once the mineral was barreled it lost but little moisture, and in winter it generally froze so that a great number of barrels were destroyed getting the frozen mineral out. Now the moisture drains while in the bins and in the cars and is exposed to the cold only while in transit to the smelter. At the smelter bins have also been constructed where further drainage takes place before the mineral is charged to the furnaces.

Mining and Metallurgical Patents.

PATENTS ISSUED AUGUST 29, 1905.

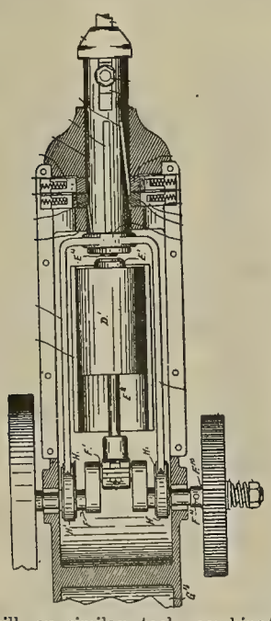
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

OIL WELL PUMP ATTACHMENT. — No. 797,672; S. Drennen, Montpelier, Ind.



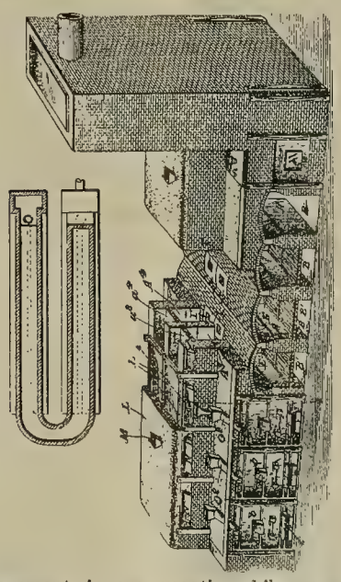
In oil well apparatus, combination with pump shaft, mutilated pulley periphery of which is less than semicircle and tangentially situated relatively to line of shaft of pump, lugs formed integral with pulley at top end thereof, flexible connecting strap hingedly connected at upper end to lugs, and removable connecting coupling situated at bottom end of strap, of reciprocating means, lever integral on and situated at one side of mutilated pulley, extending radially from center of and beyond periphery thereof and provided with series of clevis-pin-receiving holes arranged at intervals or gradations along length, cable, clevis and clevis-pin connecting clevis and lever, reciprocating means connected to cable, and suitable triangularly formed supporting frame comprising vertically extending forward portion, backward or rear inclined portion and bottom connecting or sill portion for supporting pulley.

ROCK DRILL.—No. 798,416; M. C. Jackson, Denver, Colo.



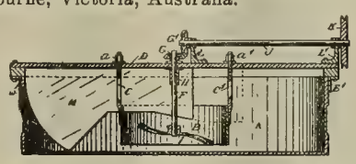
In rock drill or similar tool, combination with eccentric shaft, of hammer, drill bit distinct from hammer, but arranged to be acted on thereby, and suitable connections between eccentric shaft and hammer, and between eccentric shaft and drill bit for simultaneously imparting to hammer and bit reciprocating movement.

ORE ROASTING KILN.—No. 798,524; J. McNab, Catonsville, Md.



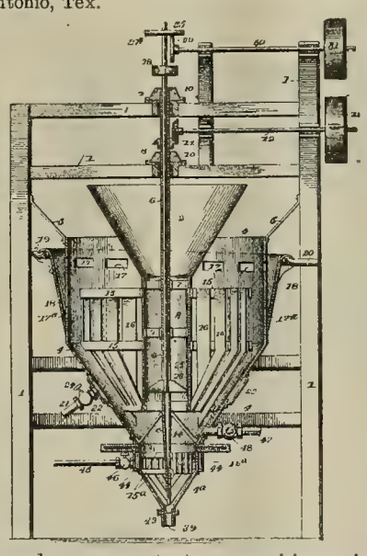
Improvement in ore roasting kilns comprising series of fireplaces arranged in battery side by side and extending in two rows with opposite fireplaces back to back, fireplaces being provided with crown arch composed of arched slabs, key slabs having tapered sides, and key block having tapered sides and opening for escape of gas, main gas flues extending above fireplaces of each row and receiving gas from key blocks of several arches, niter oven to which main gas flues discharge at one end, fines-burning flue extending longitudinally above one of main gas flues, means for supplying fines to burning flue, and return or dust flue connecting at one end with forward end of fines-burning flue and extending thence rearwardly alongside fines-burning flue and discharging at rear end to one of main gas flues.

APPARATUS FOR TREATING CRUSHED ORES, SLIMES AND OTHER MATERIALS.—No. 798,568; A. Z. Clark, Melbourne, Victoria, Australia.



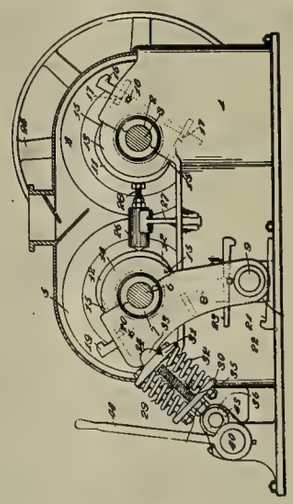
Combination of flat-topped block formed with series of openings of different sizes, and with recesses in top face adjacent to openings, pawl in each recess formed with flat top and of size to lie flat in recess with top flush with top of block, one end of each pawl beveled and toothed and projected into adjacent opening and pins passed through blocks and pivotally supporting pawls in recesses.

ORE CONCENTRATOR.—No. 798,064; W. O. Journeay, San Antonio, Tex.



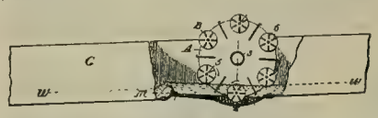
Improved ore concentrator comprising main pulp receiver and concentric chamber pendent therefrom, pulp hopper having vertical body arranged concentrically within receiver, concentric rotary shaft to which hopper is attached, agitator attached to hopper and rotating together with it and shaft, overflow hopper surrounding upper portion of main receiver which is provided with openings at that point, tailings spout connected with overflow hopper, vertically reciprocating plunger arranged in hopper and means for reciprocating same to cause pulsations in mass of pulp, water jackets applied to main receiver and concentrate chamber and communicating with same by openings, cut-off valve arranged between main receiver and concentrate chamber, and discharge valve applied to latter.

CRUSHING ROLLS.—No. 798,415; R. K. Humperey, Denver, Colo.



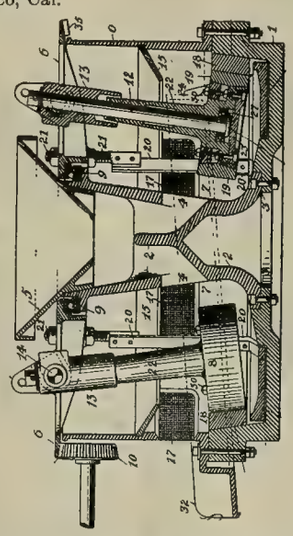
Crushing roll mechanism comprising crushing rolls, pillow blocks mounted movably in proper relation to rolls and provided with bearings for shafts of rolls, cap plates for covering bearings, pillow blocks having apertures extending through them upon each side of bearings, straps inclosing caps, and extending at ends through apertures, and inclined tapering keys engaging ends of straps for preventing withdrawal from apertures.

AMALGAMATOR. — No. 797,740; E. S. Moss, Chicago, Ill.



Amalgamator comprising sluice having depression for mercury, movable supporting frame mounted over depression, series of wheels revolubly mounted in frame, each of wheels being provided with series of longitudinal amalgamated blades, adjustment of frame being such as to cause one or more of blades to be immersed in mercury when frame is actuated, and riffle adjusted to raise level of passing slimes to top of lowermost wheel, whereby blades of each wheel may be freshly amalgamated and rotated within slimes while permitting unobstructed passage of latter.

CENTRIFUGAL WET CRUSHING AND GRINDING MILL FOR QUARTZ.—No. 798,278; L. C. Graupner, San Francisco, Cal.



In centrifugal ore crushing machine, pan constituting base, die-ring with inclined face secured to inner wall face of pan, central conduit secured to pan, having lateral openings for delivery of ore to rollers, disk plate revolubly mounted on top of conduit on suitable bearings, and plurality of pendulously mounted rollers carried by plate, their faces arranged to contact with and press laterally against die-ring.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Consul Williams of Cardiff, Wales, furnishes the following output of tin by countries for the last three years as approximately correct:

Countries.	1902. Tons.	1903. Tons.	1904. Tons.
Malay States	53,756	54,797	58,657
Banca and Billiton	18,765	20,000	14,638
Bolivia	10,150	9,500	9,200
England	3,950	4,150	4,282
Australia	3,206	4,991	5,082
Miscellaneous	350	395	384
Totals	90,177	93,883	92,243

According to these figures the production of tin is almost at a standstill, and there was an actual falling off in the output during 1904. On the other hand the consumption is on the increase, and the accepted estimate for 1904 is as follows:

Countries.	Tons.
United States	38,000
Great Britain	15,898
Germany	14,832
All other countries	25,525
Total	94,755

Thus the consumption for the year was 2512 tons in excess of the output. Ordinarily the tin consumed is lost forever, but the increasing demand and the threatened diminution of the available stock has given rise to a new industry, the detinning of tin scrap. The statistics show that the United States consumes over 40% of all the tin produced.

Director of the Mint Roberts' estimate of the production of gold and silver in the United States for 1904 shows an increased production over the calendar year 1903 of $7,131,500 gold and 3,486,000 fine ounces of silver. The largest gold gain was by California, which increased $3,000,000 more than in the previous year, and a larger amount than in any year since the 60's. This gain came chiefly from dredger operations, and a further gain is expected during the current year and for some years to come. Colorado shows an increase of nearly $2,000,000 gold and 1,300,000 ounces of silver; Alaska a gain of $700,000 gold; Montana a gain of 2,000,000 ounces of silver; Utah a gain of 1,300,000 ounces of silver; Idaho a gain of 1,300,000 ounces of silver. Forty-eight per cent of the silver was produced from lead ores, 26% from copper ores and the rest largely from ores which also carried gold.

States.	Gold. Value.	Silver. Fine Ozs.
Alaska	$9,034,200	210,800
Arizona	3,343,900	2,744,100
California	19,109,600	1,532,500
Colorado	24,395,800	14,331,600
Idaho	1,503,700	7,810,200
Montana	5,097,800	14,608,100
Nevada	4,037,,800	2,695,100
New Mexico	381,900	314,600
Oregon	1,309,900	143,200
South Dakota	7,024,600	187,000
Texas	2,300	469,600
Utah	4 215,000	12,484,200
Washington	327,000	149,900
Wyoming	16,400	4,400

The total gold production was $80,723,200; silver, 75,786,100 fine ounces. The total amount of gold mined was 3,904,986 ounces and the commercial value of the silver produced was $33,515,938, making the total value of the two metals $114,239,138.

ALASKA.

A gold strike made last November on the upper fork of the Yentna river, 120 miles from Cook Inlet, has become known. Sixty miners from the Cook Inlet camp have stampeded to the Yentna and will winter there. It is said that eleven men working this summer on Kahilta have taken out $10 a day each.

ARIZONA.

Cochise County.

A company has been organized to prospect for coal near Morenci.

Connection of Nos. 2 and 3 furnaces of the Calumet & Arizona Co.'s smelter at Douglas has been completed and No. 1 furnace will be completed as speedily as possible. The new power crane is in position and has been tested without load with highly satisfactory results. It will be three weeks before the building in which the crane is located is ready to permit of operations of the machinery.

Graham County.

A company has taken hold of the oil fields about Safford and has commenced boring operations. P. Anderson has charge.

Mohave County.

Ore has been opened up in the shaft of the Hot Tom mine at Chloride belonging to T. B. Scott. A gasoline hoisting engine will be put in to facilitate hoisting. —— The Connor-Minnesota mine at Chloride has struck a 5-foot vein of high-grade silver ore. ——E. Clark of Spokane, Wash., has taken a bond and lease on the Yellow Ned mines in El Dorado district.

Water in the Cyrus Noble mine, in Searchlight district, is causing trouble. It has come into the 400-foot level of the mine and all work has been transferred to the first and second levels. —— J. V. Clark of Ocean Grove, Cal., and H. V. DeHaas of Los Angeles, Cal., have purchased an interest in the Little El Dorado M. Co., in Crescent district. A 200-foot shaft is to be sunk on the property at once and drifts run for 500 feet north and south in the hope of catching parallel veins of ore. ——The Old American Flag mine on Big Wallapai mountain, 15 miles east of Kingman, has been cleared of debris and water in the lower workings preparatory to a resumption of work.——H. J. Heffron of Los Angeles, Cal., has started work at the Alpha mine, at Layne Springs.

Pima County.

L. M. Robinson, manager of the Robinson-Arizona Co., operating in the placer section at Greaterville, says that the company is waiting for water, and for the Interior Department to confer the privilege of allowing the company to build a reservoir of 3,500,000 gallons capacity.

Pinal County.

The experiment being tried by the Ray C. Co. at Kelvin is satisfactory and promises success, which may turn the concentrating plant into a 500-ton leaching plant.——The Big Lead M. Co. in the Kelvin district is said to be getting 3½% copper ore. A small leaching plant is to be built.

Yavapai County.

Superintendent S. Sessions of the Gold Lode M. Co. has finished grading for a 10-stamp mill. They will put in a cyanide plant.—— The hoist has been started at the Pickaway mine, east of Val Verde.

The Bunker Hill G. M. Co. is pushing its deep working tunnel, 8 miles from Val Verde. The company stopped work on its main shaft and decided to open and operate its property entirely through the deep working tunnel. The distance between the mouth of the tunnel and the main shaft is 1800 feet.

It is reported that the Tiger G. M. Co. intend| sinking a double-compartment inclined shaft on the Gray Eagle vein at Harrington. It is planned to connect this with a winze from the Cleveland tunnel. They also intend putting in a 20-stamp mill in addition to the 20-stamp mill now running. G. P. Harrington is manager and T. S. Schlesinger manager.——The Apache Panther G. M. Co. is running a development tunnel to open up their claims near Harrington. It is planned to run this 1300 feet. J. C. Ray and Bernard Cunniff are interested. —— The Saratoga G. M. Co. is running a drift to connect their 155-foot vertical shaft with an abandoned shaft on the Silver King. O. F. Place is president and Ed Foltz foreman.——Superintendent S. R. Trengove is sinking a shaft on the Colonel M. Co.s land, near Crown King. It is to be sunk 500 feet and is down 180 feet.

The following is reported as the details of the Pohle-Croasdale process to be used by the Rigby Mining & Reduction Co. at Mayer: From the bins the ore is taken by car to the dryer, where it passes through two revolving dryers—one of 40 inches diameter by 18 feet long, the other 60 inches diameter by 26 feet long—the hot ore passing from them by gravity to cars, which take it to the feed hoppers in the rollhouse, having three sets of 30x14-inch rolls and a set of 20x12-inch rolls with the necessary screens, elevators, etc. The dust due to crushing is collected by three large automatic fans and dust collectors. The crushed ore is taken from the screens to a 40-ton iron ore bin in the mixer house by an automatic belt conveyor 84 feet long. Here the ore and the salt from a smaller bin are weighed by two sets of hopper scales and deposited on a 60-foot belt conveyor, which takes it to a box mixer, whence it is dumped into a car, which takes it to the four feed hoppers, from where it is automatically fed into four revolving furnaces, and the ore, after passing through them, is dumped into an ore conveyor that carries it to cars which place it in the tailings dump, its values having been volatilized and taken to another department. The furnace room is 88 feet wide, 133 feet long and 40 feet high. The fumes are drawn from the furnaces through the flue house, which contains four sets of 3-foot wrought iron pipe 175 feet long, into the condensing house by four large pressure blowers, each capable of handling 6600 cubic gas of feet per minute, and on reaching them is forced into the condensing chambers, where the gold, silver, copper and lead are recovered. From the solution thus obtained, the gold, silver and lead values are filtered and the copper is precipitated either by electricity or iron and the precipitates melted. It is reported that the extraction of metal values is accomplished in the furnace by the application of heat to the mixture of ore, salt and sulphur, causing the sodium of the salt and the sulphur to unite as sulphate of soda and freezing the chlorine of the salt, which unites with the metals, forming gases, which are drawn from the furnaces and forced into the condensers by the pressure blowers.

CALIFORNIA.

Production of quicksilver by flasks in California, by counties, during 1904 was:

County.	Quantity.	Value
Colusa	400	$17,400
Lake	3,044	132,414
Napa	5,329	231,811
San Benito	8,480	368,880
San Luis Obispo	4,896	212,976
Santa Clara	3,889	169,172
Solano	377	16,400
Sonoma	2,700	117,450
Trinity	102	4 437
Total	29,217	$1,270,940

In California it is estimated that the dredger mining field covers 25,050 acres. The Feather River district has 7500 acres, Yuba River 5000, Bear River 1000 and American River 5000, the balance being scattered in Shasta, Plumas, Siskiyou, Calaveras, Trinity and Stanislaus. The value of the ground in the larger fields runs from 17 cents to 30 cents per cubic yard.

Butte County.

Robert D. Evans and other stockholders of Boston have sold their holdings in the Boston & Oroville, Boston & California and Bear River companies to the Venture Corporation, Limited, of London. The latter concern has incorporated under Maine laws the Oroville Dredging Co., Limited, with a capital of $3,500,000 in $5 shares to take over these. The Venture Company transferred the stock it purchased, which included all the Boston & California and Bear River companies and a majority of the Boston & Oroville stock to the American concern as an operating company. A number of other dredging companies are to be included. F. W. Baker is the president and F. W. Batchelder the treasurer.

Calaveras County.

E. J. West has bonded from W. T. Robinson the Look Out quartz mine, near the Calaveras river, in the San Andreas district. An option has also been secured on the Hexter mine, west of Mokelumne Hill, and operations will be resumed.

El Dorado County.

The Pacific House drift has been sold by J. E. Sexton to a company headed by L. E. King of Cripple Creek, Colo., and I. H. Bingham of Eugene, Or. Drilling is to be done before running the tunnel.——At the Crusader mine, El Dorado district, Seymour & Frick are pushing development work.——At the Alcimentes mine, Smith's Flat district, they have developed a fine body of gravel.

Mono County.

The Liberty-Pittsburg claims in the Masonic Mountain district, near Bodie, have been taken over by the Tonopah M. Co.

Nevada County.

High-grade ore has been struck by leasers in the 200-foot level of the Union Hill mine, near Grass Valley.

A rich strike is reported at the Kenosha mine at Deadman's Flat, near Grass Valley.——A shaft is to be sunk on the Iron Mountain copper prospects, near Spencerville, by E. A. Wiltsee. Borings have been made.

San Luis Obispo County.

The Western Mining & Steel Cor. will commence diamond drill prospecting for copper and iron on ranches on Los Osos, near San Luis Obispo.

Shasta County.

The miners and smelter men at Ingot have organized a union, a branch of the Western Federation of Miners. Organization was effected through J. C. Williams of Grass Valley, vice-president of the Federation. The union starts out with a charter membership of thirty. Homer Dehaven was elected president and Albert Lane secretary.——At the new Mammoth smelter at Kennett the ore crushers connected with the sampling rooms have been crushing the H. H. Thompson's ore from Old Diggings.

Fire at Redding destroyed the Central cable station, together with several ore cars and a train of the Ried mine, under bond to Hunt & Sallee. Ore bins just ready to be filled with an ore shipment to the Kennett smelter were destroyed.

The ore body in the Midas mine at Harrison Gulch has been found in the 900-foot level.

Sierra County.

The Forest City M. Co. is drifting on the channel of the Mabel Mertz, recently reached on the western rim after running 1600 feet. H. B. McCormick is superintendent. The mine is at the junction of the Mabel Mertz and Balsam Flat ridges, 5 miles east of Forest.——A. J. McCoy has charge of driving the tunnel on the Mabel mine, adjoining the Mabel Mertz.——The Alleghany M. Co. is driving a long tunnel in the Balsam Flat ridge. ——At Minnesota, south of Alleghany, the channel is sought by F. B. DeLauney of Chips Flat.——At the last Resort mine, near Downieville, a new crosscut tunnel to catch the vein is being run by Manager A. L. Wilson. The company proposes to put in a 3-stamp mill.

Tuolumne County.

(Special Correspondence).—A number of mines have been temporarily closed on account of a shortage of water. The Black Oak mine, mill and cyanide plant at Soulsbyville have been shut down. Pumping is being continued with steam power.——At the Rawhide mine near Sonora the plates are being replated with silver during the shut-down.——The mine and mill at the App have been closed.——The Shawmut is shut down, but the chlorination plant is running.

Soulsbyville, Sept. 13.

The Wheal-Perrin mine, near Soulsbyville, is being unwatered.——The Sunnyside mine, south of Toulumne, on the Tuolumne river, has been bonded to W. P. Cunningham, who is putting in an air compressor.

Work has been stopped at the Ranch gravel mine, near Columbia, pending the action of New York directors.——The Santa Ysabel mill at Stent is to make a test run on ore from the mine as soon as water power is available.——The new 5-stamp mill on the Fair Oaks mine, near Confidence, has started up. The main tunnel is in 150 feet on the vein. At the mouth of the tunnel a 2-compartment shaft has been started and is down 40 feet. When 150 feet is reached drifting will begin.—— James Hamilton, superintendent of the Don Pedro gold mines, 21 miles from Jamestown and 9 miles from Cooperstown, is putting in a 30 H. P. new air compressor. The main shaft is 200 feet deep. Workmen are grading for a 10-stamp mill.——The company operating the Surprise gravel mine at Dead Man's Bar, west of Sonora, and secured under bond from its owner, Otto Kanig, is making good progress on the property, with John Heath as superintendent. Bed rock has been struck after sinking 35 feet. The work of crosscutting the old river channel is under way.——At the Republic, in the Parrott's Ferry district, the main tunnel is in on the vein 800 feet and being driven ahead. The mill is hung up owing to a scarcity of water.——The underground forces in both the Grizzly and New Albany have been increased. The tramway connecting the properties is nearly completed.——A new incline is being sunk alongside the old 160-foot one on the Manzanita. When a depth of 90 feet is reached the vein will be stoped out to within 40 feet of the surface.

Yuba County.

Frank Weston of San Francisco has bonded from James O'Brien, J. E. Ebert and T. A. McKenna 1200 acres of dredger mining land 4 miles east of Marysville at $375 an acre. Sacramento capitalists have bonded 1000 acres adjoining the town for $200 an acre.

COLORADO.

(Special Correspondence).—Since the merger of the various railroads entering the Cripple Creek district the operators have received notice of an advance in freight rates. The Short Line, which was built by the operators a few years ago, was built to compete with the roads already entering the district and to relieve the high rates then in vogue; but, on account of some of the stockholders of the Short Line having disposed of their

holdings, the operators have lost control of the road—hence the advance in rates. It is now reported that a smelter will be built to handle the ores from the district and in competition with the mills and smelters now handling the ore.

Work has been commenced in Gore canyon by the Moffat road. This canyon was claimed by the Reclamation Service of the United States, and an injunction was brought against the road to prevent it from using same. Judge Hallett rendered a decision a few days ago in favor of the road. This will give the road an outlet into Routt county, and be the means of opening up valuable coal and mineral lands.

Denver, Colo., Sept. 11.

Arapahoe County.

The American Zinc & Chemical Co.'s plant at Utah Junction, north of Denver, was totally destroyed by fire Sept. 8. The plant was a combination smelter and chemical works. C. F. Dewey is the manager.

Boulder County.

Wm. Scott of Nederland has put machinery on his tungsten property.——J. H. Kemp intends to remodel the Eldora chlorination mill to a cyanide plant, preparing it to treat ores in Eldora and surrounding camps.

Chaffee County.

The Colorado Commonwealth M. Co. is operating near Marysville, near Salida. W. A. Redenberg is president; J. Kestler of Marysville, vice-president; C. J. Brock, secretary and treasurer. —— The Fourth of July M. Co. has claims near Turret. J. A. Seemann of Turret is president.

Clear Creek County

Work has been resumed on the Poorman property above Freeland by J. and R. W. McKenzie. The workings below the tunnel level are filled with water. At a distance of 250 feet from the portal of the tunnel an upraise of 60 feet will be made to connect with the bottom of a 40-foot shaft on the Poorman vein, and with an 80-foot winze. At the bottom of the latter a crosscut has been run to the No Name vein. —— On Columbus mountain, near Empire, work is being done by the Krupps M. Co. under the direction of F. M. Tucker.

The Loop Mines & Tunnel Co. has been formed to develop claims on Republican mountain, near Silver Plume, by means of a tunnel to be driven at least 2000 feet. —— Preparations are being made to resume operations on the Josephine property, which lies near the A.–P. tunnel on Kelso mountain, near Silver Plume. I. B. Nichols has been getting things in shape for putting men to work.

Gilpin County.

During the last week of August the shipments of smelting and crude ores, tailings and concentrates from the Black Hawk depot to the Denver smelters and outside points of treatment were 58 cars, or 1220 tons, making a total of 281 cars, or 5900 tons, for the month. In comparison with the preceding month, last month's shipments showed a gain of 55 cars, or 1135 tons, an increase of nearly 25% over the shipments for July, while for the corresponding month of last year the shipments showed a gain of nearly 20%.——Because of a cave-in of the shaft at the 200-foot level, work has been suspended by the Newfoundland Gold & Silver M. Co., near Central City. G. W. Mabee, Jr., is superintendent. It is reported that a new shaft will be sunk.——The new mill of the Monarch Mill Co., in Gambell gulch, near Central City, is running double shifts, principally on ores from the Colorado tunnel, but it is to be run also on ores from the Mountain Monarch property. The new mill is equipped with five rapid drop stamps, copper plates, bumping tables and a concentrating table. It is the intention of the company to put in five more stamps and additional tables. J. C. Barrows, of Rollinsville, is manager and G. C. Carson millman.——Work has been resumed on the O. K. mine on German mountain, near Central City, by A. Johnson. Retimbering of the shaft and other repairs will have to be made before work underground can be pushed. The shaft is down 600 feet.——A 30 H. P. hoist has been put on the Gladstone mine in Lake district.——Central City reports say that the Golden Sun M. & M. Co. will put in an air compressor at their claims east of Boulder park on the south side of South Boulder creek. The main tunnel, being driven by Peterson & Co. under contract, is in over 300 feet. L. A. Shearer is superintendent.——The Denver & Northwestern M. Co., on South Boulder creek, intend putting in a compressor.

The Mountz & Palmer mill, near Apex, is running on ores from the Mackey mine and the Sarah Jane tunnel. Air drills are opening new ground in the Mackey.—— The Boston Occidental Co., operating the Mascot mine at American City, sunk its shaft an additional lift and is now crosscutting for its vein at the lowest level. The company has its drying room at the millr eady for use and will soon be ready to treat its own ores at the minedump. —— W. Shultz of the Shultz Wonder is prospecting for ore shoots in his underground workings.——The Imperial M. & M. Co. and the Cyrene Mines Co. have consolidated, the Imerial taking over the property of the Cyrene Co.——Surveyors from Yankee have run a line for a wagon road from Yankee to Tolland on the Moffat Railway. The road will be run on a 10% grade. The Moffat management promised to build the first mile from Tolland.——The Palace M. Co. is underhand stoping on a shoot of lead ore in their tunnel.——The Little Sallie M. Co. has bought the Marie Louise group of claims on Silver creek and intends putting up a mill to treat their ores near the mine dump. W. E. Garver is the superintendent.

Gunnison County.

The Carter tunnel of the Ashland M. Co. is said to have cut good veins at the 1450 and 1490-foot points. It will be continued until in 3500 feet, when it is estimated that all the important veins will have been cut. New air compressors will be put in. C. W. Carter is manager.

In the Tin Cup district the Blistered Horn tunnel has been driven 1600 feet and struck a 7-foot vein of ore at a depth of 1000 feet. —— I. L. Johnson is running a long tunnel from Middle Willow creek to get under the old workings of the Gold Cup.

Hinsdale County.

High-grade ore is being shipped from the St. Jacob's mine at Carson, 14 miles south of Lake City. It is reported that a new shaft is to be sunk.

Lake County.

A tunnel is being run from the level of the Adams mill, Carbonate hill, Leadville, into the mill to tap the Wolftone shaft at a point 100 feet below the present mark from which water is being lifted. The tunnel will be 480 feet in length, and when the shaft is tapped will do away with some pumping, and the ore from the mine will be dumped into the bins at the mill. The tunnel will be 5½x6½ in the clear. —— The lessees on the Fortune, Big Evans, Becker & O'Brien have completed all of the surface work and are hoisting fifty tons a day of siliceous and sulphide ores from the upper and one of the lower levels. Where the work is being carried on the drifts will be driven farther ahead and to the north. The levels at the bottom of the shaft will be worked later, when arrangements will be made to handle the water.

Work has been resumed at the Bartlett mine, near Twin Lakes, by the Twin Lakes G. M. Co.—— Geo. Miller has charge of work on the Sunnyside mine, near Twin Lakes. —— The Last Chance Co. have resumed work on their Echo canyon claims. S. E. Smith of Twin Lakes has charge. —— The Bromley mill is being moved to Lackawanna gulch.

San Juan County.

At the Sound Democrat claims in Mastodon gulch, near Silverton, Walker & Ezell are finishing the structural work of a new 10-stamp mill.

San Miguel County.

Prior to the leasing of the greater portion of the Smuggler-Union mine and both the Smuggler-Union mills to Robeson & Carter the mills were under different managements. It is understood the new leasers will put both plants in charge of M. R. Hansen. W. J. Thomas, who has been foreman of the Suffolk-Globe 40-stamp mill at Ophir, will be head amalgamator.

Summit County.

On the Star placer, in the Upper Blue valley, Superintendent Dearing is prospecting and extending ditches, pipe lines and flumes.——M. Anderson and J. Cramer, leasing the Washington property, on Nigger hill, near Breckenridge, reached through the Wineland and Mayo tunnels, are shipping lead-gold ore.——The American Dredging Co., while prospecting its placer territory on the Swan, has sunk thirty-nine drill holes to bedrock. The holes vary from 38 to 40 feet in depth. Careful pannings and assays have been made and records of each hole kept, and when dredging is resumed the company will be in possession of data concerning gold values and depth of wash on each tract.——Excavation has been completed for an addition to the mill of the Washington–Joliet Co., on Nigger hill. Development is being pushed in the Puzzle–Extension shaft, and a drift now being driven from the 100-foot level will cut the ore shoot at greater depth.——The Hoosier Creek G. M. Co., operating the Bemrose placers, Hoosier gulch, near Breckenridge, has been sinking a shaft to cut an iron ore vein on the dip. At 110 feet from the surface a station was put in and a crosscut drift was driven from the vein.——At the Old Union mine, near Breckenridge, the main tunnel is near the 1000-foot mark. A crosscut will be driven west to the Old Union main ledge, a distance of 150 feet, and a crosscut east will cut two other veins. A continuation of the tunnel for 500 feet will put the breast of it under the main shaft workings, when connections will be made. The company is taking out milling ore.——At the Novelty mine, being worked by J. Detwiler and the Summit County Mining Exchange, the whim has been put into position and the main shaft baled out. The shaft will be sunk 50 feet on contract, and then will begin the work of taking out ore for shipment.

Teller County.

An 8-drill belt compressor driven by electric motor has been put in at the Los Angeles mine by the Exposition Mines & Leasing Co., and work has been renewed on low-grade ore bodies of the Los Angeles to supply the cyanide mill. A skip will be put in the shaft and hoisting resumed.——Superintendent J. McIlwee has opened up good ore in the Maid of Orleans shaft on Beacon hill, Cripple Creek. The shaft is to be sunk from the 500 to the 600-foot level.——Work has been resumed at the Elkton after a short shut-down during which repairs were made in the main workings.——The Long John shaft on Ironclad hill, Cripple Creek, which is to be sunk to a depth of 200 feet, is down 145 feet. A. W. Oliver is interested.——The Hull City mine of the Independence Con. G. M. Co. is shipping 1000 tons monthly. W. P. Dunham of Colorado Springs is manager.——Lessee Walsh has started a crosscut from the 610 level of the Forest Queen shaft on Ironclad hill, Cripple Creek. ——The Dexter G. M. Co. recently granted a lease to O. M. Deemer and J. F. O'Neill of Omaha on the Dexter and other of its claims on Bull hill, near Cripple Creek. The lessees have put in a temporary small hoist, pending the arrival of an 80 H. P. boiler, a 10x12 hoist and a 5-drill air compressor. The shaft is down 625 feet.

IDAHO.

Blaine County.

The Wood River Zinc Co.'s mill near Hailey is temporarily shut down because of breaking of the main line shaft. New crushing machinery and more concentrators are being put in.——The development work at both the Nay Aug and War Dance mines is being continued. At the Nay Aug a raise to the surface is being started for air.

The Lipman Tunnel & Mines Co. intend starting work on their 3000-foot tunnel from the south side of Bullion camp, near Hailey, in the Wood River mining district. The tunnel will give an outlet to the Red Elephant, Bullion and Mayflower mines, and save the expense of hoisting and pumping. An incline shaft is to be sunk on the Point Lookout to connect the lower tunnel with the upper workings.

Boise County.

The Black Pearl M. Co. at Pearl is putting in a cyanide plant.

Manager W. T. Nasseur of the Whitman Co.'s property at Pearl states that the adit level on the Leviathan vein has been driven 622 feet. The adit level on the Red Warrior vein has been driven 521 feet.

Shoshone County.

At the Success mill, near Wallace, twelve jigs are to be put in to increase the present capacity of 200 tons. Settling tanks are being built to handle the zinc tailings, and new concentrating tables will be put in to work over the settlings from these tanks. The average assay value of the feed since the mill went into operation, three weeks ago, has been 20 ounces of silver, 25% lead and 25% zinc. Two kinds of concentrates are obtained. The lead contrates run from 40 ounces to 45 ounces of silver and from 50% to 65% in lead, with practically no zinc. The zinc concentrates contain almost no silver values, 3% lead and run from 45% to 50% zinc. The separation of the zinc and lead is made with the tables, no electric magnets being used.——The Dominion M. Co., of which C. E. Poor of Los Angeles, Cal., is manager, has let a contract to W. W. Shaw to run 300 feet of crosscut tunnel to reach its main ledge near Wallace, making the tunnel, when the present contract is complete, 665 feet in length.——The Rochester claims, 12 miles southwest of Wallace, have been incorporated and preparation will at once be made to develop them. The property is now owned by the Mastodon-Cœur d'Alene M. Co. J. F. Firch of Spokane is president; A. M. Mundell of Wallace, vice-president; C. P. Ward of Spokane, secretary.

Foreman John Thyne of the Golden Chest mine, near Murray, reports that the Idaho tunnel for the month of August was advanced 220 feet. The tunnel is 6½x9 feet. The work was done by nine men in two shifts. Power drills were used. The cost per foot was $6. Miners and shovelers received $3.50 per shift. The tunnel must be driven 400 feet farther to get under the Klondike shaft. ——Work has been started on the 20-stamp mill of the Golden Reward mine, near Murray. C. S. Crysler is manager.

The appraisers appointed by Judge Beatty to determine the loss suffered by Headrick & Baillie by having their claims, the Blackhawk and Alvy, traversed by the great Morning tunnel of Larson & Greenough, found that the claims had suffered no damage by being traversed by the tunnel, but were benefited. As compensation for the ground used by the tunnel, Headrick & Baillie were awarded $97.16. This is the first case of the kind ever brought in the courts of Idaho. Larson & Greenough instituted condemnation proceedings against Headrick & Baillie for right of way for Morning tunnel No. 6 through the Blackhawk and Alvy claims. They claimed that the only complete, successful and profitable manner of working the Morning mine is by this tunnel, which has already been driven 1½ mile, and that to reach the ore bodies through this tunnel, it is necessary to drive it for some distance through the Blackhawk and the Alvy claims. Judge Beatty decided in favor of Larson & Greenough and appointed F. F. Johnson and E. H. Moffitt of Wallace and Al Page of Wardner as appraisers to determine the amount of damage done.

The directors of the Tamarack & Chesapeake M. Co., owning a property near Wallace, have decided to commence shipping ore from the mine. An arrangement for the treatment of the product has been concluded with the Salt Lake smelter. The ledge has been drifted upon in ore for 250 feet, at a depth of 500 feet.

MICHIGAN.

Houghton County.

(Special Correspondence).—The Wolverine ore returns a trifle better than thirty pounds of copper to the ton. The Calumet & Hecla has an average of forty-five pounds of metal per ton and the branch vein of the Michigan averages thirty-two pounds of copper per ton. The Allouez, Ahmeek, Wolverine, Mohawk, Centennial, North Kearsarge and South Kearsarge mines are producing copper regularly from rock mined out of the Kearsarge amygdaloid bed. The Calumet & Hecla is opening a good mine upon the same lode, while the Miskwabik has a promising prospect upon its northern extension and the Tecumseh has a chance of making a mine to the southward. The Baltic lode has three mines developed —the Baltic, Trimountain and Champion. A fourth mine is being opened to the northward by the Superior Copper Co., while a fifth is to be opened later on Section 16 by the Atlantic Co. A sixth is being started on the Globe tract, south of the Champion, while a seventh is being developed at the Challenge property of the St. Mary's Mineral Land Co.

Houghton, Sept. 11.

MISSOURI.

Jasper County.

The shaft of the Union Zinc Co., on the Lyon M. & D. Co.'s lease between Prosperity and Duneweg, has reached ore.——A new mill is being constructed on the Longen land, north of Chitwood, by Chitwood and associates. ——A 200 ton electric mill is being built by the Maud L. M. Co., on the Leonard land, north of Chitwood.

MONTANA.

The report of B. H. Tatem, assayer in charge of the United States assay office at Helena, for August, shows that the total receipts of gold from Montana during the month were $192,289.96. The contributions of the counties follow: Fergus, $71,142.37; Lewis and Clark, $21,-745.97; Missoula, $13,039.64; Chouteau, $14,682.63 from other places; British Columbia, $22,725.87; Alaska, $4109; Nevada $7928.95. Total receipts from all sources, $209,979.18.

Missoula County.

Copper ore is being shipped to the Tacoma smelter from the 300-foot level of the Monitor mine at Saltese. President Otis Hill is at the mine.

Silver Bow County.

(Special Correspondence).—In August the Butte dis-

trict yielded 449,500 tons of copper ore, from which were produced 28,356,940 pounds of copper:

Companies.	Monthly Tonnage.	Pounds Per Ton.	Monthly Production.	Daily Production.
Anaconda	142,000	54	7,700,400	248,400
Boston & Montana	80,800	70	6,076,000	196,000
Butte & Boston	18,000	65	1,209,000	39,000
Parrot	17,300	70	1,215,200	39,200
Washoe	26,350	70	1,844,500	59,500
Trenton	16,710	66	1,101,810	35,610
North Butte	26,350	80	2,108,000	68,000
Corra Rock Island	18,000	60	1,116,000	36,000
Rarus	21,700	60	961,000	12,000
Minnie Healey	15,500	62	1,302,000	31,000
Belmont	3,100	55	170,500	5,500
Clark's mines	40,300	65	2,619,500	81,500
Miscellaneous	15,500	60	930,000	30,000
Totals	448,900		28,356,940	914,710

The Washoe smelter of the Amalgamated Company, which treats the ores of the Anaconda, Washoe, Parrot, Trenton, Butte & Boston and North Butte companies, produced 15,181,940 pounds, and the Boston & Montana smelter at Great Falls 6,076,000, making the total Amalgamated output 21,257,940 pounds of copper. The total for the United Copper Co., including the Rarus, Minnie Healey, Corra and Belmont, was 3,549,500 pounds.

Butte, Sept. 11.

It is reported that there has been a rich strike of gold in one of the United Copper mines, near Butte. The mine is in the Lexington group. A large body of ore was uncovered on the 200-foot level. It is said to run 104 ounces in gold and 124 ounces in silver to the ton.

The Little Annie Mine No. 2, northwest of Walkerville, has been sold to the Cobban Realty Co. of Butte. The mine was owned by Clinto Ramsdell of Deer Lodge.

At the Reins Copper Co.'s mine at Butte, the shaft is near the 900-foot level. The work will be continued until the 1200 mark is reached. Then a station large enough to accommodate a pump will be cut and a crosscut started. No ore is being mined, and it is the intention of the company to not attempt to extract any until the development work under way is finished. While sinking is in progress, another crew is raising from the 800-foot station to the surface, in order to make the shaft uniform in size its entire depth. The large pumps on the 800 station are working well, and there is therefore no trouble in keeping the water out of the shaft.

NEVADA.

Esmeralda County.

The railroad between Tonopah and Goldfield has been completed and trains are now running. Goldfield is 28 miles south of Tonopah; 16 miles south of Goldfield is Tank Springs; 29 miles south is Summerville, the new strike, which is 3 miles west of Thorp's Mills; 27 miles south from Summerville is Muddy Spring; 8 miles south from Muddy is Old Bullfrog or Amagoza (now deserted); ¾ mile south is the new town of Bullfrog, formerly called Bonanza. From Ryolite to Beatty, a town of 500 people, is 4 miles northeast, passing the Montgomery Edwards mine. South from Beatty, 4 miles, is Gold Center, with 250 people; 110 miles southeast from Bullfrog are the rich strikes of Las Vegas.

Lincoln County.

It is reported that the Searchlight Parallel G. M. Co. has bought a 15 H. P. hoist for its mine at Searchlight. The main shaft is 200 feet deep.——G. F. Colton announces that the development of the New Year's Gift Fraction at Searchlight will be continued.——The Good Hope property will be developed to deeper levels.——The Searchlight shaft will be put down deeper. The company has decided to develop the Gypsy claim.——Water has been struck in the main shaft of the Sazerac mine at Searchlight at a pepth of 215 feet. Sinking has been discontinued until pumps can be put in.——The Searchlight M. & M. Co. have started the new 3-stamp mill. Sinking is to be resumed when the pump is repaired.——B. Macready states that the main shaft of the Santa Fe mine at Searchlight will be sunk to the 500-foot level.——The mine will be equipped with a 25 H. P. gasoline hoist, a Cornish pump, ventilating appliances, and cut-off and rip saws for preparing mine timbers. The Santa Fe M. & M. Co.'s property includes the Barney Riley, Santa Fe, Telluride, Pan American, Georgetown and Erie. The main shaft is 170 feet deep. Water was struck at 165 feet, and prevented further sinking.——The pump and hoist has been put in at the Pompeii at Searchlight, and pumping is to be started preliminary to sinking to the 600-foot level.——D. C. Spence, representing an Eastern oil company which recently leased 5000 acres of land in Muddy valley, near Logan, for drilling for oil, will begin operations soon.

Nye County.

In the double-hand drilling contest at Tonopah, September 4th, Wm. B. Ross and Walter Bradshaw of Tonopah drilled 43 7/16 inches in fifteen minutes; J. McIver and C. Make of Bisbee, Ariz., drilled 43¼ inches, and McElvary and Bijorn of Goldfield drilled 38 7/16 inches. Fred Youckey of Tonopah drilled 28⅝ inches in the single-hand contest, and Walter Bradshaw drilled 25 1/16 inches.

NEW MEXICO.

Dona Ana County.

The Stephenson-Bennett Con. M. Co. at Las Cruces has put in a new air compressor and is pushing work on its double-compartment shaft, which will be sunk to a depth of 450 feet. —— The Modoc M. Co. is to try another dry concentrating process at its property in the Organ mountains, near Las Cruces. Changes are being made in the old plant. Shipments of lead ore are being made to the smelter at Deming.

Grant County.

The Hermosa Copper Co. at Hanover will sink 1000 feet on the Ivanhoe as soon as three hoists, aggregating 300 H. P., and the necessary boilers have arrived.

Lincoln County.

The Eagle M. & I. Co. will soon have a new mill to treat its low-grade gold ore. This will give a capacity of 150 tons of ore daily. The company's property is between Carrizozo and Capitan.

Otero County.

The Lincoln Copper Co., having made arrangements with the Southwest Smelting Co., which is to build blast furnaces at Jarilla to handle its ore, announces that it will resume sinking its double-compartment working shaft on its property.——The Southwestern S. & R. Co. has let a contract to bring water to its 25,000,000 gallon reservoir, north of Jarilla, on Baird hill. —— The St. Louis Copper Co., which has a lease and option on the By Chance mines, near Jarilla, has its shaft down 400 feet. As soon as electric power can be had an electric hoist and drills are to be put in.

Socorro County.

The Mine Development Co., in the Magdalena district, has a plan to connect their Tip Top tunnel with the Key tunnel, thus giving the Key ore an outlet on the west side of the range. The ends of the tunnel are 950 feet apart. —— In the Cooney district work is to be resumed on the Deadwood mine and a cyanide plant is to be put on the Confidence by the Helena M. Co.

OREGON.

Baker County.

At the Mayflower mine in the Cornucopia district the Stampede M. Co. is putting up a new mill and intends building a 42-foot tramway from mine to mill. The ore will be crushed in cyanide solution and amalgamated by passing over copper plates. Then it will pass through classifiers separating the slimes from the sands, the slimes being at once deposited to the bottom of a 16x16 tank. The sands are then passed over Frue vanners, being discharged into 20x5 percolation tanks. The overflow solution from both percolation and slime tanks is discharged to the bottom of an additional 16x6 slime settling tank, the bottom of which is connected with a suitable pump for throwing the solution back to the battery supply tank. The overflowing solution from the slime settling tanks passes through a clarifying box, the compartments of which are filled with excelsior, which clarfies the solution so that it may be passed through zinc boxes when desired, or discharged directly into sump tanks, which tanks are connected with a clear solution pump pumping the clear solutions to the vanner supply tanks. The slimes are treated by agitation and decantation in the 16x6 tanks into which they are discharged from the spitzkasten, and the sands are treated by percolation. The concentrates, which consist principally of telluride of gold and silver, are treated separately by agitation and decantation. G. W. Boggs is manager.

Curry County.

The Chetco M. Co. has been formed, with T. H. Gillham as manager, to work seventeen claims on Chetco creek, near Chetco, and 20 miles from tide water.

Douglas County.

The Bohemia Smelting & Railway Co. has been incorporated at Portland by A. D. LeRoy, H. Daniel, J. W. Sherman, W. G. Woodruff and J. B. Keefer. The objects are to operate mines and a smelter and to build electric lines in the Bohemia district.

Josephine County.

The Oroville Dredging Co. of California has done considerable prospecting of placer and dredger ground on Applegate and Illinois rivers, near Grants Pass, under the direction of Manager Hanford. As a result they have already bought the Vroman and Bird's Eye ranches. —— Down Rogue river, some 45 miles from Grants Pass, the Gold Bar M. Co. is making preparations to start hydraulicking with water from Foster creek. —— Manager A. C. Hoofer of the Mt. Pitt mine, near Grants Pass, has opened the main vein in the lower crosscut, 210 feet from the portal.——The Whitehead & Willeke placer ground on Grave creek, near Leland, is to be worked by W. A. Krum and G. P. Furman.

The Hammersly mine has closed. W. H. Osgood of Seattle has a bond on the property and did considerable work under its terms before closing. The mine is located at the head of Jump-Off-Joe creek, near Grant's Pass. A shaft is down over 200 feet.

SOUTH DAKOTA.

Custer County.

The Ivanhoe mill near Custer is crushing ore from the 250-foot level of the mine.

Lawrence County.

The main tunnel of the Homestake Extension near Deadwood has been driven 800 feet. Manager C. E. McHugh contemplates putting up a stamp mill.

Pennington County.

Tungsten-bearing ore is said to have been discovered in the Bagdad district, 3 miles to the southeast of Keystone, by Ed. Christerson.——A cyanide plant is being put in at the Standby mine at Rochford, and ten stamps of the 60-stamp mill are to be started soon. The main tunnel has been driven 1410 feet, and a 450-foot raise has been made.

UTAH.

Beaver County.

A 25 H. P. gasoline hoist is being put in at the Burning Moscow mine, at Shauntie, by Manager M. Cullen. Sinking is to be continued.

Juab County.

In the double-handed drilling contest at Eureka on Labor Day, H. R. Kelly and R. Leroy of Park City drilled 32⅜ inches; J. Nancarrow and E. Eplett of Eureka 31⅛ inches, and I. Novack and C. Holmes of Eureka 27½ inches.

President H. G. McMillan of the Star Con. M. Co. of Eureka reports that the shaft is 740 feet deep in a lime formation on the 400 level, where some work is being done.——The ore shipments from Tintic district for the week ending Sept. 7 amounted to 114 carloads, produced by the following mines: Eagle & Blue Bell, 12; Centennial-Eureka, 47; Eureka Hill (leasers), 2; South Swansea, 1; Swansea, 4; Yankee Con., 3; Uncle Sam Con, 5; Godiva, 6; Bullion-Beck, 1; Gemini, 10; Victoria, 8; Grand Central, 3; Mammoth, 10; Carisa, 2; concentrates —Uncle Sam mill, 2.

Piute County.

The Sevier Con. M. Co. of Kimberley will use electricity in its new mill. Manager R. W. Foster has located water rights in Clear Creek canyon, 7 miles from the millsite. This is to be the location of a new power plant of 300 H. P. capacity.

Salt Lake County.

The Shawmut property in Carrs Fork, near Bingham, is being opened up preparatory to inspection. F. A. Darrenouge is superintending the property and work has been started in the Cuba tunnel.——The Wall mill has begun the treatment of ores from the Silver Shield. ——The Utah Copper Co. has made connections with the workings of the Ohio Copper Co. through a 2400-foot drive from the main tunnel of the Utah. D. C. Jackling and associates have an option on the Ohio.—— Manager G. G. Hall of the Congor mine of Bingham reports that the mine will soon be unwatered.

Summit County.

At the Ontario drain tunnel, at Park City, the drift which is being run around the last cavein is going parallel with the main tunnel. The drift was sent off at an angle for 54 feet, and now it is expected that it will be run parallel with the tunnel for 350 feet. Every precaution is being taken for the safety of the workmen, and though it will take some time, there is no question about the big drain being opened up again and work resumed at the mine. Water has been reached in the 1100-foot level in the shaft.——At the Harwood property the new whim is in place and sinking on the vein continues. The shaft is down 100 feet.——Ore shipments for week ending Sept. 9 were: Silver King, 1,305,840; Daly-West, 1,125,000; Clegg Brothers, 183,000; Kearns-Keith, 57,000.

Tooele County.

The Cyclone shaft at Stockton is down 650 feet and sinking is being continued by Superintendent F. H. Muhlenbrook.——The Honerine mill at Stockton has been closed down and will probably remain down until the drain tunnel and mine are connected, which may be within three months. For a number of months the plant has been running on tailings left from an old mill operated at Stockton in the early days.

WASHINGTON.

Snohomish County.

(Special Correspondence).—Part of the machinery for the 50-ton concentrator at the Washington Zinc Co.'s mine has arrived at Arlington. —— The Mineral City Power & Transportation Co. has been organized to build an electric road between Index on the Great Northern Railroad and Mineral City in the Silver Creek mining district, and expect the line will be completed within fourteen months. It will be 13 miles long. The president is O. O. Roland; vice-president and treasurer, W. J. McAllister; secretary, C. M. Baker.

Everett, Sept. 10.

FOREIGN.

ARGENTINE REPUBLIC.

A. C. Ross, English Consul at Buenos Ayres, reports that no gold has been won by dredging in the Argentine Republic. A number of companies have been floated in Buenos Ayres to work on rivers in the Argentine, in Chile and in Brazil. Several of the companies have imported dredgers, and in the course of this year results ought to appear. Reports made by New Zealand mining engineers state that there are good prospects of large returns from the rivers. On the Bolivian rivers the average results of numerous tests were from 40 cents to $1.20 per cubic yard. In Tierra del Fuego (Chile) the average of fifty-six bores was 16 cents per cubic yard of stuff moved.

AUSTRALIA.

Queensland.

A subsidy of £2500 is to be granted by the Queensland Government toward the cost of sinking a bore at Roma in search of oil. As natural gas has been obtained it is reasoned that petroleum exists. —— The minerals other than gold, coal or precious stones won for the quarter ended June 30, 1905, were as follows: Copper, 1975½ tons, valued at £130,636, compared with 944 tons, value £45,273; silver, 144,866 ounces, value £15,743, compared with 172,685 ounces, for £18,618; lode tin, 662¾ tons, value £44,992, compared with 663 tons, for £42,103; alluvial tin, 382 tons, value £31,617, compared with 441 tons, for £33,829; lead, 541⅜ tons, value £6856, compared with 530 tons, for £6227; wolfram, 374¼ tons, value £25,283, compared with 297 tons, for £31,477; bismuth, 1½ ton, value £565, compared with 2 cwts., value £50; molybdenite, 2¾ tons for £342, compared with 2 cwts. for £10; manganese, 501 tons, value £2004, compared with 185 tons for £738; bismuth and wolfram, 1¾ ton for £321, compared with 16 cwts. for £80; ironstone, 950 tons, value £687, compared with 640 tons for £244; scheelite, 1½ ton, value £128, compared with 3½ tons, value £300; limestone, 4980 tons, value £3253, compared with 3605 tons for £1971; total value, £262,327, compared with £189,920 for the same period of last year. The exports of silver, copper and lead during the first six months of the year show a net increase of £205,104, as compared with the corresponding period in 1904. The exports of silver, silver-lead, etc., show an increase in value of £255,478, and the output for the year bids fair to be the largest during the past decade. The value of the coal exported is less by £22,621. The shipments to Australian ports show an increase of £26,490, but against this the quantity dispatched to other ports exhibits a falling off in value of £49,111. In copper and tin there was a decrease of £9245 and £18,508 respectively in value. The value of the copper and tin ore imported into the State during the half-year for treatment was £21,175 and £87,005 respectively.

Victoria.

The Mining Journal reports that considerable interest is being evinced in an invention aiming at the effective and economic treatment of battery tailings and slimes. Recently a test was made in a vat 20 feet in diameter and 7 feet in height, and the material operated upon consisted of thirty tons of beach sand, with thirty-five tons of water. The principle of the apparatus consists of two vertical deflecting plates placed almost opposite one another, worked in combination with propellers enclosed

in a cylinder. The propellers are of the augur type, and move freely within the cylinder. The cylinder is raised from the bottom of the vat according to the nature and character of the material to be treated. From beneath the cylinder is projected a strong current of water, the force of which disturbs the mass on the bed of the vat. With a driving power of 20 H. P., seventy revolutions per minute are obtained by the propeller, which was sufficient to give a continuous and perfect movement to the whole of the charge. In the demonstration the material was thoroughly mixed within five minutes of the work being started. When in motion the whole of the contents of the vat, both solid and liquid, were brought into a uniform condition. The apparatus is the invention of a Melbourne resident. A ingenious tin-saving appliance has been invented in Melbourne. Its main feature is a longitudinally divided sluice box, provided with a series of transverse wells, in each of which works an archimedian screw carrier. Farther down the sluice is a revolving grating, overlying a subsidiary sluice, also provided with one or two similarly constructed wells and carriers, and with a transverse sloping lip, which causes the carrier to be continuously submerged. In operation the mixed ore material and water pass down the main sluice, depositing the finer and heavier material in the transverse wells. The revolving action of the screws has the effect of keeping the material in motion, thus assisting concentration, and at the same time conveying the concentrates into the clear water sluice which runs parallel to the main sluice. In this clear water sluice the product is still further reduced by sluicing, and the concentrates are allowed to escape into a launder by means of a slot in the bottom of the wells underlying the end of the clean water sluice.

CANADA.

The Ontario government has issued a report showing an increase during the first half of the year in every mining and steel business carried on in the Province. The total yield is valued at $6,529,728.

	Quantity.	Value.
Gold, ounces	2,930	$25,093
Silver, ounces	1,128,212	595,974
Nickel, tons	4,671	1,638,040
Copper, tons	2,256	335,637
Cobalt, tons	65	80,560
Iron ore, tons	113,583	274,224
Pig iron, tons	116,794	1,510,197
Steel, tons	64,527	2,070,003
Total		$6,529,728

Practically all the silver, all the cobalt and thirty-two tons of the nickel were produced in the newly-discovered mines at Cobalt, Temiscaming district. The quantity of ore shipped from these deposits during the half year was 891 tons and the value $684,879, so that the average value realized for the ore as shipped was $768.66 per ton.

BRITISH COLUMBIA.

The returns of the lead production in British Columbia for the fiscal year beginning July 1, 1904, and ending June 30, 1905, are as follows:

	Lbs Lead.	Bounty.
Nelson smelter	16,421,071	$116,709 1
Trail smelter	13,446,086	96,684 36
Unclaimed	7,599	51 84

Including claims paid at another smelter, the totals for lead produced and treated in Canada are 33,730,546 pounds of lead and $240,288.90 bounty. The amount of lead exported was 21,972,988 pounds, on which the bounty paid was $96,697 37. The grand total for the year, therefore, is 55,703,534 pounds of lead produced and $336,986 37 paid in bounty. The leading producers and bounty earners in order are: St. Eugene, North Star, Slocan Star, Ivanhoe, Idaho, Payne, Paradise, Silver Cup, Enterprise, Lucky Jim, Silver Hustler, Ymir and Triune.

Vancouver Island.

The Cordillero M. Co. of Seattle, Wash., of which Alfred Raper is manager, has bonded the Cornell mine on Texada island and work has recommenced. The 32 H. P. boiler is being put in and the air line is being connected with the Copper Queen mine. The upper levels are being cleaned and the lower levels are to be pumped out. The shaft is down to the 500-foot level.

Boundary District.

A large body of low-grade ore is reported as having been struck in the 250-foot level of the new shaft which has been sunk on the Last Chance mine of the Republic group at Smith's camp, west of Boundary Falls. W. T. Smith is manager.——It is reported that work will be resumed on the Preston in Skylark camp.——At the Elkhorn a new shaft is being sunk. Recently the Elkhorn was incorporated as the Boundary-Elkhorn Mines, Ltd., P. McDonald and J. Sutherland of Greenwood being the chief owners.——The Jewel mine in Long Lake camp has resumed operations after a several years' shutdown. J. H. Smith is in charge.

East Kootenay District.

Development of the Aurora mine at Moyie is said to show ore running 40% zinc.

West Kootenay District.

At the Canadian smelting works at Trail another gold-copper furnace will be added to the present equipment. There are already four copper furnaces, with a combined capacity of 1000 tons a day. The smelter is now receiving about 4000 tons a week from the mines of Rossland and from 100 to 200 tons a week from Larson, Idaho. The Le Roi will send a little over 2000 tons a week at the start. The new furnace will reduce 250 tons a day, which will give a total capacity of 8750 tons a week for the five furnaces.

MEXICO.

The Chihuahua Enterprise states that the American Smelting & Refining Co. has the smelter at Aguascalientes with a capacity of 2000 tons daily, and one at Monterey with 1000 tons. The tonnage of the independent smelters in operation is shown by the following: At Santa Rosalia, Lower California, the Companie du Boleo, a French company capitalized at 12,000,000 francs, is operating a smelter of 1200 tons daily capacity. This plant produced last year 22,466,000 pounds of fine copper. The Copete M. & S. Co., at El Copete, Sonora, has a smelter of 200 tons capacity. The Democrata M. Co., La Cananea, Sonora, has a furnace of 125 tons daily capacity and is producing 3,750,000 pounds of copper per annum. The Descubridora M. & S. Co., now closed down, has a 600-ton smelter near Mapimi and a 200-ton plant at Conejas. The Compania de Pinoles, of Mapimi, has a capacity of 1000 tons per day, employing 3000 men. The Yaqui Smelting & Refining Co., San Antonio de la Huerta, Sonora, has a new furnace of 125 tons daily capacity, which is supplemented by a concentrating plant, making a total capacity of 250 tons daily. The Moctezuma Copper Co., a branch of Phelps-Dodge Co., has a 300-ton smelter and a 600-ton concentrator at Nacozari, Sonora. At present only the concentrator is being operated and the concentrates are shipped to the Copper Queen smelter of the same company at Douglas, Ariz. The Greene Consolidated Copper Co., consolidated with Phelps-Dodge interests, has a smelter of 2000 tons daily capacity which is supplemented by a concentrating plant of 2600 tons capacity. Over 4000 men are employed. For the year ending July 31, 1905, the company produced 63,005,848 pounds of refined copper, 399,270 ounces of silver and 3790 ounces of gold, worth $9,768,000 gold. The Douglas Copper Co., Alamos district, Sonora, has a smelter of 250 tons capacity. The Mazapil Copper Co., Ltd , has a 500-ton smelter at Saltillo and a small furnace at Concepcion del Oro, and is producing 6,000,000 pounds of copper per year. The Compania Metalurgica, at San Luis Potosi, employs 1000 men and operates a copper and lead smelter of 1000 tons capacity, doing a custom business. The Mitchell M. Co., Chilpancingo, Guerrero, has a 200-ton furnace and will add more. The Monterey Smelting & Refining Co., Monterey, N. L., has a plant of 1500 tons capacity. The Compania Metalurgica de Torrean has a capacity of 1000 tons daily and is to have two copper furnaces of 250 tons each. It is currently reported that the smelter trust is negotiating for the purchase of the plant. In addition to the foregoing there are thirty-six small plants of from 25 to 250 tons capacity each, or an average of 85 tons each, having a total capacity of 3100 tons in actual operation, besides those that have been closed down. There are several others in course of construction, aggregating 1000 tons daily capacity. In the past few months there have been several concessions granted for smelters in various parts of the republic, among which are one at Naco, Sonora, one at Durango, one each at Jimenez and Parral, Chihuahua, aggregating perhaps 1000 tons capacity daily. The plant at Santa Rosalia is to be increased from 80 to 300 tons daily, and the owners say it is to be made 800 tons.

Aguas Calientes.

The Con. Tin M. & S. Co. is working a tin mine 30 miles from Aguas Calientas. W. A. Pratt and W. H. Foster are interested.

Baja California.

(Special Correspondence).—New machinery is being put in at the Aurora and Princess mines at Alamo by Superintendent G. W. Russell.——The smelter of the Esperanza M. Co. has been blown in on Cedros island by D. A. Crowley, who has returned to San Francisco.——The machinery for the electrolytic copper reduction plant at Julio Cæsar camp has arrived at Punta-Canvas, on the mainland. G. P. Brown is general manager.

San Diego, Cal., Sept. 11.

Chihuahua.

The output of the mines of Santa Eulalia, as shipped to the smelters during August, was about 27,980 tons. The Buena Tierra mine of the Santa Eulalia Exploration Co. shipped 5500 tons; Chihuahua Potosi Co., 16,000 tons; Galona, 2750; Mina Viega, 2200; Juarez, 1000; Eureka M. Co., 100; Dolores, 100; San Juan M. Co., 30; other shippers, 300. The Juarez mine of Manuel Gameros and Juan Trevino has been producing but a short time.

The output of the mines of the Parral district, including Santa Barbara and Minas Nuevas, was 22,993 tons of ore, of which 13,098 tons were shipped to the various smelters and 9895 tons were treated locally. The output of Santa Eulalia was 27,980 tons. Of this amount the Chihuahua M. Co. and the Potosi M. Co. shipped 16,000 tons; the Buena Tierra, 5500 tons; the "trust" mines, 4950 tons and the Juarez mine, 1000 tons.——The Pinos Altos M. Co. at Pinos Altos has remodeled the old 60-stamp mill and changed the process from amalgamation to cyanide and concentration. Twenty stamps are now in operation and will be regularly producing from now on. The company expects to enlarge the plant. The regular monthly shipment amounted to $90,000.——Lluvia de Oro has now a 20-stamp mill in operation and sent out gold bullion to the value of $120,000.

Sonora.

The Veta Grande property, formerly owned by N. S. Finch, is under bond to J. Galey of the United States Steel Co., and development work is being pushed, forty men being employed under the supervision of A. Houle. A three-compartment shaft is being sunk on the principal ore body and will go down 600 feet. The property is in the Arispe district, 9 miles from Bocoache.

The Richfield M. Co., in the Ures district, 12 miles east from Tuape, has ordered a double-reel hoisting engine, with a capacity for sinking 1000 feet. As soon as it is in operation the double-compartment shaft, now at a depth of 300 feet, will be carried down to the 1000-foot level. Arrangements are to be made for a concentrating mill with a capacity of fifty tons of ore daily. A road is to be built between Querobabi station and the camp, 37 miles.

Obituary.

VERNON H. ROOD, vice-president Jeanesville Iron Works Co., died in Bad Neuheim, Germany, Sept. 1. His death is deplored by many friends and business acquaintances.

Personal.

D. R. REED has returned to Ouray, Colo., from Denver, Colo.

E. R. ABADIE is superintendent Baltic shaft, Randsburg, Cal.

A. W. BRATTUND has charge Ward mill at Idaho Springs, Colo.

HERMAN DAVIS has returned from San Francisco, Cal., to Dayton, Nev.

H. W. TURNER of Terlingua, Tex., is examining Idaho mining property.

S. H. COX is professor of mining at the Royal School of Mines, London, Eng.

S. A. HARSH, Denver, Colo., is in San Francisco, Cal., looking after mining interests.

R. B. STANFORD, formerly of Columbia, Cal., is now at Bluefields, Nicaragua, C. A.

V. SHERWOOD is manager new 100-stamp mill Guanajuato G. M. Co., at Guanajuato, Mexico.

L. S. AUSTIN, professor of metallurgy in the Michigan College of Mines, is visiting New York.

A. A. BERNAUD of Colorado has been appointed superintendent Dairy Farm mine, California.

JOHN CARKOL is superintendent Sidewinder mine, at Victorville, San Bernardino county, Cal.

S. E. LAKE is superintendent Dragoon Mountain M. Co., near Dragoon, Cochise county, Ariz.

A. C. REDDING is superintendent Monumental Mines Co., at Monumental, Del Norte county, Cal.

EX-LIEUT.-GOV. JOHN DAGGETT has returned to Siskiyou county from a San Francisco visit.

N. H. MURRAY has charge cyanide plant San Felipe M. Co., near Hostotipaquillo, Jalisco, Mexico.

W. B. LADD of Madison, Wis., has been appointed manager Ophir Con. M. Co., at Telluride, Colo.

F. C. PFEIFER, a mining man of Esmeralda county, Nev., is in San Francisco, Cal., on mining business.

W. C. RALSTON, president Fulton Iron Works, has returned from Denver, Colo., to San Francisco, Cal.

S. J. GORMLEY has succeeded W. H. Mulling as superintendent Bingham Con. smelter at Bingham, Utah.

E. C. HOLMES, manager San Juan mine, at Santa Eulalia, Chihuahua, Mexico, is in San Francisco, Cal.

O. P. ANKENY has been appointed mine superintendent Gilt Edge Maid M. Co., working near Galena, S. D.

SAMUEL PARNALL, superintendent Calumet & Arizona mine, at Bisbee, Ariz., has been at Calumet, Mich.

R. B. BRINSMADE has been elected to the chair of mining in the New Mexico School of Mines, at Socorro, N. M.

R. J. GRANT, on his return to Colorado from Western Australia, is spending a few weeks at Greenville, Nova Scotia.

W. P. THOMPSON is manager reorganized Waterson G. M. Co., Ltd., operating near Ocampo, Chihuahua, Mexico.

W. N. FREDERICK has been appointed superintendent Richfield M. Co., operating near Tuape, Sonora, Mexico.

M. F. PERRY, manager Charles Butters Co., at La Colorada, Sonora, Mexico, has returned from a visit to San Francisco, Cal.

J. G. HARDY, general manager Dolores M. Co., at Minaca, Chihuahua, Mexico, has returned to the mines from a trip to Japan.

W. R. THOMAS, superintendent Central Eureka mine at Sutter Creek, Amador county, Cal., is said to have resigned because of illness.

JAS. HARTGERING has been appointed manager Dakota M. & M. Co. of Deadwood, S. D. N. I. Leydig will be mill superintendent.

H. E. CRAIN, representing the United States Geological Survey, is in Wyoming investigating the platinum deposits on Pliny creek, 35 miles north of Sheridan.

C. T. DURELL, manager St. Paul-Montana M. Co., operating the Spotted Horse mine at Maiden, Mont., has returned from a directors' meeting in St. Paul, Minn.

L. D. RICKETS has been appointed general manager Greene Con. Copper Co. of Cananea, Sonora, Mexico, reported to have been consolidated with Phelps-Dodge interests.

H. A. SHIPMAN, formerly manager of Stratton's Independence at Cripple Creek, Colo., leaves Western Australia in November and will return home by way of San Francisco, Cal.

AUGUSTE MATHEZ AND W. B. ROGERS, both of Salt Lake City, Utah, are examining copper deposits in Concurrie district, north of Brisbane, Australia, for Samuel Newhouse.

G. J. MCCARTY, general manager Creston-Colorada M. Co., has returned to La Colorada, Sonora, Mexico, from a trip to Chihuahua, City of Mexico, San Francisco and Denver. He had been absent since May.

FRANK S. CRONK, for the past year manager of the advertising and publicity department of the Colorado Iron Works Co., Denver, Colo., has resigned to accept a similar position with the Fulton Iron Works Co., San Francisco, Cal.

Commercial Paragraphs.

THE Redwood Mfg. Co. will erect a new $50,000 concrete building for its Oakland, Cal., tank department.

THE Fulton Iron Works of San Francisco, Cal., is sending a $100,000 stamp mill to the Lookout mine, Oasis, Nev.

THE S. H. Supply Co., Denver, Colo., report the sale of a four-drill American compressor with boiler and drills to Durango, Mexico, also a No. 2 Wild mill, with 50-ton concentrating plant, to California and a No. 2 Wild mill to New Mexico.

A BYRON JACKSON centrifugal pressure electric pump has been put in on the 400-foot level of the Old Ironsides mine, Phœnix, B. C. It has a 300-gallon per minute capacity against a 500-foot head and is operated by a 75 H. P. Westinghouse motor. The office of the Byron Jackson Co. is 411 Market St., San Francisco, Cal.

THE Raymond Con. M. Co., Ohio City, Colo., have contracted with the Colorado Iron Works Co., Denver, Colo., for a mill of twenty 1050-pound stamps, chrome steel to be used in all the mill parts; the amalgamating plates 12 feet long, in two sections; capacity 100 tons per day, power to be supplied by a 150 H. P. Skinner engine. The Colorado Iron Works will erect the complete plant, including the mill building.

THE Chicago House Wrecking Co., Thirty-fifth and Iron streets, Chicago, Ill., bought most of the Louisiana Purchase Exposition and are offering the material, etc., for sale. They bought everything within the grounds, including the fence, except a few of the foreign and State buildings. This company is the largest one of its kind in the world and has an organization that enables it to handle such gigantic operations as wrecking and selling world's fairs. A great deal of the material is illustrated in the new catalogue, No. 142, which will be sent on application.

ARMSTRONG BROS. TOOL CO., large manufacturers of tool holders, are in their modern factory at 104 North Francisco Avenue, Chicago, Ill. This concern has been progressing rapidly since their organization twelve years ago. The new factory is 60x175 feet, three floors and a basement, and is of modern mill construction. The basement has concrete floors, and the lighting facilities are of the best. Considerable new automatic machinery has been installed and the company is in good shape to handle their growing business. A new eighty-page catalogue will be sent to anyone on request.

THE Japanese army has rebuilt the city of Dalny, using Malthoid roofing, which has been used extensively by the Japanese Government for several years, finding it to be durable, long-lasting, convenient and inexpensive for army use. The compactness and ease with which it can be transported, together with the fact that all of the necessary nails, cement, tin caps and directions are contained in each roll enabled the Japanese army to quickly, inexpensively, and thoroughly re-roof the buildings that had been partially destroyed by fire and the devastation of war. Samples and booklets are furnished by The Paraffine Paint Co., 24 Second street, San Francisco Cal.

UNDER date of the 7th inst., the New York Sun says: Alton B. Parker, as referee, has reported to the Supereme Court that the John A. Roebling Sons Co. is entitled to a judgment of $231,081, with interest from December, 1902, for work done in the construction of the new Williamsburg bridge. From the amount claimed by the Roeblings fines at the rate of $1000 a day were deducted by the bridge commissioners for failure to complete the bridge contract time. The total value of the contract awarded to the company was $1,398,000. Judge Parker holds that the failure of the Roeblings to finish their part of the work was not due to any fault of theirs, but to obstacles which were placed in the way of the contractors by city officials.

THE Union Gas Engine Co. of San Francisco, Cal., will install Union engines of 300 H. P., running on crude oil, in the Pacific Coast Oil Co.'s barge No. 4. These engines are of the same size and type as those recently installed in the lumber schooner Argus, property of the Pacific Shipping Co., San Francisco; the lumber schooner Sotoyome, property of the Albion Lumber Co., San Francisco, and the Alaskan passenger boat Anvil, property of the John J. Sesnon Co., San Francisco. The German Government schooner Ponape, and the schooner Oakland, property of Hunt, Hatch & Co., San Francisco, were recently equipped with Union engines of this type. The Union Gas Engine Co. will soon enlarge its facilities, having purchased nine acres with a frontage of 350 feet on the Oakland, Cal., estuary, with a depth of water of 12 feet at low tide.

THE J. Geo. Leyner Engineering Works Co., Denver, Colo., report recent air compressor sales as follows: Asiatic T. & M. Co., Colo., two ten-drill compressors; Waldorf M. & M. Co., Colo., two eight-drill compressors, electric driven; American S. & R. Co., Utah, cross-compound; Southwestern B. & I. Co., Colo., complete plant with tandem compound, ten-drill compressor; F. C. Miller, Mont., belt-driven compressor; Denver G. & E. Co., Colo., tandem compound; Prescott Engineering Works, Ariz., duplex; Denver & Rio Grande Railway (Colo. 1, Utah 1), two steam actuated, two-stage, of 1000 cubic feet capacity each; Mountain C. Co., Cal., belt-driven, four-drill; United States Reclamation Service, tandem, compound; Japanese Government, electric driven; Kansas City Southern Railway, La., steam, straight line; Blue Flag M. Co., Colo., eight-drill, steam actuated; Denver Iron & Wire Works Co., Colo., electric driven; Consolidada de Construcciones Metalicos Mexico, electric driven; Newark M. & M. Co., Nev., two-drill, steam; Centennial Coal Co., Colo., two-stage, steam. The company reports its new factory completed and machinery now being installed by degrees without interference with its production.

Trade Treatises.

"Hoisting and Conveying Machinery for Power Stations," Bulletin No. 12 of Robins Conveying Belt Co., Park Row Bldg., New York City, gives an interesting illustrated exposition of the construction and use of the belt conveyor, giving emphasis to its utility in handling fuel.

The Sullivan Machinery Co., Railway Exchange, Chicago, Ill., describe the Sullivan automatic cross-over dump in Bulletin 48E. This is designed for the rapid and economical handling of cars from mines and quarries.

"Link-Belt Car Hauls" is an illustrated booklet from the Link-Belt Machinery Co., Chicago, Ill., showing the advantages of this system in the economical handling of material.

The process of washing coal for coke or fuel is admirably detailed by text and pictures in Booklet No. 42 of the Link-Belt Machinery Co., Chicago, Ill., "Washing Bituminous Coal."

Books Received.

As extracts from "Mineral Resources of the United States," the United States Geological Survey has issued "The Production of Quicksilver in 1904," "The Production of Fuller's Earth in 1904," and "The Production of Antimony in 1904," by E. O. Hovey.

Latest Market Reports.

SAN FRANCISCO, September 15, 1905.

METALS.

SILVER. — Per oz., Troy: London, 28 1/16d (standard ounce, 925 fine); New York, bar silver, 62c, refined (1000 fine); San Francisco, 62c; Mexican dollars, 48c, San Francisco; 47c, New York.

COPPER.—New York: Standard, $16.37½; Lake, 1 to 3 casks, $16.00@16.25; Electrolytic, 1 to 3 casks, $16.75; Casting, 1 to 3 casks, $15.75@16.25. San Francisco: $16.50. Mill copper plates, $17.50; bars, 18@24c. London: £68 17s 6d spot per ton.

Following are the figures of German consumption of foreign copper for the months from January to July, 1905, as compared with the same period of time for 1904 and 1903:

	1905.	1904.	1903.
Imports, tons	63,453	64,334	49,263
Exports, tons	7,289	4,814	6,283
Consumption, tons	56,164	59,520	42,980

Out of the above, 53,914 tons were imported from the United States.

LEAD.—New York, $4.90; Salt Lake City, $3.50; St. Louis, $4.52½; San Francisco, $3.70, carload lots; 4¼c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5¾c; pig, $4.85. London: £14 6s ℔ long ton.

SPELTER.—New York, $5.85; St. Louis, $5.65; London, £26 ℔ ton; San Francisco, ton lots, 6¾c; 100-lb lots, 7c.

TIN.—New York, pig, $32.00@32.10; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 35½c; less, 35½c; bar tin, ℔ lb., 35@37½c. London, £145 10s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@40.50, large lots; London, £7 2s 6d; San Francisco, local, $38.50@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 33@37c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.00; gray forge, $16.00; San Francisco, bar, 3c ℔ lb., 3¼c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$23.00; open hearth billets, $23.00@$24.00; San Francisco, bar, 7c to 12c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12½c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $10.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 58c; cs., 63c; raw, bbl., 56c; cs., 61c; Lucol oil, boiled, bbl., 51c; cs., 56c; raw-bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

BALING PRESS.—No. 798,782. Sept. 5, 1905. William H. Gray, San Leandro, Cal. This invention relates to improvements in baling presses, and is especially applicable to vertically disposed presses. It consists in the combination of a vertical press box, a follower, a superposed bale chamber and a vertical arm extending into the bale chamber and a vertical arm extending upwardly above the pivotal point of the lever and against the vertical sides of the press, means for actuating the retainers in series, and a unitary spring connected with the actuating means to normally retain the levers in position.

RAKING AND LOADING APPARATUS.—No. 798,810. Sept. 5, 1905. John R. Lewis, Biggs, Cal. This invention relates to an apparatus which is designed for raking and loading hay, grain, or equivalent material, and by the use of a closed shovel it may also be employed for the digging and lifting of earth or similar material that cannot be handled by a rake. Its object is to provide an apparatus by which material may be gathered, lifted, and deposited at a distant point. The apparatus comprises a wheeled frame and support, a rake or gatherer located at the front, a normally, downwardly and forwardly inclined frame having its upper end connected with the support, a flexible connection with said inclined frame and the rear of the gatherer, and a propelling frame hinged to the gatherer and intermediate between it and the front of the wheeled frame.

HOISTING AND CONVEYING APPARATUS.—No. 798,861. Sept. 5, 1905. Charles J. Allen, San Francisco, Cal. The object of this invention is to provide a simple and portable apparatus that can be quickly and easily rigged up and which is designed particularly for moving loads short distances in vertical and horizontal directions, as in handling material about a building in course of construction and for excavating, loading, or unloading coal and the like, for transferring burdens from a ship to the dock, and vice versa, and generally where it is now usual to employ either a block and tackle or a derrick and boom. The apparatus consists in a combination with end supports of a hoisting rope on one support, a counterbalanced rope on the other support, a block carried by the counterbalanced rope through which the hoisting rope passes, means for reciprocating said block between the two supports, and a spring hook or grab normally disposed at one side of the vertical plane of the ropes and adapted to engage with the counterbalanced rope.

CATALOGUE OF CHEMICAL TECHNOLOGY AND GENERAL CHEMISTRY.

PUBLISHED AUGUST 15, 1905.

☞Our Complete Classified Catalogue of Books on Chemical Technology and General Chemistry arranged under the following heads: Acids, Alkalies, and Salts; Beverages, Brewing, Cider, Distillation, Fermentation, Liquors, Preserving, Vinegar, Wine; Brick, Ceramics, Glass, Porcelain, Pottery; Cement and Concrete; India Rubber, Gutta Percha, Glue, Ink; Leather Manufacture; Oils, Fats, Waxes, Paints and Varnishes; Paper Manufacture, Fibres; Perfumery; Soap and Candles; Sugar, Starch; Flour, Baking, Bread, Confectionery; General Reference and Receipt Books. General Chemistry, Chemical Arithmetic, Calculation, Tables, etc.; Chemical Analysis; Inorganic Chemistry; Organic Chemistry; Electro-Chemistry; Addenda; sent free to anyone in any part of the world who will send his address.

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DELINQUENT SALE NOTICE.

ALTA SIERRA GOLD MINING COMPANY.—Location of principal place of business, Room 620, Kohl Building, 406 Montgomery street, San Francisco, California; location of works, Sierra County, California.

Notice—There are delinquent upon the following described stock on account of assessment of thirty (30) cents per share, levied on June 22nd, 1905, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	No. Shares.	Amt.
A. R. Baldwin	67	500	$ 150 00
A. R. Baldwin	68	500	150 00
A. R. Baldwin	69	556	166 80
W. H. Mead	73	4,000	1200 00
W. H. Mead	74	2,000	600 00

And in accordance with law and an order from the Board of Directors, made on the 19th day of August, 1905, so many shares of each parcel of such stock as may be necessary, will be sold at the office of the company, Room 620, Kohl Building, 406 Montgomery street, San Francisco, California, on MONDAY, September 18th, 1905, at 12 o'clock M. of said day, to pay the delinquent assessment thereon, together with costs of advertising and expenses of sale. By order of the Board of Directors.

SAM. W. CHEYNEY, Secretary.

Office—Room 620, Kohl Building, 406 Montgomery street, San Francisco, California.

ASSESSMENT NOTICE.

GOLDEN WEST MINING COMPANY.—LOCATION of principal place of business, San Francisco, California; location of works, Tuolumne County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 19th day of August, 1905, an assessment (No. 5) of one cent per share, was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, 307 Battery street, Room 15, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 28th day of September, 1905, will be delinquent, and advertised for sale at public auction; and, unless payment is made before, will be sold on SATURDAY, the 11th day of November, 1905, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

CHAS. BOVONE, Secretary.

Office—207 Battery street, Room 15, San Francisco, California.

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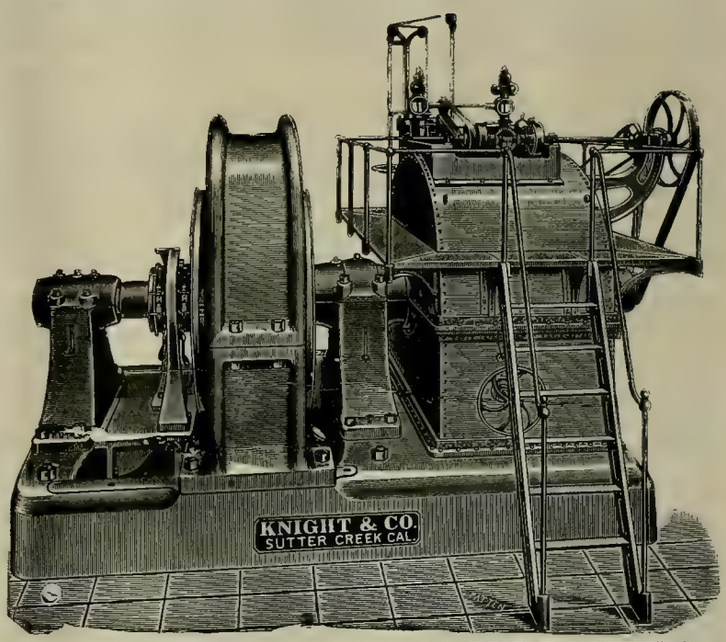

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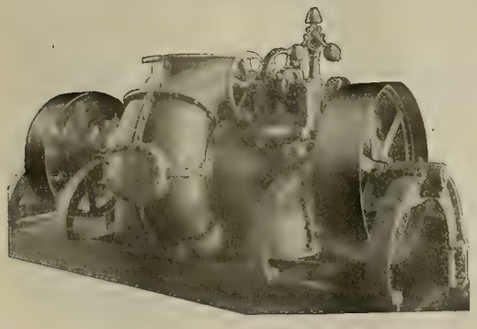

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MINING AND SCIENTIFIC PRESS.

Whole No. 2357.— VOLUME XCI. Number 13. SAN FRANCISCO, CAL., SATURDAY, SEPTEMBER 23, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Electricity in Mining.

The equipment of a mine is often left to the discretion of the superintendent. He is often a man who has worked his way up through the hard school of experience gained through mistakes, which mistakes he will never again make. But within recent years the progress in mining machinery has been so rapid that few superintendents have been able to keep track of all the latest improvements.

This is particularly so with reference to the application of electricity to mining. When for various reasons a board of directors has voted that an electric hoist or other electric power application be installed at their mine, they usually look to the superintendent to put in an efficient plant at the least possible cost. He is immediately confronted with the problems of deciding whether to use direct or alternating current; single or polyphase circuits; high or low frequency; synchronous or induction motors, and rotary converters or motor generators. In his perplexity he usually consults a number of machinery houses, each of which urges the advantage of their own product, but all tending to confuse him. For a large installation it is undoubtedly best to employ an unbiased electrical engineer to design the installation.

But the progressive superintendent can often solve the problem himself if he make a careful study of the circumstances and conditions under which the plant will be required to operate. The problem is simplified greatly if the mine be within the ever-widening zone of great central generating plants. For in this case one deals only with the motor, and not the dynamo.

The most recent developments in the electric field tend to the use of single-phase alternating current motors for use in hoisting and all variable speed work. This is displacing the direct current machines largely because of the economy effected by the use of the current without preliminary transformation. For mining work this is still in an embryonic stage, but its success in railway work is an indicator of possible usefulness in mining. Consequently developments in this line are being watched with interest by engineers intent upon cost reduction commensurate with efficient service.

A Level Party.

Studying Adjustment of Solar Compass and Transit.

Bird's-Eye View of Students' Camp.

Noon Hour in Dining Tent Room.

SUMMER CAMP OF SURVEYING STUDENTS, UNIVERSITY OF CALIFORNIA. (See Page 207.)

HOW the facts may be juggled and how figures may be mixed up in what are called "statistics," in an effort to prove anything, is strikingly shown in the current issue of a contemporary wherein the argument is made that "oil cannot compete with coal." It is now in order to furnish further data proving that for economy and efficiency the electric light is not in it in competition with the tallow candle.

BUTTE, MONTANA, reports that one of the mines in the Lexington group, heretofore classed as a strictly copper proposition, is developing into a high-class gold mine. Senator Clark's biggest wealth producer, the United Verde, Jerome, Arizona, was originally bought for and worked as a gold mine, later developing into a first-class copper property. The Mountain Copper Co.'s property in Shasta county, California, was first sold as a gold mine, and long believed to be such.

APART from any speculative excitement, the value of the mining industry as an investment proposition is manifest. Much of the present prosperity of the country is because of the permanence and profit of the mining industry. And those words "permanence and profit" are deliberately chosen. A business fifty years old is not usual; a manufacturing or mercantile establishment one hundred years old is phenomenal, but "going" mines that have been profitably productive for hundreds of years are not so uncommon as to excite remark. As a regular, steady, legitimate business, mining stands equally well with commerce, manufactures or agriculture in this present era of prosperity, and when the inevitable period of financial depression rolls round it is to the miner that the whole industrial world looks for immediate relief. For it is he alone who is a creator of wealth. The dollar that he produces makes the world have just that dollar more than it ever had before. The merchant's transaction is but a swap: the manufacturer's product but an assemblage of already created values, the agricultural product but a brief evolution of perishable material, but the product of the metal miner enhances the aggregate of the world's wealth forever.

MINING AND SCIENTIFIC PRESS.

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SAN FRANCISCO, SEPTEMBER 23, 1905.

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"Concentrates."

A good many questions are weekly asked this journal; questions involving everything relating to mining or metallurgy, which includes considerable technical matter, engineering, law, geology, etc. Some of these questions are hard to answer, especially in the usual limits of a "Concentrate" in which is accorded the answer. Some of the questions take a long time to answer, for the required information is not on tap, nor can it be had by the mere pressure of a button. Many questions so received have had to journey long distances for solution, for, on the principle that "everybody is wiser than anybody," specialists on different subjects are constantly consulted, and, through the years, there are many men of pronounced p ominence in the mining world who have been courteously requested to answer some of the myriad questions submitted to this journal, and in turn forwarded to them in recognition of their ability or knowledge in that particular line. In this connection gladly indeed is the statement made that almost invariably the requested information has been furnished. Thus through the years have those pages of "Concentrates" become the repository of the very kind of practical, up-to-date information most eagerly sought by live mining men everywhere. Of course, there have been mistakes, for infallibility is an attribute denied to any work of hand or brain, but it is honestly believed that in no other way has so much of practical value been gathered in such concise shape for miners, mining engineers, mechanicians and metallurgists everywhere as in the thousands of "Concentrates" that have appeared since that department was started by the writer in 1894. The appearance of so many similarly worded paragraphs under various names in so many contemporaries is not the least of the numerous testimonials to the recognized value of the work.

Origin of Our Mining Laws.

"An Act granting the right-of-way to ditch and canal owners through the public lands, and for other purposes."

There is nothing in the above that would even remotely indicate that the act, so entitled, covered the location and patenting of a mining claim, but it does, the quoted paragraph being the title of the first law in relation to mineral land ever passed by the Congress of the United States. The real "origin of our mining laws" is the procedure of the California miners "in the days of '49," in the local enactment of mining district regulations. So obscure was the whole matter in the minds of our national legislators that there was no attempt by them to make any law applicable to mines or minerals till the close of the Civil war of 1861-65, when in December, 1864, the Secretary of the Interior in his official report suggested that, as mineral lands were the property of the Government, a revenue tax be laid upon the miners, and that the Internal Revenue Department be invested with power to issue licenses and collect a tax of 1% per annum "on the present product of the mines." That scheme did not meet with approval, and then it was proposed in Congress to "sell all the mineral lands in California and other Western States and Territories" and apply the proceeds to the payment of the national debt. In June, 1865, Congressman G. W. Julian of Indiana introduced a bill providing for a survey of mines, filing of plats, and public advertisements that at set times and places such lands be sold at auction to the highest bidder. California and Colorado protested strenuously, holding that such action would throttle mineral development, that it would shift the burden of the war debt from the East to the West and that the West was furnishing the solid money that held up the arms of the Government, whereupon Congressman Fernando Wood of New York, a great leader of that day, moved that the President be authorized to send an army to expel the miners from California, Colorado and Arizona, "by armed force if necessary to protect the rights of the Government in the mineral lands."

Mr. Wood's plan was to run the miners out, take governmental possession "and work the mines for the benefit of the national treasury." (That was the time for Congress to establish a bureau of mines and mining, with a Cabinet officer, as advocated then, and ever since, by the MINING AND SCIENTIFIC PRESS.) Mr. Wood, who was invincible in peace and invisible in war, found a few supporters in his plan of battle murder and sudden death, but Congressman Washburn of Illinois reminded him that the miners were fighting Indians and digging gold, and were altogether an earnest lot of hardy chaps, and that if Mr. Wood's motion prevailed the Government would probably have a bigger Civil war on its hands than the one in the South.

It happened that at that time the then Territory of Colorado had Jerome B. Chaffee as Congressional delegate. He argued that miners were not trespassers on the public domain, but that their work was essential to the national life and the development of this west half of America, and that so far from being exterminated by the bloodthirsty member from New York, they, as a class, should be allowed some few rights in accordance with their innate privilege to "life, liberty and the pursuit of happiness." He was a miner himself, able to give his fellow Solons a few pointers. Senator Stewart of Nevada and Senator Conness of California were also able to show cause for more peaceable measures.

About that time there was an agitation regarding some Eastern canal rights, and as a great concession when the 1866 law thereon was being enacted, Stewart, Conness and Chaffee succeeded in having tacked on to it a clause giving the Western miner a right to possess and hold a mining location by virtue of annual assessment work. For a long time these regulations were known as the "Chaffee laws." The Government did not further contemplate either sale or operation of the mines. Whether it would have been wiser policy at the time to create a mining code and have the Government share in the production of the property would now be futile to discuss. By 1869 it was manifest that "the lode law of 1866" was insufficient, and in 1870 Congress passed "the placer law," which, as regarding placer mining property, amended and supplemented the law of 1866.

In 1872 a law of the utmost importance to the mining industry was passed. It set the stamp of governmental approval on mining by declaring that all mineral deposits on land belonging to the United States were open to exploration and purchase. The law of 1872 also brought out and confirmed the extra-lateral right, and which, as interpreted by the federal courts, gives the owner of a lode claim the right to follow the vein wherever it goes. Around this point, which includes the "apex" of the lode, have been waged furious wars, wreaking ruin on many and enriching mining lawyers. For over a generation this has gone on. The time has arrived for a federal mining code, which, as distinguished from a lot of loose ideas on a little understood subject, shall be a clear, terse, dignified creation and compilation of national governmental mining requirements commensurate with the importance of the subject regarding which it enacts.

Trans-Pacific Trade.

With the Russo-Japanese war over there is general expectation of increase in demand for all kinds of American machinery. So far as Japan is concerned such expectations should not be too sanguine. The Japanese are as wily in the arts of peace as of war, and their standards of commercial morality are different from those of Aryan stock. They have bought American machinery, but only to copy it wherever possible, and whenever practicable they have merely used their purchase as a model and made no more purchases, faithfully or faithlessly copying what they had bought. Little matters like patents, or trade marks, have not stood in the way. Their commercial value is recognized, but there is usually no recognition of ownership rights therein on the part of many Japanese purchasers. An air compressor or steam boiler, a motor or a band saw, are of primary value to them and exactly reproduced, with the name of the maker, date of patent, as in the original. Such infringement of rights in other countries would invite suit for damages, but the Japanese manufacturer is immune in that regard and boldly appropriates the product of American brains with no acknowledgment of any obligation on his part. Of course such procedure is inimical to expectation of increasing trade. Japan expects to modernize her mills and shops and then compete with America for Oriental business. Her success in that direction will be proportional to her ability to furnish raw material. It would seem that for the next few years there should be good business for American products in Russia and China, where exists tremendous possibilities of demand.

It is manifestly the intent of Japan to make herself as independent of other nations as possible. She possesses considerable coal and copper, but little gold or silver, and less iron, being particularly poor in that basic requirement. For her deficiency in natural resources she will attempt aggrandizement in Corea and China, where late events give her prestige. To China especially will she be likely to look, her ultimate idea being to furnish the engineering there that will utilize that country's mineral resources to the profit of Japan. Japanese engineers are in some particulars as superior to Chinese engineers as they are inferior to American engineers, an inferiority that they hope to overcome. In this regard may be noted as characteristic of Chinese engineering that it is fairly successful along static lines, but a failure in anything that involves motion. Whatever in China has to do with the work of moving men or merchandise is rude and primitive, but their fixed structures evince a higher order of talent. The subtle Japanese hope to absorb the ability of the West to build up a vast Eastern empire and dominate the Pacific.

THAT "you can't run a mine on jawbone" has long had almost the moral force of an axiom, but the narration from Barkerville, B. C., on page 207 goes far to disprove so self-evident a truth in the particular case cited. Contrasting the usual with the occasional, it is to be said that the circumstances certainly were unique, but the statements carry the stamp of truth sufficient to warrant their publication.

American Mining Congress.

There will be a convention of the American Mining Congress at El Paso, Tex., on November 14, 1905, and continuing one week. This organization under different names has led a precarious existence for several years from its inception in Denver, Colo., in 1897. In so far as it aids in any way in the development of the mineral industry of the nation, it is deserving of commendation and support. Its utterances are sound, its declared intent deserves endorsement, and the principles it advocates are of a worthy nature. It has at times been left largely to its own devices, and has not always earned or deserved the dignity and respect that are necessary for the best results from such an organization. Like all similar societies it is just whatever the American miner pleases to make of it. If he go as a delegate to its conclaves; if he contribute with voice and purse to its support; if he take an active interest in its life and welfare, it will flourish. If he neglect it, it will languish. There is a certain field that it or some similar organization could fill with dignity and advantage to all. There is reason for the continuous successful existence of a society having for its sole object the advancement of the mining industry of the country, and so far as it aims toward such high ideal it is worthy of commendation and active personal support. There are several matters affecting the mining industry that might be aided at the coming session of the Mining Congress. Among them are the present need of a cabinet department of mines and mining, with a cabinet officer in charge, as in coordinate departments of the Federal Government. This is so plainly an existing necessity that it requires no argument. Another is the revision of that jumble of statutes known as the United States mining law. Now that ex-United States Senator Stewart of Nevada is relegated to private life, one of the legislative blockades has been removed. While he was in the United States Senate, "senatorial courtesy" enabled him to kill any attempt to simplify or modernize that maze of cryptic mystery—the "federal mining law."

Another matter, though not of such pressing import, is necessary provision by law of method whereby accurate statistics of the production of precious metals shall be secured by the Government. We have an effort in that direction now, but it is largely guesswork. The director of the Mint gives out annual estimates made up as best he can, but they are usually susceptible of successful contradiction. So far as mint receipts go, the statistics are fairly accurate, but a law requiring each transportation company by land or sea receiving bullion to demand from the shipper a certificate of the smelter or assayer, showing the contents thereof in gold, silver and other metals, the consigner, consignee and money value of each metal and that such certificate be immediately deposited in the nearest mint or government assay office to be forwarded to the Philadelphia mint, would appear to be a salutary measure. Supplementary calculation of such items as had been already reported from other smelters and their elimination from the sum total would tend toward final accuracy. The suggested certificates should show in all cases whether the bullion came from the original producer or from a mill or smelter. With such additional data at his command, the director of the Mint could very closely approximate the annual yield.

THE season is almost over for this year in which isolated mining camps are most threatened by fire, but there exists another deadly menace to life in many mining districts in the existence of so many uncovered prospect holes and abandoned shafts. True, there are many State laws and local enactments, regarding those deadly pitfalls and the commonest promptings of safety and humanity almost universally impel prospectors and mine owners to heed such requirements. But carelessness and callousness exist, and scattered throughout the mining region are myriads of man traps. Any one who reads all the local papers every week will note with regret the many fatal accidents resulting from unguarded walking where such deadly holes abound. It is a homely subject, but one of great importance. Often there is an ineffectual or thwarted effort to overcome the danger by covering the hole with poles or planks, but where such covering is stolen for firewood or other use, the condition is worse than before. Holes made in the course of assessment work seem chief among the causes in such fatality. The better way to do is to fill up the abandoned opening. Human life is not so cheap that it can be unnecessarily sacrificed, and the subject is one of sufficient personal import to make every miner who reads this remember that prevention of disaster is not so much a silent precept as an active duty.

Handbook for Metallurgists and Metal Miners.

The mining superintendent of to-day is called upon to meet the same fundamental problems as was his predecessor of yesterday, but in the meantime each of these problems has been complicated by the introduction of new aids and obstacles that were unknown in the past. Within the last few years the development of great forces has been coincident with the development of great mines, and modern mining requires methods and machinery unknown in the past. Great progress has been made, not only in the power, but also in the vehicle for the transportation of material, both underground and on the surface. While the fundamental principles of prospecting, drilling, blasting, timbering and development are the same, yet they have been so amplified by recent experience that ignorance of the new methods becomes a serious handicap to successful progress.

To intelligently cope with all these problems requires a knowledge of the principles and applications not only of mining, but also of mechanical, electrical, civil and chemical engineering. These being understood, an engineer meeting a problem involving their application, looks up how some one else has solved a similar problem, and then modifies such solution to meet the needs of his own problem. Instead of wasting time and thought in devising an original method, he applies the combined experience of others to his own case, modifying it to meet the new conditions. He profits by the mistakes of others and is often saved from making a costly mistake himself.

But this requires an extensive and expensive library of current engineering literature. By necessity the average mining man is a nomad. He has little opportunity or inclination for accumulating and less for transporting such a library. To meet this deficiency various "handbooks" have been devised to give a portable yet comprehensive collection of facts and formulæ; and to-day the civil engineer can ill afford to be without his Trautwine or the mechanical engineer without his Kent.

But it is believed that no single suitable handbook has been written for metal miners and metallurgists. A mining engineer is compelled to get a number of handbooks, each designed for a single class of which he is not a member. Such books necessarily contain much material not pertaining to mining, and they also omit much that is essential to the miner for a proper understanding of the context, but which would be a useless repetition to those familiar with the field. In the aggregate these give an excessive bulk and even then are deficient in many of the most essential subjects.

It seems that a handbook might be written to meet the demand above indicated; a book in which the fundamentals of each engineering branch are lucidly and compactly treated, omitting all the specialized detail except that which is applicable to the field of mining. It would also, perhaps, be well to include an account of metallurgical practice in all its branches, giving a metal miner's and metallurgist's handbook designed for those interested in gold, silver, copper, lead and zinc mining.

To be successful such a book should not be written by one individual, but should be made up of the suggestions of a great number, so as to be of value to all classes of mining men. The work should be under the direction of one having a good knowledge of engineering in general, but understanding that the elementary phases of each should be treated as well as the more advanced. His duty would be to bring the work of specialists within the range of the users of the book, his work to be subsequently revised by the specialists for the correction of errors and omissions.

Every mining man should be willing to help the common cause by suggesting and contributing subjects that in his estimation would be of value to the handbook. This is not written with the idea of merely suggesting a need, but with the intent of filling that need, and it seems that such a work could be profitably preceded by discussions from mining men in these columns.

IN mining and scientific progress few phases are more noticeable than the ease and swiftness of communication as compared with the slow and painful transit of a few years ago. The railway and motor car are doing much for mining development throughout desolate mining regions. Places to which it took days to travel can now be reached in as many hours with a minimum of discomfort. The automobile is greatly in evidence, in the mining world no less than in other fields, and is of prime value. The man who at one period paid 35 cents a mile for a seat in a back-breaking buckboard at a 5-mile-an-hour gait across a Nevada desert finds reason for contrast between past and present in the ease and swiftness of a 20-mile-an-hour automobile jaunt over almost the same region. To associate the prospector with other than the burro, the bacon, beans, flour and frying pan would seem like a severance of indissoluble ties, but it is within reason to believe that to the prospector no less than to the mine owner or mining engineer the automobile will prove of inestimable value. In the mountains everywhere are found the best of natural roads and that the motor will displace slower and more cumbersome means of locomotion is manifest. And this, too, not only for passengers, but for freight service. In this way the automobile will make mining property more valuable in securing cheaper access. This marks a change in accord with the advance in mining and scientific methods. Visitors to mining camps now pass swiftly in palace cars across the way that is ofttimes blazoned with the bones of those who perished on former toilsome journeys through the same region.

THE making of a mine and its development from a prospect to a dividend-paying proposition is usually accompanied by numerous reminiscent remarks, as the stock ascends in value, from those who "could have bought that stock" for as many cents as it now costs dollars per share. "To the victors belong the spoils," and to the man that takes chances belongs the profits that immediately come from the advance in values, and the likelihood of a steady income if the mine shows promise of permanence. This is as applicable to any other form of investment or mode of business as mining. There are as many ups and downs in merchandising or manufacturing as in mining, and, contrary to the usual opinion, while the risks are no greater in mining than in many other business investments, the chances of profit are immeasurably greater.

THE great and growing demand for tin, and its comparative scarcity, makes the Alaska tin ore deposits of exceptional value. The scanty tin yield of Temescal, Cal., and Tinton, S. D., have hitherto been this country's sole contribution to the world's tin supply, which in 1904 was 92,243 tons, being 2512 tons less than the tin consumption of the world for that period. The cassiterite deposits near Cape Prince of Wales, Alaska, are found in an area 10 miles by 25, and are being taken up under the United States placer mining laws. Recent assays are reported to show from 50% to 75% tin. A railroad is projected from Port Clarence, 40 miles south, to the newly discovered tin mines.

THE annual report of the American Smelting & Refining Co. is of material interest from the magnitude of its operations and the position it occupies as to possibilities of profit or loss in connection with the laws of supply and demand. The report shows that for the year ending April 30, 1905, the net income, after deducting $3,500,000 for the 7% dividends to which the preferred stock is entitled, was $4,118,912. The company's present prosperity is partially occasioned by rise in the price of silver and lead. It is also ascribed to increased economy of operations and improved methods. Dividends for one year to the amount of $8,898,811 certainly show the profit and possibilities of such consolidation.

CONCENTRATES.

AIR released from a pressure of 100 pounds will expand four and one-fourth times its volume.

A 10-FOOT head of water would give an approximate pressure of 4⅓ pounds per square inch.

THERE is no metallic zinc mined in Mexico. Zinc is now being shipped from Wallace, Idaho.

IN constant regular work a "horse power" may be considered as equal to the work of eight men.

THE weight of a steel pipe 20 inches in diameter, 150 miles long, ¼ inch thick, would be 41,600,000 pounds.

LEAD went down in price to 2.9 cents per pound in August, 1896. In March, 1877, it was 6⅝ cents per pound.

GREEN lumber will weather season better and quicker if a hole be bored through it lengthwise, and it will also add strength to the stick.

THE green coating on the copper mill plates is a hydrated oxide of copper, and is removable by ammonia, dilute acid or cyanide of potassium.

CARBON DISULPHIDE is usually made by passing the vapor of sulphur over red hot carbon. It boils at 47° C., and when mixed with air the vapor forms an explosive compound.

TELEPHONES are a valuable adjunct in extensive mine operations, being of sufficient economic importance to warrant general use, and any large mine or smelter can find profitable use for them.

SINCE the advent of oil as fuel the coal question of free or duty paid is of secondary importance in California. The coke consumed in California comes from British Columbia, Australia and Antwerp.

IT is permissible to use other mining claims to designate boundaries of a mining claim in locating it, clear reference to natural objects and permanent monuments sufficing to comply with the statute.

IN the casting of brass the pattern should be slightly larger to insure the proper dimensions. The shrinkage allowance on patterns for casting brass is $\frac{3}{16}$ of an inch to the foot in length or diameter of the pattern.

THE apex of a vein is not necessarily a point, but often a line of great length, and any portion of the apex on the course or strike of the vein found within the limits of a claim is a sufficient discovery to entitle the locator to obtain title.

THE latest best unbound work on stamp milling and amalgamation of free gold ores is considered to be the article written for this journal by the late Dana Harmon, and which appeared in the issues of Jan. 17 to Feb. 21, 1903, inclusive.

CRIPPLE CREEK, COLO., is now producing about 75,000 tons of ore per month. Of this about 45,000 tons are chlorinated, 12,000 tons cyanided, 18,000 tons smelted. In the chlorination process the cost averages $3.25 per ton, with a 90% extraction.

WHEN a boiler is to be laid up for some months it should be filled to the safety valve with water at boiling heat, when all air will be expelled from the water, closed to keep out air from the inside and so covered as to also keep out air from the outside.

A PLACER patent includes with it all lodes not known to exist at the date of application therefor; but if a lode was discovered within the placer location limits before such application it could be located, and the placer location to that extent would have to yield to it.

THERE would seem to be some merit in the suggestion that the Siberian black sands be smelted and the gold recovered in metallic iron, but the idea has not been brought to a definite conclusion. Pyritic smelting is practiced in the Altai mountains as elsewhere.

PAHANG, in the Malay peninsula, is reported to contain immense deposits of tin and gold-bearing drift, but which can only be worked profitably by dredging and hydraulic elevators, the details of the work, of course, only determined by careful and thorough investigation.

THERE is no trouble about constructing a wave motor; they are built right along; the trouble is in getting one to develop power. A motor operated by the waves of the sea will deliver power in an intermittent way, but to develop power as a commercial proposition is a different matter.

IN a case of poisoning by phosphorus, sulphate of zinc in 10-grain doses, dissolved in water and given at intervals of ten minutes till vomiting ensues, is the best antidote. A half-teaspoonful dose of old turpentine is also recommended. No oil of any kind should be administered.

STEEL is an alloy, and a very complex one. Alloy steel is that to which other metals have been added to improve its natural properties. Pure iron may be classed among the "rare metals," and not a pound of pure iron has been made under ordinary smelting conditions.

WITH coal at $6 per ton and fuel oil at 80 cents per barrel, delivered, the latter would represent a substantial economy in mine and smelter work. A matteing furnace which would need a ton of coal for every three and three-fourths tons ore should smelt a like quantity with four barrels oil.

CONSIDERABLE of the sulphur used in the eastern United States comes from Sicily at very low freight rates; the cost of transportation usually precludes profitable working of Pacific coast sulphur deposits; makers of sulphuric acid import considerable sulphur from Mexico and Japan.

IT is not unusual to find the upper levels of a mine wetter than the lower levels. Several gold mines along that part of the gold belt of California extending through Amador and Calaveras counties are of that nature, notably the Kennedy of Jackson, Cal. The Lake Superior mines are dry to their lowest levels.

AN atom is the smallest particle of an element which can exist, and it cannot be divided by any means either chemical or mechanical. Every atom of a given element has the same weight, but the atoms of different elements have different weights. The lightest atom is the atom of hydrogen. The heaviest is uranium.

ORDINARILY the Purple-of-Cassius test, of such value in gold chlorination works, is of little avail in cyanide solution, the purple coloration not appearing. If, however, the cyanogen present is got rid of by oxidation or otherwise, the purple color will show with the same delicate clearness as though pure solutions were used.

THE percentage of antimony in hard lead may be very closely estimated by determining the specific gravity. Hard lead consists chiefly of lead and antimony with only small percentages of impurities, and, theoretically, the specific gravity of the alloy should vary according to the proportions of lead and antimony.

AT the United Verde copper mine, Jerome, Arizona, the ore averages 6½% copper. It carries from 15% to 32% sulphur. When heap roasted, such ore is piled 3 feet high on 8 inches of wood, which, being ignited, fires the sulphur on the ore, that burning from five to eight weeks, when the now desulphurized ore goes to the furnaces.

IF the battery screen be inclined outward at the top it will greatly aid the discharge. Strips of ¾ inch wide of $\frac{1}{32}$ inch rubber sheet packing between the tin and wood frame will double the life of the tin screen. If, before using, the tin is burned off before a clear forge fire—just heating to redness—it will anneal and toughen the iron.

BY a miner's inch in Colorado is known that volume of water which is discharged through 1 square inch of an aperture which is 2 inches high and 4 inches long, cut through a plank 1.25 inch thick, the lower edge of aperture being 2 inches above the bottom of the measuring book, and the upper edge 5 inches below the level of the water.

IN South Africa, as elsewhere, the "cheap" miner, that is the low-priced peon, is often found to be the dearest. The Chinese are plodding and patient and in surface or shallow work can be used, but even in such cases a white miner is worth three Chinese, and wherever skilled work in mining is required there can be no comparison.

THERE are two universities within 30 miles of San Francisco, Cal., the University of California, with about 3500 students, and Leland Stanford, Jr., University, with about one-half that number. They both have excellent mining colleges and equally excellent colleges of mechanical engineering. The cost of attendance at either need not exceed $500 per annum.

AT GUANAJUATO, MEX., a 60,000-volt transmission line carries about 3300 electric H. P. 100 miles; one 60,000-volt circuit transmits 13,000 H. P. 147 miles in California, and another transmits 15,000 H. P. 142 miles; two 55,000-volt circuits carry 10,000 H. P. 65 miles, from Canyon Ferry to Butte, Mont. These are but a few isolated instances of long-distance electrical transmission.

RED LEAD is usually tested by oxalic acid and sugar. A much finer way is: Take 2.5 grams red lead, treat with 20 c.c. dilute nitric acid, and shake. The red lead will be converted into the oxide, oxygenated water to be added while shaking. If the red lead be free from barium sulphate, sand or other impurities, a solution almost limpid will be obtained in three or four minutes.

MILL PLATES are silver plated by the electro-plating process. A solution is made of the requisite proportions of cyanide or chloride of silver, cyanide of potassium and water. The copper plate is thoroughly cleaned, immersed in the solution and attached to the negative pole. The silver sheets (anodes) feed the solution, and the silver is deposited on the plates, as the solution, being a conductor of electricity, permits the current to pass through the anodes to the copper plate.

THE amount of air required by a rock drill depends much on the make or design. It is commonly estimated that a 3-inch drill will consume about 15 cubic feet of air per minute, compressed to a pressure of sixty pounds. A 3½-inch drill will use about 20 cubic feet per minute. These figures, which are about a general average, may be used for choosing a compressor which is to operate drills at sea level.

IN the case of Tyson vs. Beill, 70 Pac. Rep., 791, the Supreme Court of Idaho held that where parties enter into a written contract for a lease with option to purchase placer mining claims, the details being given, that such contract cannot be defeated by showing an oral agreement not made subsequent to the signing of the written contract, no fraud or mistake in securing such contract being alleged.

COLORADO quartz mines start in in altitude about where California quartz mines leave off. The bulk of California quartz mines are from 2000 to 5800 feet above sea level. The most of Colorado's quartz mines are above the 8000-foot level, none below 5500. The highest quartz mine in Sierra county, Cal., is the Oakland, 7400 feet above the sea. There are quartz mines in Colorado operated at a height of 13,000 feet.

STATEMENTS made by a party as to the value of goods when selling them where no confidential relations exist between him and the buyer, and the property can be seen and inspected by the latter, are considered as mere seller's statements, and furnish no ground for an action for damages for false representations, as such statements do not relieve the buyer from responsibility of investigating for himself before purchasing.

A BOY of 17 is not too young to enter an engineering school, though he could better grasp the requirements of the course were he a year older. It is not the most brilliant or showy student that always makes the best engineer, the chap who has to "dig" and acquire knowledge slowly often developing into the most trustworthy engineer. In its commercial application engineering is the art of making a dollar earn the most interest.

TIN ore exists in southern California, South Dakota, Texas and Alaska, but for a variety of reasons is not yet being mined in a commercial way. In the Federated Malay States is the greatest present annual production. In Bolivia, South America, a production of 8000 tons and in Australia an annual yield of 3000 tons are reported. The cost of production varies. In Cornwall, England, at the Dolcoath mines, a ton of black tin now costs from $275 to $400.

FIRE CLAY is acid, and when a basic furnace lining is required, dolomite (magnesian limestone) is used. It consists of carbonates of magnesia and lime, from which the carbon dioxide is driven off by calcining. The resulting mixture of magnesia and lime has little coherence, and hence it is coarsely ground and mixed with tar into a plastic material, which is formed into the furnace lining. Heating then cokes the tar and it becomes a cement for the magnesia and lime.

THERE are several welding compounds for steel and iron. One recommended is: Iron filings, 1000 parts; borax, 500; balsam copaiva, 50; sal ammoniac, 75. Mix, heat and pulverize. Another is made thus: Borax, 5 pounds; sal ammoniac, 1 pound; prussiate of potash, ½ pound; resin, ½ pound; alcohol, ½ pint; water, ½ pint; iron filings, ½ pound. Melt in iron pot over gentle fire; allow compound to boil a few minutes until it becomes dry and charred, then pulverize.

SOUTH AFRICAN mining engineers calculate that with a mean temperature of 68° F. at 1000 feet, the rock temperature at a depth of 8000 feet would be 102°, and at 12,000 feet about 122°. In the lower levels of the Comstock, Nevada, a temperature of 170° F. was frequent till ventilating connections were made, when the heat was reduced from 30° to 40°. Detailed discussion has elicited a general belief in the practicability of deep mining in the Transvaal being carried on successfully at a greater depth than 6000 feet.

IT would be impossible to say how much salt there is in a boiler at any given time except by a test with a salometer, or by a boiling test. Sea water boils at atmospheric pressure at 213°, and saturated sea water at 226°. The amount of salt remaining in the boiler depends upon the amount of water that the boiler has evaporated and very slightly on the density of the water. To keep the water in the boiler at a certain density it must be blown down sufficiently to secure that result, the quantity or amount blown down being proportionate to the amount evaporated.

VARIOUS colored cements can be produced by incorporating certain metallic oxides or metallic salts directly with the ground raw materials used in the manufacture of Portland cement, and then burning the resulting mixture in the usual manner. A small quantity of chromic oxide added to the raw cement mixture

will produce a green colored cement; oxide of cobalt will give a blue, varying in intensity according to the quantity of metallic salt added. Oxide of copper will yield a peacock, or blue-green, cement; a small quantity of oxide of iron, oxide of manganese and oxide of cobalt, in almost equal proportions, will produce a black cement.

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IN feeding ore to a furnace the fine ore should be thrown against the sides and the coarser in the middle to neutralize the natural tendency of the material in being shoveled up, where the fine will tend to go to the bottom and the center, while the coarse has an equal tendency to go to the top and the sides. Thus, when flung from the shovel, the coarse will go farther than the fine and land beyond it. It may be noted that in a conical heap of ore formed by shovelfuls the coarser particles of ore will tend to roll to the base and the finer will stay near the top.

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FIGURES giving in detail the cost of mining and milling free-gold ore have been given repeatedly from special data furnished by experience in Colorado, California, Alaska and South Dakota. In the San Juan district, Colorado, in mining and milling 54,000 tons of ore, among other costs it was determined that the powder used cost 11.8 cents per ton of ore; fuse, 1.87 cent per ton; caps, .081 cent; candles, 4.43 cents; steel, .30 cent; stoping, 1.22 cent; timbering, 47.45 cents; crushing, 8.98 cents; stamping and amalgamating, 27.27 cents; cyanide treatment, including tailings, 70.25 cents.

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IN making malleable castings, white cast iron—that is, iron with all the carbon in combination—is melted and cast into the required forms. These castings, which are hard, weak and brittle, are packed in cast iron boxes in the midst of coarsely powdered oxide of iron, usually hematite ore or hammer-scale. These boxes are sealed and exposed to a temperature of full redness in a reverberatory oven for from three to six days. They are then slowly cooled down, and the cast iron is found to be changed to something that is very much like wrought iron in strength, ductility, resilience and softness.

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AN excellent way to lay up a cam shaft pulley is to have the boards radiate from the hub and to extend full length from hub to rim. Another way is to lay the boards transverse to the shaft. It will be found, however, that in operation the strain of the belt and the jar tend to make the transverse boards work, until in a short time the rim boards drop or give at every revolution of the pulley. Where the boards radiate from the hub there will be no such drop. In the one case dependence is placed upon the nails and bolts keeping the pulley in place; in the other one has the full strength of the fiber of the wood.

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MOLYBDENUM alloys are used for a variety of purposes, combining with steel and other metals for industrial use. Molybdenite, the ore from which molybdenum is produced, is scattered widely throughout this west half of America, in California, Arizona, Nevada, Washington, Utah and elsewhere. To be of much value it must be free from copper and carry 50% or more molybdenum. If it assays 55% it is worth approximately $300 per ton. Metallic molybdenum is worth about $1.70 per pound. Any large steel works can give exact reply as to the likelihood or terms of purchase of the ore. The treatment of the ore cannot be more than a concentration at the mine; the metal is produced at the metallurgical works, where the ore is bought by assay.

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THE roasting of sulphides has a three-fold effect. It occasions an alteration of obnoxious compounds into indifferent ones; it removes the sulphur and the ore grains become porous, and the fine gold and silver particles become accessible to solvents; there is also occasioned a certain amount of fritting of the fine ore grains, which allows more rapid leaching afterward. If roasted "dead," the effects will be different. The last-named point would be the same; but, instead of insoluble oxides, there would be a mixture of sulphates and oxides, as well as undecomposed sulphides, and hence a less porous product. If one could transform all sulphides into sulphates at the same time, little could be said against adopting such a method preparatory to cyanidation.

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THE mining statutes of the United States require a locator of a mining claim to disclose a vein or lode of ore in place, but do not require that he sink a 10-foot discovery shaft. If he should sink a shaft to any depth required by the local or State or Territorial laws, and then mark his claim and record it according to law, even though he found no ore in place in his discovery shaft, and afterward discovered ore in place in another part of the location, such discovery of ore has been held to cure the defect of not finding ore in place in the discovery shaft, and the claim was adjudged as good and dated to the time of original location. This will not apply to cases where any second locator has obtained conflicting territory by location between the dates of the first location and the discovery of ore in place.

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THE assay ton has been repeatedly explained. One pound, avoirdupois, equals 7000 grains; 2000 pounds equals one ton; so that there are 14,000,000 troy grains in one ton, avoirdupois. There are 480 troy grains in one ounce, troy; hence, by dividing 14,000,000 by 480 one gets 29,166 troy ounces in 2000 pounds avoirdupois. Ore is weighed by avoirdupois weight; gold and silver by troy weight. In assay work, by taking as many milligrams of ore as a ton contains ounces, every milligram of gold or silver extracted is equivalent to an ounce to the ton. In one assay ton (A. T.), there are 29,166 milligrams. Hence, by taking one assay ton of ore, one milligram of gold or silver extracted equals one ounce troy to the ton of ore. That is, 2000 pounds is to one assay ton as one ounce troy is to one milligram. Weighing by grains, the assay ton contains 29,166 grains; hence one grain of gold or silver extracted equals one ounce troy to the ton of ore.

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THERE are miners' associations in California, Oregon, Idaho and British Columbia, each with substantially the same intent, viz: to advance the general good and protect and foster the industry. The California association of late has been more technical in its tendencies than in former years, and the British Columbia association still debates and resolves. The Oregon and Idaho associations are solely protective in their present tendencies. The Colorado association is composed almost entirely of mine owners and operators. The chief danger in any such association is that it be left to its own devices and be liable to seizure by those who would use it for the furtherance of their own private interests. Whether a Montana miners' association would or would not prosper, "Concentrates" is not prepared to say; but it would seem difficult there, were such an organization perfected, to keep it out of politics.

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THE price of the platinum found in the California, Oregon and British Columbia sands varies considerably from the quoted price of pure platinum, just as the price paid for placer gold varies with the fineness or freedom from impurities of what is offered for sale. True, pure gold sells for $20.67 per ounce, and platinum for $20, yet gold will run as low as $13, and platinum as found in these sands as low as $9. The platinum as found nearly always carries iron, iridium, osmium, etc., either in separate grains or usually as a natural alloy, and while the osmium or iridium, if separated, could be sold at high values, yet it requires skilled apparatus to so separate them, and their existence is a detriment instead of an addition to the value in such shape. Native platinum and platinum in place have been apparently authentically reported at various times, but "Concentrates" is not prepared to affirm the known existence of platinum in situ in rock in this country.

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THE connection of cause and effect in the case of magnetism and electricity gives rise to the energy produced by and in the electric motor, occasioned by that result of magnetic influence called induction. If a magnet be moved about in the vicinity of a coil of wire whose ends are connected to a means for measuring the passage of an electric current, it will be found that a current of electricity will be generated in the wire of the coil, and that it flows only when the magnet is being moved nearer the coil; and also that as the magnet moves toward the coil, the current flows in one direction through the coil, and as it is being pulled away, the current flows in an opposite direction. By suitably arranging a set of coils and magnets in such a manner that the coils pass in front of the magnets, there can be generated strong currents of electricity. It is by reason of this fact, and primarily on such plan that all dynamos and generators are operated. The ordinary method is to so mount an electro magnet (called the field magnet) that there is a break in the magnetic circuit, across which the lines of magnetism will pass in completing their circuit. In this gap in the magnetic circuit, an armature, consisting of a number of coils of insulated wire mounted on a shaft, is revolved by means of power applied to it. As these coils of insulated wire move through the lines of magnetism, currents of electricity are generated in them which are carried away from the armature for the varied uses of power, light, heat, etc.

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THE principal cause of corrosions in boilers is the presence of animal or vegetable oils in the feed water. Most of those oils are composed of glycerine chemically united with acids. When heated they separate into free glycerine and free acid. This decomposition takes place at a temperature of about 2200° F. This is the temperature of steam having a pressure a little above that of the atmosphere, showing that such oils are not safe in even low-pressure boilers. In the case of the liberated acids they attack the boiler plates until they have corroded and carried away an amount of iron equal in weight to the glycerine they have given up. The result of this chemical action between the iron of the boiler and the acids of the oils is a compound that either falls to the quieter parts of the boiler or sticks to the sides of the shell, a sticky black grease that must be removed by mechanical means. Neither common salt nor sulphate of lime are corrosive, but chloride of magnesia is, the hydrochloric acid in the latter when set free attacking the boiler where lime is present, it and the chloride of magnesia also reacting on each other, producing, among other products, carbonic acid. The form of local corrosion known as grooving makes its appearance at the edges of the plates where they come together to form a riveted joint. Grooving is always found on flat boiler heads next to the circumferential seam that joins the heads to the cylindrical shell, and around the points where the through stays are secured to the heads. The cause of grooving is that the boiler material first corrodes to a uniform depth at nearly all points, and then the alternate expansion and contraction causes the protecting layer of corroded iron and boiler scale to crack off at the line of greatest flexure, which is close to the riveted joints and around stays, because the stays through the heads and the double thickness of metal at the joints cause a greater stiffness of the shell at these points, and this results in a concentration of the bending along a line adjacent to the rigid portions. The parts thus uncovered are again attacked, and the above series of operations repeated.

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UNDER no circumstances should any one not an expert attempt the manufacture of nitroglycerine, and even if thoroughly understanding the details of its manufacture no move should be made toward combining its constituents unless the operator has all the needed requirements to reduce to the minimum the ever present danger of destruction. In making it the nitric and sulphuric acids are first mixed, the pure colorless glycerine poured in, in a fine stream, the acids stirred while they boil and send out thick red vapors of gas. If the glycerine is poured in too fast, or the water in which the jars set gets too warm, the mixture will blaze with a blowing noise, and if it is not stirred fast the blaze will shoot up 3 or 4 feet. The mixture is kept stirred with a glass rod until the action becomes less intense. Each jar is stirred in turn as glycerine is added, with a good current of cool water running around the jars, until the jars have each had some glycerine. Then that work is begun over again at the first jar, and so kept up till no more action takes place and no more fumes are given off. When all is quiet, and as much glycerine taken as the acids will convert, the nitroglycerine will be in the bottom of the jars, like a milky, heavy, oily-looking fluid. Then the acids are poured off, and it is washed with water, for nitroglycerine is insoluble in water. An old-fashioned wooden churn with a dasher is good for that kind of work. After most of the acid is washed out, and poured out of the jars, the nitroglycerine and acids left can be poured into the churn, water then dipped in, and the churn briskly operated; the wash should be so thorough that litmus paper will show no reaction. One should continue to keep on putting in more water and churning and pouring off, for on the freedom from all acids depends the safety and keeping quality of the nitroglycerine. When the churning is done the stuff is poured into a wooden bucket, and it is ready for use, looking milky, with a little clear water on top. After two or three days the milkiness disappears, and the nitroglycerine looks clear. If it grows yellowish it shows free acid, and should be churned some more with clear water. If it becomes orange colored some lime or soda should be put in the churn. If it begins to look deep orange or cloudy it should be exploded at once, or poured out on the ground where it will not be dangerous. It is a most dangerous proposition from the start, and unless properly handled throughout, disaster is likely to result.

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SILVER is easily dissolved by nitric acid and converted into nitrate of silver, but this acid, if pure, does not attack gold. If the nitric acid contain chlorine, however, it will dissolve some of the gold, so that it is always necessary to test it by adding a little solution of nitrate of silver, which will render it milky, from the separation of the insoluble chloride of silver, if any chlorine be present. An alloy, containing two parts of gold to five parts of silver, is most suitable for this process. If it contain a larger proportion of gold than this, the acid will be unable to penetrate to the center of the mass, while if it contain more than three parts of silver to one of gold, the latter will break down to a fine powder, after the silver has been removed, by the action of the acid. With the proportion first named, the silver may be completely dissolved, but the skeleton of gold may be still sufficiently coherent to hold together unless it be violently boiled or roughly handled. Originally the proportion of three to one was employed, and the term quartation, or inquartation, applied to the process, was derived from this fact. The alloy, in a granulated state, is heated with twice its weight of moderately strong nitric acid (sp. gr. 1. 32), in a still made of platinum, glass or earthenware, connected with an apparatus for condensing the vapors of nitric acid which pass off. While the silver is being dissolved, a large quantity of the red gaseous oxides of nitrogen are evolved, resulting from the action of the silver upon the nitric acid, and when these are no longer perceived, the silver is known to be dissolved. The still is then cooled, the solution of nitrate drawn off, and the undissolved gold boiled with a little more nitric acid to extract any remaining silver. It is then washed with water, dried, melted and cast into an ingot. The use of the nitric acid method of parting gold is practically confined to assay laboratories, where it is universally employed. In order to recover the silver from the nitrate, hydrochloric acid is cautiously added, so as to separate the bulk of the silver, as the insoluble chloride, leaving the nitric acid in the solution, which may be used again if care be taken to leave a little nitrate of silver undecomposed in the solution, so as to insure the absence of chlorine. The separated chloride of silver is washed with water moistened with sulphuric acid, and some bars of zinc or iron placed in it when chloride of zinc or iron is formed and dissolved, the silver being left in the finely divided metallic state. The rest of the zinc is taken out, the silver allowed to remain in contact with dilute sulphuric acid to dissolve any particles of zinc, then thoroughly washed with water, dried, melted, and cast into ingots.

Operating a Mine Without Money.

TO THE EDITOR:—Sometimes a miner with more luck than sense strikes it rich; sometimes mining is a straight, unobstructed short cut to fortune, but more frequently sense looms large in mining success. Often the miner meets difficulties sufficient to put his ability and courage to a supreme test. On those few occasions when Fate plucks a commonplace man from the bunch and thrusts him into ephemeral fortune and lasting fame the story of it travels far and becomes a classic. On the opposite hand, a man may accomplish the seemingly impossible in his fight against adverse fortune, and it follows as naturally as his tail follows a dog that the exploit attracts but little more attention than is accorded by those critical incompetents who predicted failure.

These remarks are introductory to the story of a unique example of pluck and fact in mine management. Although the facts related are well known locally, no reference thereto has ever appeared in print—from which it may be surmised that some men are better at doing a thing than bragging about it.

The Slough Creek Gravel Gold Co.'s deep channel placer is in Cariboo district, near Barkerville. The development of this channel was begun by the Slough Creek Mining Co., composed chiefly of Tacoma men. W. F. Sargeant was secretary and money hustler, and John Hopp was manager from 1893 until the present year. The development of a wet channel 287 feet deep requires a lot of money, so it happened that in 1895 the money stringency throughout the United States nullified Mr. Sargeant's every effort to sell stock, so he went to England and began negotiations in "the tight little isle," and finally succeeded in reorganizing the company with a goodly sum in the treasury. It was good work, but it was not quick work—the Englishman doesn't do business that way. He is the best man on earth to back a mining proposition when once you get him in—his word is good, he stays, his feet remain warm. But the wear and tear on a promoter's mind while the Englishman is being separated from his money on a mining deal is nearly hades. It must have been all that to Manager Hopp, who at this time for a period of two years kept the development work going steadily, without fuss, strike, or outward show of trouble, and without a dollar! There was no money to pay his salary, the wages of the miners, grub, tools—anything. I reckon it was the completest, longest stand-off ever put up by an incorporated company. It amounted to $25,000 or $30,000, which, of course, was promptly paid after reorganization. How was it done? I do not know yet, and I was here at the time. Obviously Hopp had entire confidence in himself, Sargeant and the mine, but how he could impart that confidence to all whom those thousands of dollars might concern is certainly a difficult thing to understand, for he is not a brilliant talker, and there is in him no spark of "that genius which your soul leaps to meet." For one thing, he was frank; everyone concerned knew as much about the situation as Hopp could tell him. Another factor was his long-headed foreman, Laurent Muller, now manager of the Willow River Mining Co. This sketch would be incomplete if it failed to mention other men whose loyalty made the work possible: S. A. Rogers and John Peebles, merchants; John Bowron, gold commissioner, and John Stevenson, sheriff and magistrate; miners E. D. Fargo (now accountant for the Cariboo Consolidated), L. D. Muller (now merchant and mine owner at Teller City, Alaska), Robert Fleming (now mine owner at Fairbanks, Alaska), James Shriver, Charles Moulton, Julius Hansen and Ener Enersen. Messrs. Sargeant, Peebles, Moulton, Hansen and Enersen have passed away. Good men and true they were.

I almost forgot to mention Ah Wah, the cook, who was one of the stayers. Imagine the nerve requisite for standing off a Chinaman to the extent of two years' wages!

I trust this sketch will tap other veins of reminiscence in the readers of your valuable journal.

HENRY BOURSIN.

Barkerville, B. C., Sept. 12.

Why Study Mining?

TO THE EDITOR:—Nothing is more difficult to correct in the public mind than its convictions upon education and special classes of training, when once fully committed to an error. Every one knows that for ages past all record, holes in the ground have been dug and mineral in varied forms taken therefrom; and yet, in modern times, certain people have foolishly thought that if men were specially set aside and trained for it, and were to devote their time, thought and energies toward a study of geological conditions, to the improvement in methods of mining, and to the treatment of metalliferous mineral, that mining would, in a productive and business sense, achieve a higher measure of success. As this fallacious notion grew and thrived, they established schools and colleges, instituted courses in practical training, sent their sons to them, spent thousands upon such education and special training, only to find out later on that it was, for them, just so many years and monies wasted.

For other pursuits and professions, of course, a special preparation is essential. No one would attempt to become a doctor, lawyer, banker, merchant, or, in fact, anything else, without a preparatory period of study and a subsequent period in which to acquire practical experience, or a combination of the two. But that it is being very generally accepted at last as wholly unnecessary with reference to mining, among the educated and thinking public, is evidenced by the many mining enterprises entered upon by individuals who have been, probably, fairly successful in other pursuits, and to whom the calling of mining appeals as one of attractive ease and profit and a larger measure of success, when backed by the sound business judgment which has distinguished them in their own chosen pursuit prior to their entry into the mining field. To them it is a matter of tolerant surprise that there should be deemed necessary anything like a training, technical or otherwise, to "simply run tunnels, drifts and crosscuts or sink shafts and winzes." This is the sum total of the necessary work. There are hammers, drills, powder, timber, hoists, etc., and labor. What could be more simple? Method of work and costs as against produced values are matters which must perforce regulate themselves. If the element of cost happens to predominate — well, nothing could alter that. It then, in a manner, becomes "all a gamble," and should never be permitted to rank as a legitimate business, needing special training, study or experience. Any one can mine. That 99 out of 100 enterprises so conducted fail early and miserably is no evidence of the business incapacity in this line of the gentlemen associated with it or any evidence of the desirability of the so-called technical assistance. It simply demonstrates the precarious nature of the mining business in its entirety.

The foolish advocates of professional miners would insist that it is only by reason of study and experience that so many properties of low tonnage value, for many years deemed utterly impracticable, are working profitably to-day; but better informed people know that it is just accident, and that they could have done equally well with such properties had it occurred to them to take it in hand.

And so the tinker, tailor, soldier, sailor, etc., will continue to cheerfully tempt fate in the assurance of their capability and wisdom in the simple matter of mining.

MINER.

Tucson, Arizona.

Ball Nipple Blast Connection.

TO THE EDITOR:—The old method of making blast pipe connections, its delays and annoyances are well known to managing metallurgists. Ever since the Bessemer process was adopted for converting, all connections were made by means of a short stuffing box and a canvas pipe rigidly attached to the converter. This necessitated the removal of all bolts whenever a coupling was made or broken. Time was thus wasted in unbelting from expanded metal.

L. H. Wheeler, superintendent of the F. M. Davis Iron Works Co. of Denver, Colo., has a device in which he uses the air pressure generated for the blast on its way to the converter, to actuate a piston of a greater diameter and area than that of the coupling and its contained surfaces. By this force a short pipe with spherical ends is propelled forward to a junction with a receiving cup or seat in the side of the converter shell, thereby making an airtight and secure contact and connection. One end of this connecting pipe is seated in a piston working in a cylinder formed by a horizontal extension of the blast pipe, the other end being seated as above. By means of a hand lever, the piston and connecting pipe are moved backwards and forward to and from the seats, thus connecting or disconnecting the blast from the converter shell. The ball finish at the ends of the pipe permits of motion in any direction, on the principle of a universal joint, thereby compelling a tight connection to be maintained, although the seats are not in line.

METALLURGIST.

Denver, Colo.

THOROUGH and systematic prospecting is not undertaken nowadays without employment of the diamond drill. Formerly these drills were a monopoly and could not be purchased at all, but had to be leased. Now, however, they are sold outright. Drills and plants can be purchased at prices ranging from $1500 to $5000. A plant once on the ground, it is ordinarily estimated that the cost of drilling averages about 10 cents per foot. The cost of a good hoisting plant and pump is as much as that of a diamond drill. It takes two men to operate a drill and at least that many to sink a shaft. A diamond drill will sink 40 feet a day in hard rock; two men will not average over 2 feet. The diamond drill takes out a core which will show just as well what there is at any depth down to 1500 feet as a shaft, and any number of holes can be drilled rapidly along the vein, so as to cut it at any desired depth down to about 1500 feet. When the diamond drill has demonstrated the fact that the ore is down there and in sufficient body, capital will go after it with a shaft in hot haste.

Summer School of Surveying.*

Written for the MINING AND SCIENTIFIC PRESS by CHARLES DERLETH, JR., C. E †

An examination of the booklet‡ entitled "Summer Session of the University of California" shows that all the University's summer work is not done on the campus at Berkeley. On the coast of the Pacific, 12 miles north of Santa Cruz, where Lyddell creek adds its waters to the ocean, is the Summer School of Surveying, a veritable engineer's camp, Camp California, which, during the session just past, was a village of sixty tents, housing 225 students and a faculty of six instructors, not to mention cooks and other help.

The summer school idea is growing rapidly in the United States. Technical or engineering schools feel the necessity most keenly. During the winter months engineering students have little time for out-of-door work and their practical surveying and mining and machine shop practice must in part, if done at all properly, come in the summer vacations. All our mining students are required to work in a mine at some time during their four years' course, and all mining students devote at least one summer to that work. All students in civil engineering and mining must go to the Summer School of Surveying at least once, while certain students in civil engineering taking the railroad and sanitary engineering courses are required to go two different summers. And so when one looks at the University's summer session prospectus, one finds, as already mentioned, the Summer School of Surveying.

All the large Eastern institutions have summer surveying schools. Some of these are older and more equipped with permanent buildings, but none are larger than Camp California, while the latter has the distinct advantage of lacking all permanent fixtures and being exactly like the roving camp of a railroad party which is locating a long length of track through a wilderness.

During the winter months the students devote themselves to theory and mathematical subjects which form the ground work of the true engineer's training, but at Camp California for two months each year practice is emphasized, always with respect for theory, however, and the young engineer is given a chance to measure his fitness and aptness for his chosen profession. The true engineer is neither the man who devotes all to theory and book learning, nor the so-called practical man who despises mathematics and respects only the rule of thumb, the tape and the hatchet. He is the well rounded scholar who knows to what extent to use his theoretical knowledge so that he may obtain in the quickest time and with the least labor results and designs accurate and strong enough for the particular purposes in hand and for the least expenditure of money. Such a man is not made in four years at college, but only after further years of study and experience; however, during his undergraduate career, the Summer School gives the budding engineer the first good chance to weigh theory and practice and the first principle of instruction at Camp California has always this end in view. While the student weak in theory is discovered at Berkeley, the man lacking in practicality is picked out in the Summer School.

SUMMER CAMP OF 1905.—The 225 students who attended camp this summer represented the freshman, sophomore and junior classes in civil engineering and the freshman and sophomores in mining; 158 of them reported for duty on May 18 and the rest on June 15. Previous experience has developed a complete code of rules for the conduct of the camp and these rules with field instructions, printed in pamphlet form, are distributed to the students before their departure for camp. Students who do not report on the right date or in the right year are fined, and all pay a regular fee of $10 to the University for the privileges of the camp, the use of instruments, and the benefits of instruction, a mere nominal sum which covers an extremely small fraction of the running expenses, which are mainly borne by the University. In the East, students in some institutions pay as much as $35 for similar privileges, which shows in this one way the great boon of our University to the sons of California. Each man pays an additional sum of $20 to the committee of the faculty in charge of finances. This amount covers all living expenses connected with the four weeks' trip and includes railroad fare to and from San Francisco. The University provides the student with a tent. Three to four students occupy a tent together. The camp provides for him a postoffice service and furnishes his meals and equips him with all the main instruments for field surveying. He provides all minor materials, his cot, roughing clothes and bedding, but these are sent in bulk for the class by the University authorities from Berkeley to the camp.

During the past session of May, June and July the camp was under the personal direction of Professor E. N. Prouty, who holds the chair of surveying and

*See illustrations first page.

†Associate Professor Structural Engineering, University of California, Berkeley, Cal.

‡This booklet may be obtained by addressing the Recorder of Faculties, University of California, Berkeley, California. A prospectus giving general information regarding the work at the Summer Surveying Camp may be obtained by addressing the Department of Civil Engineering.

railroad engineering at the University. He was assisted by five instructors: Messrs. C. Loring, J. P. Williams, E. A. Gibbs, H. R. Ebright, and Dr. J. C. Blair. These men each represented a special branch of instruction work and further assisted the director, as appointed, in the care and assignment of instruments, the sanitary arrangements, commissary department, meetings and lectures, finances and discipline. Dr. J. C. Blair acted also as camp physician and adviser in sanitary matters, which have been developed to a high and careful standard, a matter of gravest importance in so large a camp. Much credit is due this body of instructors for the efficient instruction at the successful camp season just closed, and the writer of this article, speaking for the home faculty of the College of Civil Engineering, takes great pleasure in making this statement.

THE FIRST DAYS AT CAMP.—Upon arrival at camp in stages from Santa Cruz on May 18, the students and instructors joined hands in the construction of a cook house, a wood house for sheltering instruments, a barn for horses, feed and storage, sanitary buildings and water supply, and in the pitching of nearly sixty army tents. This work is no small job and has proved to be, as already intimated, one of the most valuable experiences for the young men, for it gives them all the conditions of the actual establishment of a large camp on untried ground and all enjoy and profit by it. In Eastern summer schools these opportunities are often wanting, due to the permanent nature of the site and buildings.

FIELD PROBLEMS.—With these matters settled, the work of the school is planned, which has as its final object the making of a complete topographical map of Arroyo de la Laguna Ranch, a property of about 2500 acres, by the freshmen and sophomores; and the running of an imaginary railroad line by the junior class. All of this work is done in a most practical way and with complete organizations of parties so changed in personnel from day to day that every student gets a chance to be everybody from axeman and chainman to transitman and chief engineer. The results of the summer's work are carefully compiled and recorded and used in further studies the following winter at Berkeley.

THE DAY'S WORK.—The discipline is strict and each day's work carefully outlined. At 5:15 o'clock in the morning the rising horn blows, breakfast is served at 5:30 and field work begins at 6 o'clock. Dinner is served at 11:15 and work continued at noon. At 3 o'clock in the afternoon the work-day officially stops because little field work can be done with accuracy during the later afternoon due to the prevailing high winds from the ocean at this season, but so keen are the boys for their work that most of them devote the later hours till 5 and 6 P. M. to the office work of computation and draughting, which is done in their tents. Saturday is a half holiday and Sunday for rest. While the students find their days full and busy there is nevertheless much time left for enjoyment and it is at camp that good fellowship is formed and lasting friendships made. Some of the fondest recollections of an engineer's student days are centered about the rough and democratic life of the camp, and many a student owes many manly qualifications to his camp experiences. At night when the tired parties come tramping into camp there is always food and lots of it to appease the hungry appetites. Three Celestial cooks and an army of student waiters are kept busy satisfying the cavernous appetites of the boys. There is little difference between the three daily meals; hot bread, ham and eggs, beefsteak, milk, potatoes and vegetables, form the menu of nearly every meal. After supper the boys often collect about a camp fire with their songs and stories and all the good natured raillery of college camp life. Saturday afternoon often sees good ball playing. Sunday morning is "washday" in the surf and a mussel bake often fills the evening hours.

Four weeks spent in this way prove of inestimable value to all the men. They get a taste of the application of at least part of their theoretical studies; more than that, they learn to live with their fellows and feel the influence of obeying the chief of party and in turn being the master. But above all it is healthful and invigorating and all return to the city better fit to begin another hard year at Berkeley. The students invariably have a good word for camp and all feel the object of and the end to be attained by the Summer School of Surveying.

PROBLEMS FOR THE FRESHMAN CLASS. — A few words are not amiss as to the detailed procedure of the professional work:

For the freshman and sophomores[2] the object, as already stated, is a complete topographic map of a ranch of about 2500 acres. By parties of three men the angles of a net work of triangles covering the ground are read by repetition and direction methods with engineer's transits; all stations in the triangulation have their elevations determined with respect to a main bench mark on the ocean coast by running lines of levels with engineer's levels, and two base lines, at opposite ends of the ranch which are at the same time sides of the triangulation, are carefully measured with catenary tapes. Each party maps a part of the coast line by plane table surveying and ties it to the main triangulation, and then determines the complete topography of some assigned piece of the ranch property by running a closed azimuth traverse about it with a transit, assisted by plane table and level work for details and contours. Each party computes and reduces the entire triangulation system, starting with one base line and checking to the other, and maps its piece of coast line location and a part of the inland topography.

In all the work methods of checks and balances are used to insure accuracy for the final results, and at all times it is intended that the student shall appreciate the schemes of checks and balances and observe the general unity of the survey of which he is producing a part. Moreover, every student is cautioned to observe what degree of accuracy should be aimed at in each part of the work and to appreciate the degree of accuracy which may, with reasonable care, be obtained with any type of instrument or any given method. The actual completion of a survey of a given piece of land is one thing, but a just appreciation of precision and method and the value of time is another and much more important thing to the engineering student.

By observations of the North Star, Polaris, at elongation, each party determines the azimuth of some line of main triangulation, and the whole network of triangles is tied and checked to a nearby government monument.

Besides this main freshman and sophomore work, each party is given some special problems depending upon the remaining time available and the ability of the individuals. Sextant observations are made upon the sun at noon to determine the latitude of some station of the camp triangulation, and other observations of the same orb when off the meridian to determine the error of the watch and obtain the true time of day.

Special parties also find time to run township lines, to observe the sun for azimuth with solar attachment transits, and some of the mining students are given problems to locate mining claims or to stake out tunnel and mine shaft lines.

PROBLEMS FOR THE JUNIOR CLASS.—There were forty-four men in the junior class who took the railroad field work and they were divided into eleven parties of four men each. These parties were under the immediate charge of the instructors who devoted parts of their time to each of a number of parties, and all parties were under the general supervision of Prof. Prouty.

Each party locates a piece of line about 1 mile in length between two designated points. After a reconnaissance survey with hand level, clinometer, aneroids, pacing and sketch books, and a resulting rough map, the preliminary line is located by transit deflection angles with taping and levels on the center line and side slopes with clinometer. From this field work a preliminary map and profile are made and a paper location platted. A final line is then run from notes prepared from the paper location and adjusted in the field and cross-section notes for cut and fill are made. A computation of earth work in excavation and fill; a final estimate for the complete piece of location and construction; a location map describing the right of way and a location profile showing grades and curves completes the main work.

Special side problems for each party consist in the locating of transition curves and the sketches and studies for bridges, trestles, culverts, embankments etc., as demanded by the special conditions of the various surveys.

Much of this work required heavy grades and sharp curves, due to the extreme roughness of the coast topography, and would be classed as extreme mountain construction, still it is done with all the care and completeness demanded in actual practical problems for important roads to be built to pay dividends. Much of the material gathered by this group of students will be used in their senior studies in the fall at Berkeley in their advanced courses on railroading and construction.

PROBABLE FUTURE DEVELOPMENTS.—1. Permanent Site for the Camp: In the past the camp property has been leased by the University from year to year and has not always been located at Santa Cruz. Every property is not suitable. The site for camp must be readily reached and yet must not be too near a town or city. It must afford a wealth of varying topography for surveying purposes and must be near a large body of water. The Department of Civil Engineering hopes in the immediate future to secure through the Regents of the University a lease for a long term of years of a desirable tract of land so that certain features of the camp may become fixtures. While it is intended to preserve the lack of permanency in the camp life for the reasons already stated, it is desired that monuments, base lines and bench marks become permanent so that the instructors may be better able to check the accuracy of the student's labors, a condition that can only be obtained with a fixed site. Moreover, much labor to the instructors will thereby be saved and more time become available for the real work of instruction.

2. Changes in the Curriculum: Heretofore no surveying instruction was given to the freshman class. With the increased requirements for entrance to the University which have just gone into force, it was made possible, beginning with this year, to require of the freshman what was before done by the sophomores. The freshmen now receive at Berkeley instruction throughout the year and become familiar with all the important branches of plane surveying. The Summer School immediately follows this course of study and tests the student's acquired class-room knowledge. It is hoped that very soon it will be possible to somewhat restrict the scope of the freshman lectures and Summer School, thereby covering less ground, but securing greater thoroughness, and to introduce into the sophomore year an entirely new requirement of surveying lectures to deal with more advanced branches of plane surveying, such as the plane table, solar attachment and solar compass, hydrographic work, mining claims, city surveying, etc., and the elements of railroad field work. These studies in turn are to be followed by a Sophomore Summer School, a new requirement, to complete the field practice of plane surveying. The adding of the elements of railroad surveying to the sophomore schedule will allow further expansion of the junior lectures and the Junior Summer School practice in that important subject.

3. Instruction in Geodesy: At present the University of California gives instruction in those branches of astronomy which are necessary for a proper prosecution of higher surveying. This course is given under the direction of Prof. Leuschner, and so far as the writer's experience goes, is second to none in this country. It is required of the junior and senior students in the College of Civil Engineering who elect the railroad engineering course and deals with the astronomical methods which determine latitude, longitude, time and azimuth. In the senior year the same students receive from Prof. Prouty a course of lectures on higher surveying or geodesy, that branch of surveying which deals with vast areas of the earth's surface and requires that the curvature and size and figure of the earth be taken into account. It is intended to amplify this final course, both by lectures and field work so that in the near future the railroad students may become more familiar with the methods of the United States Coast and Geodetic Survey. Field work, including angle reading with theodolites, base measurements by tapes and compensating bars, barometric hypsometry, precise level work, etc., in combination with the astronomical field work with sextants, transit instruments, etc., now required under Prof. Leuschner, will comprise the fourth and final Summer School.

When this complete program shall have become a working reality, and the time is certainly not far distant, it is safe to state that the civil engineering students of the University of California will have opportunities in the study of plane surveying and geodesy second to those of no institution in the country.

[2] In the future this work will be done regularly only by students who have just completed their freshman studies at Berkeley. Heretofore it was a sophomore requirement.

THE PROSPECTOR.

The samples from Burnt Ranch, Cal., are the following: No. 5, much altered diorite; No. 6 is mostly a variety of soda lime feldspar. It also shows some quartz and a little mica. No. 7 is chiefly feldspar with a little quartz, evidently from a pegmatite vein. No. 8, quartz with considerable iron and copper sulphide; No. 9, vein quartz with small crystals of iron oxide. This rock looks like the quartz often associated with the occurrence of gold pockets in California. No. 10 is chalcocite (copper glance). No. 11 is quartz. No. 12 is a bluish vein quartz, probably gold bearing.

The rocks from Hailey, Idaho, marked "F. C. M.," are as follows: No. 1, phyllite, a metamorphic rock, with some graphite. No. 2 is a much altered greenstone. No. 3 is syenite in which there are also a few quartz blebs. Quartz is not an essential constituent of syenite, but may occur sparingly, as in this rock, without necessitating a change in name. With abundant quartz the rock would be more properly called hornblende granite. No. 4 is pegmatite, a granitic dike rock. The prominent minerals present are pink orthoclase, white quartz, muscovite (white mica) and black tourmaline. It is always a good idea to prospect for tinstone (cassiterite) in pegmatite dikes. No. 5 is gneissic granite. In this may be seen quartz, feldspar, biotite (black mica) and hornblende, all arranged in rudely parallel layers. No. 6 is quartz with considerable copper glance and copper carbonate enough to constitute a fair grade of copper ore. No. 7 is trachyte containing large feldspars, both sanidine and plagioclase. No. 8 is porphyrite, or feldspar porphyry. The greenish color is due to finely disseminated hornblende. A very little quartz can be seen scattered through the rock.

WHEN zincblende is associated with iron sulphide the quality of zinc is sometimes affected by the presence of the iron, but by the employment of modern methods of concentration and reduction of the sulphides the zinc is rendered as free from undesirable elements as that entirely free from the presence of iron sulphide in the ore.

Crushing Machinery for Mines.

Written for the MINING AND SCIENTIFIC PRESS.

There is great variety in the devices employed in crushing ores for subsequent metallurgical treatment. Since the dawn of history the hammer in some form has been employed as a means of reducing rocks and ores to a granular condition of greater or less fineness. This crude and expensive type of crushing machine is exemplified in the various designs of stamp mills, and may be said to reach its greatest capacity, if not its highest efficiency, in that machine known as the steam stamp.

From the stone hammer of the aborigines to the steam-driven crushing machine has been a long step. Centuries have come and gone in the interval between, and yet in some portions of the world the stone hammer, or some modification of it, is still in use to crush rock for the purpose of freeing gold from its rocky matrix and also for other purposes. In Central America the writer has seen a basin hollowed out in a hard, tough rock, the depression having possibly a capacity of a gallon. In this bowl-shaped hole rich gold rock from a neighboring vein was crushed by pounding upon it with a boulder weighing about ten pounds. The boulder was fitted with a forked handle —the branch of a sapling of strong wood. With this rude stamp mill the native pulverized his ore, scooped it from the bowl with his bare hands, unmindful of the sharp-edged cutting fragments, and washed the sand in a horn spoon, making in this way a living with no more capital than his hands and abundant patience, time counting for nothing. The device, simple as it was, answered its purpose, for the reason that the owner of this primitive quartz mill had never heard of a gravity stamp mill, nor of the steam stamp, and looked upon his simple device with satisfaction.

Less than a century ago power derived from an over-shot water wheel, the shaft of which was provided with projections that acted as cams, was employed in raising and dropping a rude hammer-like mass of metal upon ore placed beneath it. By slow degrees the modern stamp mill has been evolved. Even no longer than fifty-five years ago the stamp mill of California consisted largely of wood, the lower ends of the stems only being shod with iron, the stems themselves being square pieces of timber. The iron stamp mill was soon introduced into California practice, however; but the first mills having iron stems and shoes, and iron cams, were far inferior to the modern mills. The principles, however, remain the same—a weight raised by power and allowed to drop upon the ore falling beneath it.

Early in the mining practice of the civilized ages men sought constantly to improve upon the crushing machines, and this effort is still being made. The fact that the stamp was idle the greater part of the time —the period during which it was being lifted and falling again by gravity—has stimulated men to find some device which would be continuous and not intermittent in its operation. The arrastre and the Chile mill are the earliest types of the result of these endeavors. For ages the millman has used a mechanism consisting of a shallow basin in which stood a central upright post, from which projected horizontally one or more cross arms and to these were attached drags of heavy stone. This is the arrastre in its simplest form. Animal power was usually employed in running the arrastre. The stones are dragged around the post in a circle, crushing the ore beneath it by sheer weight and attrition. The stones are disposed from the cross arms in such a manner as to cover as completely as possible the entire surface of the crushing basin in a single revolution of the central post. This simple form of crushing machine has resulted in the introduction of such devices as the Huntington, Griffin and similar rotary mills. Steam, water, electricity, gas engines and other means of power are employed in driving these mills.

Flouring mills have been equipped for ages with grinding or burr stones, and this type of crushing or grinding mill finds its modern representative in such forms of the quartz mill as the Washoe pan, with muller (which really means miller), the Wilcox pan, Knox pan and the various other kinds of grinding pans in which the grinding surface is practically nearly the entire area of the basin.

Although the Kinkead mill is a rotary crushing device, its operation is somewhat different from those above mentioned, as it crushes rather than grinds.

The Chile mill may be rudely described as one or more wheels having a broad face, revolving vertically about a central shaft, crushing the ore in its path by weight of the wheel itself. The original Chile mill was equipped with blocks of hard stone, shaped like a rather flat cylinder, and set on edge. The modern Chile mill is of iron and provided with rings of hard metal—chrome, manganese or chilled steel—to resist wear. Other grinding mills are similarly provided against excessive wear of the grinding parts. As the outgrowth of the Chile mill, have been introduced such devices as the Bryan and similar mills. The various types of this class of mills have been provided with arrangements calculated to increase the crushing capacity of the machine beyond that due to the weight of the rollers only, by the use of springs and other devices.

In addition to these are other types of pulverizing machines of entirely different structure and operation, but perhaps, none the less efficient, and, in some instances, at least, are better suited to the class of work they are required to perform, for it must be understood that every type of crushing mill is not equally well adapted to every class of ore.

One of the simplest forms of crushing machinery is that of cylinders of iron furnished with steel shells running on horizontal shafts and set in pairs, so disposed that rock passing between these cylindrical masses of metal must be crushed as small at least as the space between them. Rolls have been in use for many years, and for certain classes of rock they are perhaps superior to any other crushing device. The early Cornish rolls have been improved upon in many ways by modern machinery manufacturers. The frames have been strengthened and made of better material, the springs controlling the space between the rolls have been placed in many ways, each manufacturer claiming some particular excellence for his devices and attachments. The early rolls were relatively broad for their diameter. More recently rolls have been made narrow and of larger diameter, and calculated to run at high speed. There are a great number of rolls in the market to-day and these represent every variety of shape and size of the rolls—in reference to width of face to diameter of the rolls. Some are set to run at high speed, some at slow speed and others at intermediate speeds. Some are driven by gears, others by belts, and there are numerous other differences of mechanism. Rolls are excellent crushing machines and in their proper place are superior to most other devices for the purpose. As to the relative merits of high and low speed, or intermediate speed rolls, the character of the ore must determine this. Some ores will crush faster than others when the rolls are run at high speed, and vice versa.

There are numerous so-called pulverizers. These are various in design and effect the crushing by means of rolls, impact, grinding or otherwise. There are centrifugal pulverizers, pneumatic pulverizers, grinding pulverizers, pulverizers with rolls and pulverizers in which steel balls or cobbles of hard rock comminute the ore fed into it. Each and every one of these machines has been through the process of evolution—"there is no new thing under the sun."

Beside the numerous types of machines above mentioned, there are others in less common use. These include rocking mills, mills provided with hinged hammers and a few of peculiar and little known design, being mostly "home-made" contrivances of limited capacity and usefulness.

(TO BE CONTINUED.)

The Ventilation of Mines.

NUMBER VI.

DUST IN MINES AND MILLS.—The researches of the Transvaal Miners' Phthisis Commission led that body to attach very great importance to the dust produced in mining work as the cause of the great mortality from miners' phthisis in the Transvaal, and the more recent report of Dr. Haldane and Messrs. Martin and Thomas on the Health of Cornish Miners takes the same view even more strongly. The latter authors point out the other causes to which the prevalence of miners' phthisis have been attributed, such as an atmosphere more or less vitiated by carbonic acid, sudden changes of temperature, chills from working in wet clothes, absence of sunlight, and so on, are shared in common with metalliferous miners by coal and ironstone miners, who are rather more healthy in respect to this disease than the average population. Then, too, those engaged in occupations which require the worker to breathe an atmosphere laden with stone or metallic dust, such as stone masons, file grinders and potters are affected quite similarly to the metalliferous miners. The common factor is the stone or metallic dust, and there can be little doubt that this is rightly regarded as the main cause of miners' phthisis. The ravages of this disease among miners are so terrible that its prevention by every possible means is one of the most serious problems of public health, and of the highest importance from the standpoints both of humanity and of working efficiency.

The men on rock drills underground are the most affected by miners' phthisis of any class of underground workers, and it is evident to anyone watching them at work that they are in a position which compels them at times to breathe an exceedingly dusty atmosphere. When water can be used in the holes, the dust may be prevented, but in drilling "uppers," and especially in rising, the holes are commonly bored dry, and the crushed rock from the borehole is driven out as sharp sand and dust. The workmen become rapidly covered thickly with dust, and the whole air is full of it, so that the men must breathe it constantly. It is only the excessively fine dust that can reach the workers' lungs, but under such conditions it is evident that some of the dust must get right in. The dust is fine particles of the rock which is being bored through, which is often mainly quartz, and the shape and constitution of the particles are dependent on the physical characteristics and composition of the rock mass. At times, therefore, they may be sharp, splintery, needle-shaped or knife-like, or they may be more rounded or granular. There is a presumption that the former sort of particles would be more likely to cause irritation of the tissues of the lungs than the latter, though there is no very positive proof yet available on this point. Fine particles of steel from the drills are also in the dust, and seem likely to be specially pernicious, as in the allied case of the file grinder's occupation. Besides the dust from rock drilling, there is also a large amount raised after blasting, partly by the concussion stirring up dust that has already settled, and partly from the attrition of fractured rocks thrown out. The air immediately after blasting is often so thick with dust that it is impossible to see a light a yard away from the eyes. The heavier dust soon settles, but the very light particles, which are the dangerous ones, remain suspended for a long time in a dry atmosphere. There is also a good deal of dust produced in dry ground during the operations of shoveling ore to passes and in filling stoped out ground with "mullock." A common cause of dust being raised is the blowing out of air from the "nose" of the rock drilling machine, owing to defective packing, this air preventing the dust from the boreholes from settling. In such cases greater attention to repairs is required. In the mills on the surface there is often a great deal of fine dust generated at the stone breakers, whether of gyratory or jaw crushing type, and in the mills which have dry crushing there is also much dust produced when the stone is ground to fine powder either by stamps, Griffin mills, ball mills or any other similar device. The handling of this dust by elevators and conveyors, its storage in bins and removal therefrom, its treatment in roasting furnaces and removal therefrom are all dusty processes, and unless special care is taken to keep the dust down the whole mill may become full of fine dust. Even when a great deal of care is taken this is very likely to happen, a little dust escaping at all times and a good deal when there is any hitch in the working of the plant, and in consequence dry crushing mills invariably show fine dust lying everywhere, and it is more or less perceptible to the sight in the air of the mill. The dust may be kept down very much, but not entirely. In this State several of the largest mills crush their ore dry and roast it before beginning amalgamation and cyanide treatment, and the question of dust in these mills is therefore important. Under similar circumstances the workers in New Zealand dry crushing mills were, about four years ago, allowed higher wages than in corresponding posts in wet crushing batteries, when the wages were settled by the Arbitration Court, the court considering that the work in dry mills was more unhealthy than in wet treatment. In the dry crushing mills of this State it is usual to have storage bins in which reserves of finely crushed pulp are kept for feeding the roasting furnaces on Sunday and at any other time when the ordinary supply may become suspended. It is sometimes necessary for men to go into these bins to shovel the pulp—a most exceedingly dusty piece of work. Respirators are then generally used. At one mill, however, there was a filthy practice, the men using the respirators indiscriminately, which should be absolutely forbidden; obviously each man should have a thoroughly clean respirator served out to him, which should be used by nobody else till returned to store and again cleansed.

When the mill is a wet crushing one the dust at rock breakers may be overcome by spraying the stone with water as it passes through the breakers, but where the stone has to be crushed dry this is impracticable, as the moisture would have to be removed before the subsequent fine dry grinding would be possible. When the ore is very wet, as it comes from the mine, it is frequently necessary to provide special drying furnaces before it can go to the fine crushers. Sprinkling with water to lay the dust from fine crushing is plainly out of the question too, when the next process is that of roasting the dust, as caking of the material must be carefully avoided. The roasted dust might sometimes be sprinkled after cooling sufficiently, but it is so much more easily carried in conveyors, elevators and shoots when quite dry than when damp that it must generally be kept quite dry. In the dry crushing process, therefore, any method of laying the dust with sprays of water is impracticable. The usual method in vogue here is to close all crushing machines and dust conveyors, and to connect them with dust chambers, into which the dust is drawn by exhaust fans. There being an in-draught at every opening to the machines, the dust is not able to escape into the open air, but is drawn into the flues and dust chambers, or carried through the fans and blown into the chimney stack. Where the method is well carried out it is very successful, and very little dust is seen in the mill, except what has escaped during stoppages of the draught and opening of the machines for cleaning and repairing. There was, however, a great deal of difference in the dry crushing mills seen by us in this respect, some of them being fairly free from dust while others were exceedingly dusty, and required much attention to dust removal.

The devices to prevent dust underground by systems of spraying with water are numerous and

varied, ranging from simple jets of water in the faces to the elaborate systems of mains and standpipes used in some collieries for laying the coal dust, and from vessels of water carried by men, to large spraying tanks running by electric or other power along the mine roadways. It is now recognized that fine coal dust suspended in mine air, if not, as some contend, itself liable to form an explosive mixture, greatly intensifies the violence of explosions of fire damp and that, in a mine where much fine coal dust is lying about, a slight explosion of fire damp may raise such an amount of dust that a very serious explosion may result. Consequently the constant spraying of dry colliery workings is now rendered compulsory by legislation in many countries. It is unnecessary, however, for us to enter into this aspect of the dust question, as our only collieries at present are naturally very damp and coal dust does not rise in them. In the metalliferous mines the question of the humidity caused by spraying has to be taken into account, as some authorities think that the creation of an atmosphere saturated with moisture is likely to be as unhealthy and more uncomfortable than a dusty one.

(TO BE CONTINUED.)

The Murphy Drill.

Herewith is illustrated the newest device in the drill field, the Murphy drill, which its makers say strikes 2000 blows per minute. Another claim to favorable attention is the statement that the exhaust air through the steel keeps the hole clean in front of the bit, also serving the purpose of keeping the bit cool. The makers further say that with it the holes can be put in just as they would be by hand, and shot as often as desired. These drills are stated to be in active use in several large mines in Colorado, Arizona, Nevada and Mexico. They are made by the C. T. Carnahan Manufacturing Co., 1724 Lawrence street, Denver, Colo.

The Murphy Drill.

Charcoal Precipitation From Auro-Cyanide Solutions.

In the district of Victoria, Australia, this method is used, in many cases probably in imitation, rather than with any definite grounds for its superiority over the zinc process.

The methods are identical down to the extractor house, which in a typical plant contains 189 tubs, each 2 feet 4 inches high, 2 feet 1 inch in diameter at the top and 1 foot 9 inches at the bottom. In the center of the bottom of each tub are two small wooden cleats, 4 inches apart, on which rests a glazed drain pipe, 4 inches in diameter, flanged end downwards. Center pipes and tubs are filled with charcoal, coarse for 6 inches from bottom, and medium size to within 6 inches of top of center pipe, with about 3 inches outside, and 5 inches inside the tub of coarse charcoal again. On the top of the charcoal inside the tub and all around the pipe is a wooden lid to keep the charcoal from floating and blocking the outlet pipe.

Another form of tub much used has no center pipe, but there is a false bottom of filter cloth, while on the top of the charcoal is a hinged lid with feed pipe let into it.

The preparation of the charcoal is important, impurities being prejudicial and wasteful. Fine stuff is objectionable, being a bad filtering medium and also passing through into the sumps. Heavy compact charcoal again is not so efficient as that which is light and porous, gold being deposited throughout the whole of light charcoal, so that compact material offers less depositing surface, and is, moreover, more difficult to incinerate. The charcoal is ground and sieved to three sizes—coarse, medium and fine, the latter being discarded. The other sizes are thrown into separate tanks of water, and only that which floats used.

The tubs in above works are arranged in two groups, the first of 141 filters, in twenty-four sets of six each, for strong solution; the second of fifty-four, in eighteen sets of three each, for alkaline wash (0.04% and KCN) and weak solution.

The solution passes down the center pipe of the first tub in each set, coming up on the outside and flowing over the lid through a 1-inch pipe to the next tub of the series, and so on, finally passing away to its own particular sump. The top filter catches most of the gold, and when fairly charged, is removed, each of the remaining five being moved up one step and a newly charged tub being placed in the sixth position. The filter removed is drained of someof its solution and emptied into a large box with a filter bottom, where the rest of the solution is run off into the sump, leaving the auriferous charcoal ready for the furnace room. A tub occupies first position for about three days.

The efficiency of the precipitation is, of course, an important point. The strength of solution does not appear to affect the precipitation at all, the percentage extraction being uniformly high, the solution going out to the sumps in one establishment rarely showing more than three and one-half grains per ton (original value not stated), while 0.04% KCN solutions are successfully precipitated. The gold in the top filters is considerably purer than that caught in the lower ones, and the author suggests that means might be taken to keep the contents of the top filters separate. Frequent tests show steaady diminution in the value of the gold, taking the place downwards through a set, till the bottom tub is nearly pure silver.

The exact action of thecharcoal has never, as far as the writer knows, been experimentally demonstrated, but he thinks it may be due to the hydrogen and hydro-carbons remaining in the charcoal, the result being the formation of hydrocyanic acid and free gold. This KCN represents a certain amount of loss of active agent.

From the filter house the auriferous charcoal is conveyed to the furnace room, where it is incinerated in four reverberatory furnaces, each 10 feet long. The ash is sieved through a 900-mesh trommel, and the coarser residues returned to the furnaces. The fine stuff or "ash," containing about 80% gold, is then smelted.

The author points out what appears to him to be the following advantages:

1. A high-class bullion is produced—one well-known mine receives £4 per ounce for cyanide gold.
2. Percentage extraction is high regardless of strength of solution.
3. In spite of the large amount of auriferous charcoal to be handled the "waste" is easily got rid of by burning, and the ash is easily smelted without the necessity of treating with strong acids or careful oxidizing roasts (with some unavoidable loss).

One great disadvantage is the greater chances of loss through the immense bulk of stuff to be handled, and the higher cost of the operation itself. The cost of charcoal precipitation (with charcoal at 9d per forty pounds) works out at 4.29d per ounce of gold, or 0.545d. per ton of stuff. Zinc precipitation (with zinc at 4½d per pound) would cost 2.25d per ounce of gold, or 0.275d per ton of stuff. Labor works out at 0.763d per ton for the charcoal, and 0.382d per ton for zinc. To recover the gold from the "ash" at these works costs 1s per ounce, bullion 900 fine, exclusive of labor, as against about 2d for zinc slimes, which would probably average not more than 800 fine. There remains the question of increased outlay for plant and buildings, but these are not very serious. Considering the same works, the 198 tubs cost £247 10s; zinc boxes would require but a small portion of this.

FROM three to eight days is the time considered by cyaniders as requisite for maximum extraction of gold, dependent on existing local conditions. The general idea is to use a weak solution and give plenty of time.

Treatment of Copper Ores by the Electric Furnace.*

By M. VATTIER.

We are not dealing here with a philosopher's stone which would, as by magic, transform any copper ore into a mass of pure metallic copper, or which would overthrow and supersede the well-known reactions of the old metallurgy of copper. Nor do we pretend to have discovered a process which suppresses all the cost of production, and permits of reaping imaginary millions from any kind of ore under any conditions. We abandon the monopoly of these pretentions to the fancy prospectuses which circulate in certain financial centers, and which cause such diappointment to the credulous investors, and we approach the subject in a more scientific and industrial spirit, and especially with the intention of facilitating, within the limits of our powers, the labor of the indefatigable workers who strive to further improve these processes, and whose efforts deserve praise and reward.

You all know that, generally speaking, in the metallurgy of copper by dry processes, either in reverberatory or water-jacketed furnaces, the copper ores are first of all converted by the help of coke or coal into copper matte containing 40% to 50% of the metal; these mattes are then submitted to a roasting, followed by a remelting, either by special treatment in converters or in Thofern and Saint-Seine reaction furnaces, which transforms them into copper bars; these are then refined by electrolytic processes, which produce the pure copper and effect the separation of the gold and silver.

At present our object is solely to suppress the consumption of fuel (coke, coal or charcoal) used to smelt the ore for the production of the matte, and to replace these calories of the black coal by electric heat derived from the "white coal;" that is from hydraulic forces. Then we proceed to the refining of this matte by the processes now in use in metallurgy (converters, furnaces, etc.), and all we ask from electricity is to lend us its aid to produce the heat, whenever it can be done with advantage, by the introduction of the electrodes.

In a word, the endeavor is to develop a process which could be established in regions favorably situated as regards water powers, and where coal is costly; it is the difference between the cost of the black coal and the white coal, which shall constitute the main profit derived from the adoption of these new processes. It is bearing these conditions in mind that we made the series of experiments of which I shall now give you a brief account.

ORE.—Our experiments were conducted on two different kinds of ore.

First—Copper ore from the Volcan mine, Chili, belonging to Gregorio Denoso. The copper contents was approximately 7%, present as copper pyrites. This ore contains from 8% to 9% of sulphur, and the gangue comprises silicates, silica, a little carbonate of lime, but mainly micaceous copper oxide.

Second—Low-grade copper ore from the mining regions in the vicinity of Santiago, Chili, mixed with a small proportion of manganese and lime.

The composition of the charge of the furnace was as follows:

	Per Cent.
Carbonic acid	4.310
Silica	23.700
Alumina	4
Lime	7.300
Magnesia	0.33
Sulphur	4.125
Iron	28.500
Manganese	7.640
Phosphorus	0.046
Copper	5.100
Arsenic	trace

These ores were crushed partly into large pieces and partly to dust. The crucible was filled with a hand shovel, indiscriminately, of the coarse or dust, and without experiencing the inconveniences which usually accompany the presence of "fines" in the water-jacketed furnaces. All the charges were very carefully weighed and sampled, and an exact record of the various phases of the experiments was kept. Rather large blocks, at first refractory, were soon dissolved and incorporated in the molten charge, after undergoing a pronounced gyratory movement.

FURNACES.—The main furnace, for the first fusion or breaking up of the molecules by the application of heat, is a chamber or crucible built of refractory bricks, and having the following dimensions: Length, 1.800 meter; width, 0.90 meter; height, 0.90 meter. Below this chamber we have a forehearth, in which can be effected the sharp separation of the matte from the slag; the dimensions of this forehearth are as follows: Length, 1.20 meter; width, 0.60 meter; height, 0.60 meter.

At the bottom of the upper chamber there are some openings which can be tamped at will by means of fire clay, for the purpose of tapping the contents into the lower forehearth. In the upper chamber two carbon electrodes, with a square section of 0.30 meter on the side, and a length of 1.70 meter, are introduced, and their height may be so regulated as to either be immersed in the bath or just clear its surface.

Into the forehearth penetrate two carbon elec-

*From the French.

trodes of 0.25 meter on the sides, which are used to reheat the bath. Openings are left at different levels of the forehearth, and which are opened by means of steel rods driven in by blows of a hammer, for the purpose of tapping either the slag into small sand trenches, or the matte into steel ingot moulds, which are handled by an overhead crane. Voltmeters and ammeters permit of observing the intensity of the current. Alternating current was used. A special contrivance allows of easily and independently raising and lowering each of the electrodes.

PROCEDURE OF OPERATIONS.—The two large electrodes are lowered into the upper chamber, and the circuit is established by the introduction of pieces of carbon and of matte placed at the bottom of the crucible, and the temperature is gradually raised. The ore is elevated by a hoist to an upper platform, and is charged into the furnace around the electrodes, which are raised in proportion as the burden increases. Fusion begins to take place in a very short time, and when the crucible is full of molten or semi-molten material a taphole, situated some 0.10 meter from the bottom, is unplugged by means of a steel rod. The molten mass, more or less pasty (quite fluid after a short time), flows into the forehearth, where the reactions are completed, and where the separation of the liquefied materials is effected by means of the reheating electrodes.

When this forehearth is nearly full the slag is evacuated through one of the upper openings, and as soon as the quantity of underlying matte is judged to be sufficient, it is tapped off by one of the lower openings. It is thus a process of successive tappings, both from the upper and the lower crucibles.

DATA OF THE METHOD.—The furnace has a smelting capacity of twenty-five tons of ore per twenty-four hours, which it converts into matte. The current used for the experiments was of 4750 amperes; 119 volts; cos $\phi = 0.9$, which corresponds to 500 kilowatts, or 680 H. P. Therefore, to treat one hundred tons of ore per twenty-four hours will require from the dynamos 2833 H. P., in round numbers 3000 H. P. of 76 kg/m.

PRODUCTS OBTAINED.—Mattes of the following composition were obtained:

	Per Cent.
Silica	0.800
Alumina	0.500
Iron	24.300
Manganese	1.400
Sulphur	22.960
Phosphorus	0.005
Copper	47.900

and slag of the following composition:

	Per Cent.
Silica (SiO_2)	27.200
Alumina	5.200
Lime	9.900
Magnesia	0.390
Iron	32.500
Manganese	8.230
Sulphur	0.570
Phosphorus	0.062
Copper	0.100

The slags at both the beginning and the end of the operation usually contain a slightly higher proportion of copper.

The slag has high contents of iron and silica and could be used to manufacture ferro-silicon. For this purpose it should be poured directly into a special crucible, submitted to the high temperature of the electric furnace as soon as possible, in order to take advantage of the heat it possesses when it is tapped out of the crucible.

If the slag should be high in manganese, it could be manufactured into ferro-manganese and spiegels.

REMARKS.—For good results it is advisable to use a voltage sufficient to cause the arc or electric current to pass from one electrode to the other, by regulating their height to just clear the surface of the bath, in order to avoid as much as possible their coming in contact with the bath. Carbon at such high temperatures has a tendency to reduce the iron oxide into metallic iron, which gives rise to the following inconveniences:

First—A more rapid wear of the electrodes.

Second—Loss of electric energy.

Third—Decrease of the copper contents of the matte.

By the use of Acheson's graphite electrodes these inconveniences would be greatly diminished.

The economic and other advantages of this new electro-metallurgical process are at present quite evident, without having to defer judgment until further improvements are introduced. The problem may be said to have been solved by the Livet experiments.

COMPARISON BETWEEN THE OLD PROCESSES OF COPPER METALLURGY AND THOSE OF ELECTRO-METALLURGY.—Let us consider the case of a copper mine situated in South America, in Chili, for instance, and at some distance from the coast, in the foothills of the Cordillera; such a mine is the Volcan, the ore from which was submitted to the experiments of electric smelting; under these conditions coke costs at least 100 francs, and owing to the slope and other local conditions, a powerful and constant hydraulic power can be developed economically. We shall take for purposes of comparison the figures relating to one ton of copper ingots, extracted from the Volcan ore, which has a copper content of 7%; this is a comparatively high tenor, higher than the average mines worked on a large scale.

For the production of a ton of copper we shall have to treat some sixteen tons of ore; we shall neglect the figures, which would be the same for both cases as regards mining of the ore and subsequent treatments, and we shall restrict ourselves to the comparative elements of the two methods.

First—In the present water-jacketed furnace, the production of the matte, containing one ton of metallic copper, shall require 3200 kilograms of coke, at 100 francs per ton, that is to say, an expenditure for fuel of 320 francs.

Second—In electric furnaces the smelting of sixteen tons of ore will require an energy of 1.25 kilowatt-year, at a cost, in the region in question, of 30 francs per kilowatt-year, representing a cost of $1.25 \times 30 = 37.50$ francs, say 38 francs.

The wear of electrodes, as shown by our experiments, amounted to 75 kilograms per ton of copper in matte, so that we may calculate an actual cost of 45 francs for this item; this would be greatly reduced by the adoption of electrodes such as above mentioned, and more especially of graphite electrodes.

In short, the electro-metallurgical process for the smelting of sixteen tons of ore would entail a cost of:

$$38 + 45 = 83 \text{ francs},$$

and the economy effected, over the water-jacketed furnace, in the fundamental element of heat energy is, therefore:

$$320 - 83 = 237 \text{ francs, or more than £9.}$$

The additional important advantages derived from the use of electric furnaces are the following:

First—Suppression of the blowing engines, which are essential in connection with water-jacketed furnaces.

Second—The possibility of operating on much more refractory ore than with the water-jacketed furnace.

Third—Suppression of the manufacture of briquettes or of an agglomeration of the fines and dust.

Fourth—Notable decrease of the cost of labor.

Fifth—Elimination of the danger of scaffolding of the charge in the interior of the furnace; this accident is comparatively frequent and costly in the water-jacketed apparatus; moreover, choking up and obstruction of the hearth is likewise avoided.

Let us now consider the case of low-grade ore, say 4%; the production of one ton of metallic copper in matte shall require:

First—In water-jacketed furnace, an additional expenditure of coke amounting to

$$\frac{100}{1000} \times (5000 - 3200) = 180 \text{ francs.}$$

Second—In the electric furnace, instead of 1.25 kilowatt-year, we shall need two, which entails an additional cost of

$$30 \times (2 \text{ kwt.-yr.} - 1.25 \text{ kwt.-yr.}) = 22.50 \text{ francs.}$$

Which represents an additional saving of 157.50 francs, which figure is comparatively important for a low-grade ore.

It is, of course, impossible to arrive at a general average figure representing the savings effected by the adoption of the electric furnace; this depends on the grade of the ore and also on the local conditions; yet, in the case of the ores produced from the South American mines, remote from the coast and in proximity of powerful and constant waterfalls, the economy effected would certainly not be less than £10.

Placer Mining in Alaska.*

NUMBER VI.

In drifting operations on a bench of Anvil creek, Seward peninsula, a main long adit was run 4 by 6 feet 6 inches in the clear, at a cost of $4 a foot, untimbered, for the entire width of the ground in a direction transverse to that of the creek. This was 500 feet in length and was 10 feet below the surface of the schist bedrock. The average depth of the ground was 20 feet, being 2 feet of muck, 11 feet of wash gravel containing almost no gold, and 7 feet of pay dirt, the last consisting of 5 feet of pay gravel and 2 feet of bedrock, which contained the best pay. This was the thickness drifted. The adit served as a drain for the workings. The ground was only partially frozen, and it is likely, as has been found in parts of the Alaska interior, that the constant draining of the ground assisted in a gradual thawing of the frozen parts. From the end of this main adit a long tunnel (600 feet) was run for the length of the ground which was to be drifted, at a level of 8 feet above that of the adit floor. This was timbered with 6 by 6-inch posts, 8 by 8-inch caps, sets with 4-foot centers, lagged with 2 by 6-inch plank, top and sides. From this long drift cross drifts were run in a direction parallel to that of the main adit, at intervals of 100 feet, and with lengths of 40 feet on each side of the main longitudinal drift. The ground was then breasted, carrying a 40-foot face toward the adit. The Hidden Treasure system of timbering, using false sets, was employed. Track was laid both in the main adit and in the upper workings, and cars of 21 cubic feet capacity were employed in tramming, four in the main adit and from fifteen to twenty in the upper workings. The stopes never exceeded 20 feet in back and forward dimensions. The timbers used were 8 by 8-inch posts, 7 feet long, 10 by 10-inch caps, 11 feet long, 5-foot centers, all ways, between posts. Boards were laid down to shovel on. The ground was so heavy that it was found impossible to save the timbers, but the track was all recovered. In extracting 21,000 cubic yards timbering cost $14,000, with lumber at $50 per thousand.

The gravel was trammed to the surface and distributed on a long dump 40 feet on each side of a previously constructed 24-inch sluice 500 feet long. As usual, planks were laid on top of the sluice, and when spring opened the gravel was caved and horse scraped into the sluice. In distributing the gravel on the dump three men and a horse scraper had to be employed most of the time in keeping the snow off, on account of especially heavy snowfalls when the work was being done. When completed, the dump measured 700 by 80 by 20 feet, approximately. The drifting work consumed nearly eleven months, and the sluicing about two months, being delayed on account of frost in the gravel.

Labor employed averaged forty-five men in two shifts of ten hours, at winter wages of $2.50 a day and board. A shift in the drifting operations consisted of ten men shoveling into cars, averaging 8 cubic yards to the man, and three to four trammers took care of the dirt shoveled. In sluicing, ten men and two horse scrapers were used to a shift. The product of the operations was $160,000, and the cost, including preliminary prospecting, was 59% of the output. The work was done in 1901–2, and the opinion was given by the operator that the cost could be decreased 20% under present conditions.

In drifting operations on high benches lying between Anvil and Dexter creeks, near Nome, the gravel must be hoisted through shafts. It is said that powder is efficient in extracting the frozen ground. This is contrary to experience in the Alaska interior, and is doubtless due to the fact that the gravel is not nearly so solidly frozen. In fact, it is said that the powder is used for only a portion of the time. From the main shaft, which must be in some cases 230 feet deep to reach the second pay streak, a drift is run the length of the pay ground. From this transverse drifts are run at alternate intervals of 50 feet in each side of the main drift. Some operators sink the shaft on the side rather than in the center of the ancient channel, as by this method the shaft is less likely to "squeeze." The shafts are 3 by 6 feet, timbered with 2 by 12-inch plank laid up on the sides, with 2 by 4-inch timbers set vertically on the corners inside.

The face can be carried from 50 to 100 feet in length in the winter, as the constant slight freezing renders the gravel less heavy. In summer, on the other hand, the ground must be worked in small blocks. With the methods of timbering in use, 6 by 6 to 10 by 10-inch sawed posts are put in, on base block, and with a short 4 by 12-inch plank caps, posts having 3-foot centers in all directions. A space of three sets in width is generally carried before the ground is allowed to cave. When the ground is ready to cave a bulkhead is nailed to the second set, the timbers are pulled with ropes from the third, and the caved ground is caught by the bulkhead. The breast is then carried forward as before. No lagging is used except in the shaft and the main runway. In summer work the area of bedrock exposed in one stope rarely exceeds 10 square feet.

In sluicing the dumps from winter operations on the high Anvil benches, the expedient is adopted of building small dams of sod and erecting snow fences behind them to catch snowdrifts, so that sluicing water may be afforded in the spring from the melting snow. The remarkable phenomenon of deep-lying pay streaks on the Anvil benches has been considered by A. J. Collier in his geological account of the Nome district.

On Eagle creek, in the Birch Creek district, an interesting drifting operation was seen. It is especially difficult to work the creek claims by drifting on account of the partially thawed character of the gravel. A bedrock drain was run in winter at one side of and parallel with the paystreak, and low enough to drain all the ground which it was proposed to work. The drain was covered and lagged with poles and thus rendered permanent. A shaft was then sunk at the lower end of the ground, 4 by 8 feet in dimensions and 20 feet deep. This was timbered only for the upper 14 feet, and was sunk in three days by two men. A tunnel was then run upstream the length of the ground, wide enough to admit 8-foot caps. Posts were 5 feet long, all timber being 9 inches square. Sets had 4½-foot centers, and the tunnel was lagged overhead with 2½-inch flattened poles. A set of timbers delivered cost $4, there being thirty-four caps to a cord of wood. Lateral drifts 8 feet wide were driven at intervals of 8 feet, 4½ feet in thickness of gravel being taken. The gravel was wheeled to the shaft and windlassed to the surface, about 25 cubic yards being raised in ten hours. The lamentable lack of any tramming arrangement for transporting the gravel to a distance resulted occasionally in the caving in of the ground from the added weight of the dump. The gravel so laboriously raised was thus lost. Some idea of the difficulties of operating on Eagle creek may be seen from the following figures: Wood was $10 a cord, not excessively high; lumber, $180 a thou-

*Bulletin 263 U. S. Geological Survey.

sand; freight packing rates from Circle, on the Yukon, 25 cents a pound in summer and 8 cents in winter. Considering the remoteness of the district, the work carried on was remarkably good and systematic.

THAWING.—One who has never visited the interior of Alaska finds it difficult to conceive the formidable condition of solidly and perpetually frozen alluvium which is there encountered by the placer miner. The quantity of water in the form of ice which occurs in the frozen gravel averages about 25%; while in the overlying fine, black silt which forms the overburden the quantity of ice varies from 50% to 75%. Whatever may be the physical composition of the material, it forms a mass as solid and as difficult to penetrate as solid stone, and can be disintegrated only by exposure to the sun's rays or by the long-continued application of some form of energy artificially applied.

In any open-cut operations the dense blanket of moss, from 12 to 18 inches in thickness, which covers the frozen ground, must be broken into and turned over either by adzes or plows before the action of sun and water can take any effect on the underlying muck. As has been said, this effect is remarkably rapid when the water is allowed to run over the exposed black and icy mass.

A curious condition exists in the treeless area of Seward Peninsula. Wherever a growth of stunted willows occurs, the ground beneath is found to be thawed, and wherever the willows are replaced by moss the ground is frozen solid. The rule is not without exceptions, but has been found to have rather general application. The distribution of the willows and moss covered patches in the creek bottoms and along the low valleys appears to be entirely irregular.

Drifting operations in the creek deposits of the Klondike, Birch Creek, Forty-mile and Fairbanks districts of the interior are nearly always carried on in solidly and perpetually frozen ground. A necessary accompaniment of the work is the thawing of the ground by artificial means. G. W. Pichard has thoroughly investigated for this report the possibilities of using any form of the electric furnace for thawing the frozen gravel and has reached the conclusion that electric thawing is impracticable. Artificial power, through the agency of the steam point, is only in rare cases applied in open cut work. The Klondike district afforded a few examples of this application of power, notably in connection with dredging operations on Bonanza creek, the steam shovel operations on Bear creek and in two open cuts on Upper Dominion and Hunker creeks. It is difficult to determine the efficiency in open work, as, naturally, a portion of the thawing is done by the sun. From the data collected, however, it does not appear to be any greater than its underground efficiency, which will be presently discussed.

The method of thawing gravel underground by wood fires is expensive, and, unless the conditions are very exceptional, is not used in those districts where transportation facilities permit the bringing in of boilers.

According to experience on Deadwood creek, Birch Creek district, the efficiency of a wood fire in creek ground was as follows: A fire taking three-fifths cord of wood (at $12 a cord) is built against the face of the bank. The pile of wood will be 18 inches wide, 2 feet high and 25 feet long. Stones are laid up over the pile and a space is left to light the fire. The fire is lighted at 5 P. M. and left to burn until 8 A. M. the next day. The stones, which quickly get hot, are regarded as most efficient in thawing.

(TO BE CONTINUED.)

How World's Weight Is Calculated.

When Newton set himself to find the law by which an apple falls to the earth and the planets revolve at varying speed along their orbits, he constructed a formula which would explain these phenomena. He laid it down as a law that the force with which the earth attracts the apple or the apple the earth, or the planets one another, is equal to the mass of the one multiplied by the mass of the other, and divided by the square of the distance between them—the whole multiplied by a constant called G. G is the Newtonian constant of gravitation. It is of all the constants the most important to physical science; it is a constant for the more accurate determination of which Prof. Boys has been willing to spend five years of arduous and minute observation. Mitchell first devised an instrument by which it would be possible to obtain, by actual observation, the attraction which two bodies have for one another.

Cavendish improved upon Mitchell's observations, Cornu carried it on. Professor Boys has carried it two decimal places further. If Professor Boys were to hang a couple of 50-pound lead balls by two fibers he would find it as impossible to measure the inclination of the two fibers to one another as to weigh a sunbeam. But there is a possible way of measuring the attraction, and Professor Boys has made it more practical by the employment of quartz fibers to suspend some of the balls he uses. He uses four balls—two gold balls ¾ inch in diameter, weighing forty or fifty grains, and two lead balls, 4½ inches in diameter and weighing each sixteen pounds.

Suppose these four balls in their first position suspended in one plane. The two little gold balls are suspended by quartz fibers on either side of an oblong mirror, to which they are attached. If any force were to pull one gold ball a little way forward, and at the same time to pull the other little gold ball a way back, it is obvious that a twist, an oscillation, would be imparted to the tiny mirror. So delicately is this mirror, with its gold balls, hung on its tube, that a force equal to the hundred-millionth part of a grain will set it swinging. With this degree of sensitiveness attained, one begins to get near some means of measuring influences upon it. The influence we can measure is that of the two lead balls. We imagined them to be, in the first instance, in the same perpendicular plane as the little gold balls. Suppose we move them contemporaneously and coequally, so that one lead ball moves in front of one gold ball and the other lead ball moves, exactly in the same way, behind the other gold ball. If the hanging of the mirror and its gold balls is delicate enough, it is obvious then that the force exerted by the attraction between the gold balls and the lead balls will give the mirror to which the gold balls are attached a little twist and will set it oscillating. The instrument is delicate enough.

Seated 80 feet away the observer can time it. He therefore can measure the force which the lead balls and the gold balls exert upon one another; he can measure the distance which the balls are apart; he can measure the balls. Therefore, knowing the force, the masses and the distance between them, he can determine the great constant G, and, knowing G, he can determine the specific gravity of the earth; he can find its weight. Prof. Boys, after years of experiment, has found the specific gravity of the earth to be 5527. Before this time we were content to regard it as 5.5. He has taken five years or more to establish these other two decimals. Taking this as a basis, the weight of the world may be figured as 5,882,000,000,000,000,000,000 tons.

The instrument which contains the system of gold and lead balls is put in the corner of an underground crypt in Oxford. There is too much tremor of the earth in London. It is boxed up in a thick octagonal wooden box. It is separated from the observer by a series of felt curtains. He sits 80 feet away and examines its movements by means of a telescope through slits in the felt curtains and in the wooden box, and in the metal tubes holding the gold ball system.

The mirror reflects a 9-foot scale with 5000 divisions placed behind the observer's head. To avoid creating currents of air, Professor Boys has the scale illuminated only by a little traveling lamp. To avoid tremors of earth, he works at dead of night, for a train switching a mile away will move that tiny mirror; and once an earthquake in Transylvania, on the other side of Europe, was marked by it. As to the measurements, the distance of the lead balls from one another is calculated by micrometer and microscope to the three hundredth part of an inch, the distance of the gold ball quartz fibers in the ten thousandth part of an inch, and a force equal to the millionth of a grain would be sufficient to send the reflection of the mirror right off the scale.

Ice Making and Refrigerating Machinery.

A severe test of pumping machinery was made by the Ice & Cold Machine Co. at the ice making and refrigerating plant, Louisiana Purchase Exposition, St. Louis, Mo., during the entire period of the Fair.

Fig. 1.—Cameron Boiler Feed Pumps.

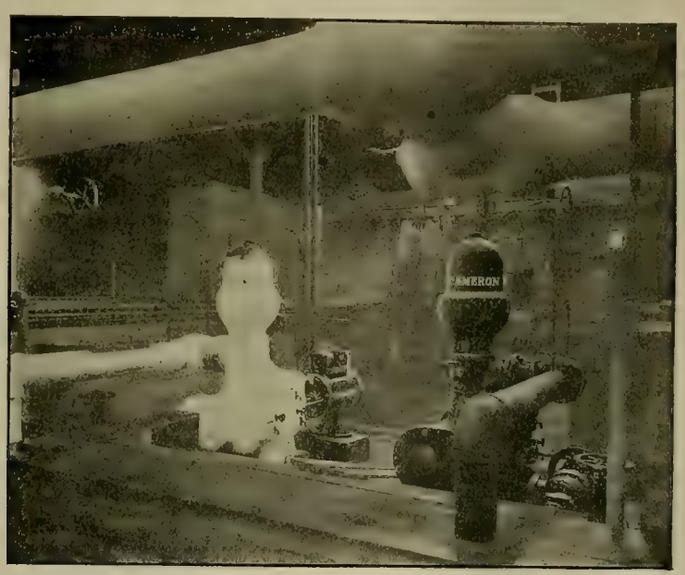


Fig. 2.—Cameron Special Brine Circulating Pumps.

Fig. 1 shows two Cameron boiler feed pumps, 8x6x13, in the boiler house, and used for supplying two water tube boilers of 750 H. P. Fig. 2 shows two 10 x 9 x 18 Cameron special brine circulating pumps, of the light service pattern, having long bodies and composition linings, also in operation at the plant, and were used alternately in the refrigerating pipe line, which was claimed to be the longest continuous line in operation using brine as a refrigerating agent. These pumps were in constant use day and night from May 14, 1904, to the close of the Exposition, December 3, for the 500-ton refrigerating machine, with the two ice tanks capable of making 120 tons of ice daily, and cold storage space of 100,000 cubic feet. Brine at a temperature of 10° F. was put into the pipe line and pumped through the various and numerous refrigerator boxes, containing 60,000 cubic feet, at the "German Tyrolean Alps," 7000 feet from the plant, the brine traveling through the pipe 14,000 feet after leaving the pumps before returning to the brine coolers. The manufacturers state that these pumps successfully withstood the constant rack and strain to which they were subjected. P. D. C. Ball of the Ice & Cold Machine Co. states that the service was entirely satisfactory.

The pipe line was used by other parties for refrigerating between the above mentioned points, the connections and arrangement being such that no difficulty was experienced in getting proper circulation, and without interfering with other boxes on the line.

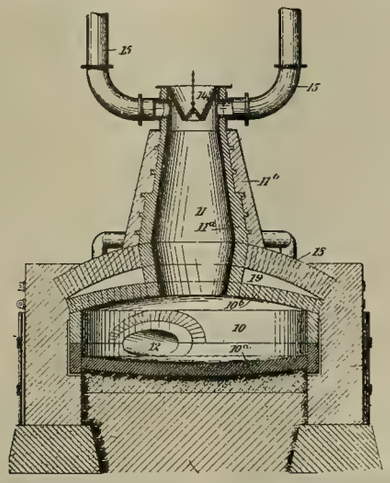
The pumps presented a unique and picturesque appearance, owing to their being covered with a layer of frost. One old mining engineer's wife remarked: "Those pumps look like statuary, and unlike the old station pump at the mine shaft, which we have seen in service nigh on to twenty years."

Mining and Metallurgical Patents.

PATENTS ISSUED SEPTEMBER 5, 1905.

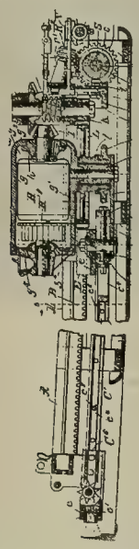
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

SMELTING FURNACE.—No. 798,312; H. L. Wrinkle and N. Wrinkle, Keeler, Cal.



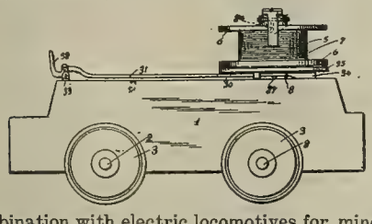
Smelting furnace having circular crucible, permanent outer top wall for crucible, inner top wall below outer wall and spaced therefrom to form circular chamber, stack sustained by outer top wall and passing through both top walls, radial partition in circular chamber, air blast pipe passing into chamber at one side of partition, and air blast pipe passing from chamber at other side of partition and leading into crucible.

MINING MACHINE.—No. 798,108; E. R. Merrill, Columbus, Ohio.



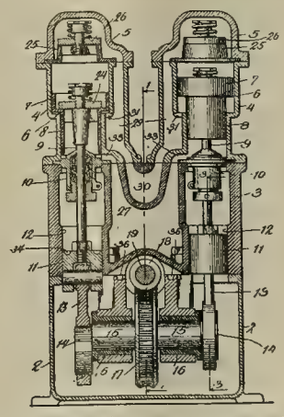
In mining machine, combination of bed, carriage, cutting apparatus on carriage and arranged to be thrust thereby directly into coal, two-part feed mechanism, of which one part is secured to bed, and other is supported by carriage, electric motor having armature shaft arranged longitudinally of machine, bevel wheel at rear end armature shaft, vertical shaft behind motor, bevel wheel thereon above bevel wheel on armature shaft, worm gear on vertical shaft, gearing interposed between vertical shaft and carriage feed mechanism and means connecting vertical shaft to cutting apparatus.

REEL FOR MINE LOCOMOTIVES.—No. 798,389; H. Booker, California, Pa.



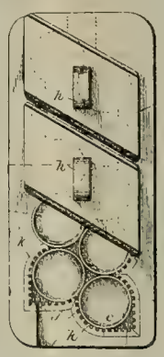
Combination with electric locomotives for mines, of revoluble shaft operated by locomotive, disk carried by shaft, drum loosely mounted upon disk, cable carried by drum, means to establish electric connection between locomotive and cable and means to hold drum in stationary position.

PUMP OR COMPRESSOR.—No. 798,506; M. W. Hall, Brooklyn, N. Y.



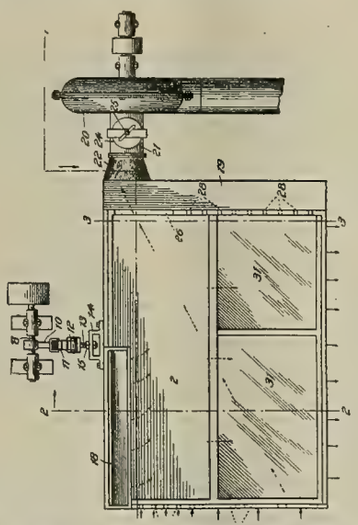
In pump or compressor, combination with cylinder having differential bores, of differential piston fitted to bores, piston having passage therethrough, valve carried by piston controlling passage, discharge valve controlling discharge from forward end of larger cylinder bore, cylinder provided with inlet passage leading to rear end of smaller bore thereof at rear of smaller head of differential piston, and passage through wall of cylinder separating differential bores, connecting rear end of larger cylinder bore at rear of larger piston head, with discharge.

ASSAY FURNACE.—No. 798,950; W. W. Case, Denver, Colo.



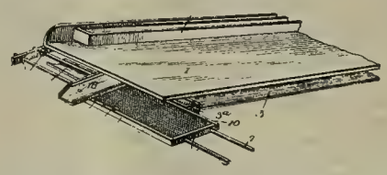
In assay furnace, combination of wall thereof having flame inlet near bottom and near one end thereof, series of crucibles located in furnace, crucibles nearest fuel inlet partly surrounded by wall of furnace to protect them from too rapid heating, wall provided with exit for products of combustion located in proximity to rear top thereof, series of projectors, or heaters, arranged within wall of furnace and around crucibles located at or near rear end to heat up latter rapidly enough to keep pace with heating of crucibles located nearer fuel inlet.

DRY ORE CONCENTRATING TABLE.—No. 798,843; A. Tetrault and E. C. Pohle, Boulder, Colo.



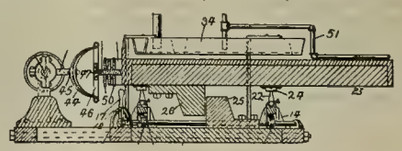
In dry concentrator, smooth surfaced table, cover therefor forming top chamber, leaving openings across three edges of table, closure for fourth edge thereof, casing forming exhaust chamber extending across openings at one end of table, pipe connected to one end of exhaust chamber, means to draw air therefrom connected to pipe, open ended pipe rising from latter, valve controlling open ended pipe for regulating volume and force of air currents, feed hopper opening into table chamber at closed edge, means for causing reciprocating bumping movements to table.

SEPARATING AND SIZING ATTACHMENT FOR CONCENTRATORS.—No. 798,632; J. H. Smith, Creede, Colo.



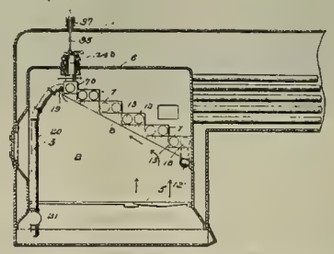
Attachment for concentrating tables, comprising angular supporting brackets, pair of guide rods carried by brackets, rectangular screen frame having end bars apertured for reception of guide rods and series of openings in side bars, middlings trough supported by frame at one end, trough retaining devices engaging openings, screen mounted on frame at one side of middlings trough, and values trough secured to frame and extending beyond opposite side of middlings trough.

SLIME CONCENTRATING TABLE.—No. 798,842; A. Tetrault and E. C. Pohle, Denver, Colo.



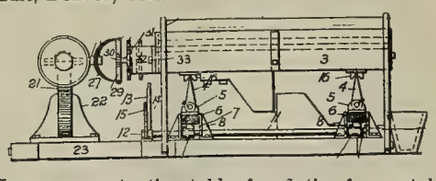
In concentrating table, foundation frame, means thereon for supporting table in operative relation to frame consisting of bracket guide rising from each corner of frame, pair of beams loosely fitted in pair of guides, means arranged beneath beams at one side of frame for simultaneously and vertically adjusting ends of beams, means carried by other ends of beams for independently adjusting each vertically, pair of rocker arms mounted on upper side of each beam, adapted to swing at right angles to length of beams, in combination with table mounted on rocker arms, abutment carried by table, abutment carried by frame, means for reciprocating table, means for adjusting table toward and from its driving crank shaft to vary its stroke consisting of crank shaft, pitman rod bow spring, links connecting spring, head connecting links having screw stem, loop bracket secured to and projecting from table, and nuts engaging screw stem and bracket.

STEAM BOILER FURNACE.—No. 798,684; J. J. Le Duc, Mankato, Minn.



Combination with firebox having water space surrounding, opposite stepped brackets provided upon inner walls of firebox progressing upwardly and forwardly from back with steps at one side staggered with respect to steps at opposite side of firebox, headers supported upon steps of brackets, each header provided with inlet and outlet, water tubes extending between corresponding headers at opposite sides of firebox, each tube inclined upwardly from outlet of one header to inlet of next above header at opposite side of firebox, inlet connection between lowermost header at one side of firebox and water space at back of firebox, and outlet connection between upper portion of device and water space at top of firebox.

ORE CONCENTRATING TABLE.—No. 799,021; A. Tetrault, Denver, Colo.



In ore concentrating table, foundation frame, table having V-shaped bearings on under side, pairs of pointed rock arms engaging grooves of bearings, pair of beams supporting rock arms, means for adjusting beams at feed end of table, guide brackets within which both ends of beams are loosely placed, means on beams engaging brackets to prevent rock arms from sliding out of table bearings, and means for reciprocating table.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

Henry Bratnober has discovered copper at the headwaters of the Nabesna, White and Tanana rivers. —— It is stated that John Rosene and associates will build the Northwestern & Copper River Railroad to the Nabesna copper district within three years. Rosene's first section of 35 miles from Valdez is now being built.

ARIZONA.

Cochise County.

It seems certain that the wagon road to the Bacoachic district in Sonora from the Nacozari railroad will be started. It will open up a rich mining district tributary to Douglas, but which is severely hampered by lack of transportation. The road will open up a large number of camps in the Arizpe district.

Near Charleston, south of Fairbank, is a new discovery by J. Lorrien, the values being principally in vanadinite of lead, although there are other ores of lead in the veins. It is claimed that this ore can be concentrated and the concentrates of the vanadinite of lead saved.

Regarding tungsten a recent report of the United States Geological Survey says that there were quite extensive operations conducted on the tungsten deposits in Cochise county. These deposits occur 13 miles from Benson and 6 miles north of Dragoon, in the Little Dragoon mountains. This area has been pretty thoroughly prospected for tungsten ores by means of open cuts, pits, shallow shafts, etc. These prospect cuts and pits have been made on a long ridge, in the gulches of which placer and float tungsten minerals have been found, principally hubnerite, in aplite veinlets and crystalline quartz that occupy fissures in the main body of granite constituting the country rock, also as hubnerite and wolframite, which are due to the alteration of the incasing wall rock and flank the vein itself. Scheelite has occasionally been found in small seams or streaks with the hubnerite. The deposits near the surface have been more or less decomposed. The belt containing these veins is the ridge at the head of Texas ridge and Sheep canyon. There has been considerable work done on this ridge by running in crosscuts and tunnels to intercept these veins, but many of the lower tunnels which were run in sufficient distances to have intercepted the vein if it existed found no trace of it at these lower depths, with the exception of the Bluebird vein, which seems to be more continuous than the others. This vein occurs at the contact of granite and intrusive diorite. It has a strike of north 50° east and dips 55° to 60° toward the east and is on the hanging wall side of the diorite dike. The tungsten minerals in these veins are very apt to occur in bunches and also in streaks, so that a large proportion of the vein contains little or no tungsten minerals. In some instances where the vein is a number of feet in width, the tungsten minerals have been concentrated in seams 5 to 6 inches in width; then again, rich bunches of hubnerite ore, from a few pounds to four or five tons of nearly pure ore, averaging from 50% to 60% tungstic acid, have been obtained. The supply of tungsten ore from this locality has been obtained from the veins, and also from the placer deposits in the gulches below the veins, and it is probable that by far the larger part has been obtained from these placer deposits. One estimate made of the production of this locality has been over 500 tons of tungsten ore, of which not over fifty tons have been obtained from the veins themselves, the balance being the result of mining in the placers. The percentage of tungsten in these ores varies from 50% to 78%, and usually it can be concentrated so that the ore will yield an average of 68% of tungstic acid (WO_3).

It is reported that the Empire Copper & Gold M. Co. intend sinking a three-compartment shaft 700 feet to develop their claims, near Johnson. J. L. Brooks is manager.——The Cons. M. Co. has sunk 260 feet on the Republic mine and 275 feet on the Mammoth mine, both near Johnson. The Republic is shipping ore to El Paso. S. J. Entriken is manager.——A double-compartment shaft is being sunk on the Black Prince, near Johnson, under the direction of Robt. Mackey.——It is reported that the smelter of the Southwestern S. & R. Co., at Benson, is to be completed under the direction of Manager Doane Merrill. The works are to be of 350 tons capacity, with one 250-ton water-jacket blast furnace and one 100-ton reverberatory furnace. The product will be a 60% matte.

Work has commenced this week on the Cochise Dev. Co.'s property, near Bisbee. The old shaft will be widened to a two-compartment. Orders have been placed for a double-hoisting engine, boilers, compressors and air drills. C. L. Jones is managing director and Robert Ludwig mine foreman.——At Gleason the Copper Belle Co. is putting in additional machinery. A new blower for the smelter is being put in place. The miners have been blocking out ore to be run through the smelter when it starts up again.

Gila County.

The August production of the Old Dominion Copper Co. at Globe was 2,242,000 pounds of blister copper as compared with 2,080,000 pounds in July. An accident to one of the blowing engines interfered with production for seven days. The company's new plant has been completed at a cost of $1,500,000 and paid for. Three furnaces are in blast at the Old Dominion smelter and the concentrator is running continuously.——The Pinal Copper Co. of Globe, of which C. W. Slack is superintendent, has been reorganized in St. Louis and will hereafter be known as the Arizona Banner Copper Co.—— The Arizona Commercial Copper Co. recently stopped shipping ore from the Copper Hill mine to the Old Dominion smelter, as there would be a saving to the company of $5 to $6 per ton if the ore was first concentrated. The Old Dominion Co. was charging the Arizona Commercial Co. $3 per ton working charge, but had made an additional charge of $4 per ton on account of the Copper Hill ore being highly siliceous. They may make an arrangement with the Old Dominion Co. for concentrating the ores, whereby the largest part of the silica will be eliminated, in which case shipments will be resumed, otherwise they will build their own mill. It is stated that a diamond drill is being put in.

Graham County.

Rich silver ore has been found at the bottom of the 200-foot shaft of the Commerce mine, 14 miles from Duncan. Arthur Murphy is superintendent. —— Considerable second-class ore is being shipped from the Standard copper mines north of Clifton. ——Good milling sulphide ore has been struck after driving 200 feet in a tunnel on the Copper Plate mines, near Metcalf. Ambrose Burke has charge.

Mohave County.

W. G. Kelly, of Winslow, Arizona, is directing work on a mine near the Ark, 16 miles north of Kingman. Work will be continued until water is struck.

The Vivian M. Co. is building a mill near the shaft, to the east of the Mohave & Milltown railroad at Vivian. The shaft is down 200 feet. A supply of water for all purposes is said to have been found in the mine.

Santa Cruz County.

The recent sale of the Grubstake gold and silver mines of the Blanco district, near Nogales, to the Grubstake M. & M. Co. recalls the early discovery of the property when it was considered a rich silver mine while now it is considered almost entirely for its gold, running $12 per ton, with large bodies of ore. Many years ago these mines were located for silver, when that metal was high. Out of one shallow shaft and crosscut the original locators, Holden & Hewitt, took $17,000. To-day the mine is to be worked as a gold mine.

Yavapai County.

At the Senator mine, 12 miles south of Prescott, Superintendent A. J. Pickerell has the tunnel in 2500 feet.——In the same district the Gold Copper Co. is running a development tunnel from Crook canyon under the superintendency of T. Marmont. —— At the Mt. Union mine, south of Prescott, the shaft is down 530 feet, with drifts from the 400 to the 500-foot levels. The ore is crushed and concentrated at the mine. E. E. Greenwood is manager and L. Greenwood superintendent.——At Walker, the Metals M. Co., under the management of G. W. Middleton, is developing the Sheldon and Monroe properties. A car line extends to the Sheldon, with a branch to the Monroe. At present the cars are hauled by animals, but the company has contracted with the Arizona Smelting Co. for electric power sufficient to supply the mines, car line, and a new mill of 250 tons capacity.

At the Jeanette–Arizona mine, near Hillside, the shaft has been sunk 440 feet under the direction of Superintendent Carbaugh.

CALIFORNIA.

Amador County.

The Oneida mine, near Jackson, is to be prospected to greater depth. A winze is to be sunk from the 2400 level to a depth of 600 feet. The grade of rock at present being worked is low.——At the Zeila mine, near Jackson, thirty of the forty stamps will be run by electricity, the other ten will be run by water power. This utilization of water for part of the mill is necessary to supply sufficient water to carry off the tailings.

El Dorado County.

Richard Reed and Clifford Cheek will put in an arrastra on the Silva mine at Georgetown.——The Gopher-Boulder mill near Kelsey has been started up on a test run. C. S. Hersey of Georgetown is millman.

The River Hill mine, near Placerville, has reached a depth of 1300 feet, 1000 feet in the main shaft and 300 feet in the winze.——At the Nigger Flat mine, near Placerville, they are boring for the channel and splendid progress is reported.

Humboldt County.

A 3-stamp mill is being put in at the Fern Leaf mine at Orleans Bar, 65 miles by trail from Arcata. F. S. Elder is superintendent. The lighter machinery is being packed by mules to the mine, while the heavier sections are to be hauled by wagon to Hoopa, and then carried up the Klamath river by boats to within 8 miles of the mine, whence they will be taken in by sleds.

Los Angeles County.

(Special Correspondence).—The Lowell & California M. Co., F. C. Fenner manager and J. L. Witney superintendent, have started their new 10-stamp mill at Bighorn on ore from the No. 6 tunnel, averaging four tons to the head.

Bighorn, Sept. 16.

Mono County.

(Special Correspondence).—The metallurgical treatment of ore at the mines of the Standard Con. Co. at Bodie has been materially changed within the past eight months, and is now one of the most modern in California, including crushing in cyanide solution, further crushing in tube mill and final treatment by the Moore process. The ore is crushed to 30 mesh in the 20-stamp mill. Crushing is done in cyanide solution, using two pounds of cyanide per ton of ore. Plate and battery amalgamation save 60% of the values, which run from $18 to $20 per ton. The plates have an inclination of 2½ inches to the foot. After concentration by vanners the pulp is elevated to the tube mill, where it is first classified by spitzkasten and the coarse material fed to the tube mill, together with the sands and slimes from the vanners, which are fed dry. Irregular pebbles from Mono lake have been used, but, being irregular, they slide and will not roll, causing greater wear on the liners and requiring more power. Hereafter Iceland flints, now being shipped, are to be used. The tube mill crushes to 150 to 200 mesh. The coarse material from the mill is separated by spitzkasten and recrushed. The pulp then passes to settlers and the settlings, 25% to 30% solid, are treated by the Moore process. This makes an extraction of 85% from the slimes and mill tailings, as compared with 70% extraction obtained before regrinding was tried. The concentrates from the vanners are ground fine with strong cyanide solution in pans and also treated by the Moore process, giving an extraction of 95%. In the Moore plant two "baskets" or units of filters are used, consisting of a series of parallel plates 4 inches apart, each plate being about 20 feet long and 4 feet high, consisting of a light framework covered with canvas. In the original plant a suction pipe passed through the top at the center to within ½ inch of the bottom; two blowpipes also entered at the top. The whole series was hung from a crane, which raised and lowered the basket and carried it from one compartment of the tank to another. The filter is lowered in the slimes compartment and the vacuum pump started, the slimes being agitated to prevent settling. The suction is continued until a coating of slimes is formed on all parts of the filtering surface to a depth of from ⅛ to 1 inch. During this time the pump is continuously discharging the clear gold solution. The crane then carries the basket to the weak solution and to the wash water, the vacuum preventing the cakes from dropping off during the transfer. To discharge the cakes, a blast of air is turned into a pipe connected with the blowing pipes of each plate and the vacuum pump is stopped, the air dislodging the slime cakes, which drop into cars below. The filtrate from the baskets passes to the zinc boxes and thence to the sump, whence the solution is pumped to the mill. The Moore process is giving satisfaction. Theodore J. Hoover is superintendent of the mine and mill and W. P. Hamilton is foreman of the plant.

Bodie, Sept. 18.

Nevada County.

It is stated that the Gaston M. Co. at Gaston intends running a tunnel from Poorman's creek, several thousand feet below the present workings. The new tunnel would be over 5000 feet in length in order to reach the ledge, 3000 feet below the surface. The present tunnel is 2000 feet long.

The Prescott Hill shaft, near Grass Valley, has a depth of 650 feet, and it is the intention of the Sultana Co., which owns the mine, to put it down 500 feet farther.

Shasta County.

Suit has been filed in the Circuit Court of northern California by Joseph A. Coram against the Balaklala Con. C. Co. of Nevada; the Western Exploration Co. of Utah; F. H. Buhl of Sharon, Pa.; G. H. Baird of Chicago; Willard F. Snyder of Salt Lake City, Utah; the executors of the estate of Peter L. Kimberly, and the White Knob C. Co. of Maine, to prevent the sale of the Balaklala Co.'s property to the White Knob C. Co., which previously operated in the Hailey district in Idaho. The complaint states that on April 3, 1905, F. H. Buhl, representing a majority of the directors of the Western Exploration Co., which at that time owned the entire capital stock of the Balaklala C. Co., with the knoweledge and consent of the other directors, Peter L. Kimberly and Willard F. Snyder, who owned and controlled a majority of the stock of the Western Exploration Co., authorized J. A. Coram to sell the Balaklala property for $750,000 cash and $1,000,000 worth of stock in the consolidated company of which the Balaklala was to form one of the constituent parts. Pursuant to the authority granted to him, J. A. Coram accomplished the sale of the property on May 3, but on July 3 the Western Exploration Co. sold the property to the White Knob C. Co. Coram prays that the sale to the White Knob C. Co. be set aside and the Western Exploration Co. be compelled to pay damages in the case. The complaint further shows that Mr. Coram, in his endeavor to keep his agreement with his principals, tried to purchase a controlling interest in the White Knob C. Co. The agreement between Mr. Buhl and Mr. Coram, under which the latter sold the property, is also exhibited.

The rates which the Mammoth Copper Co. at Kennet has established for the treatment of siliceous ores are as follows: Ore from $3 to $15 a ton assay value will be smelted free, and 75% of the value returned to the shipper. On ore between $15 and $25 in assay value, 77½% of the value will be returned to the shipper and there is no smelting charge. On ore from $25 to $50 a ton, 90% of the assay value will be returned and a charge of $2.50 a ton will be made for smelting. On ore from $50 to $75 a ton, 95% will be returned and a charge of $5 a ton will be made for smelting; on that assaying from $75 to $100 a ton 95% will be returned and a smelting charge of $7 a ton will be made. On ore from $100 to $200 a ton, 95% will be returned and a smelting charge of $10 added. In addition to the above percentages of gold, 90% of all silver values will be returned on ores assaying above five ounces to the ton. No return will be made on less values. Only siliceous ores as high as 90% in silica will be subject to a smelting charge; gold will be paid for at the rate of $20 per ounce and silver at current New York quotations. No lots of less than ten tons will be received at the smelter.

Sierra County.

It is stated that A. J. Pinkstone, superintendent of the Sierra Buttes mine at Sierra City, will develop the Comet quartz mine in Jim Crow canyon, 5 miles from Downieville.

Siskiyou County.

The Eliza mine on Humbug, near Yreka, is being developed under the superintendence of C. A. Patterson. The machinery for a new quartz mill and cyanide plant is on the ground.——The Deadwood placer mine, near Yreka, has been sold to a syndicate of Chinamen at San Francisco, headed by U. S. Interpreter Mun.

Tuolumne County.

It is reported that a pumping plant, 100-ton gravel mill and excavating machinery are to be put in at the Montezuma gravel mine, near Columbia. W. T. Beveridge is interested. —— Leasers are working the New York tunnel on Table mountain, near Columbia. The lower channel has not been reached.——A drain tunnel has been run 1000 feet to unwater the Cincinnati mine,

near Columbia. The shaft was abandoned because of the water.——The Richards' claim on Table mountain is to be unwatered by the Muir tunnel.——The Truckenmiller Con. M. Co. are making a raise to tap the gravel channel, having run the tunnel 670 feet. Sluices and gravel bins are being put in to work the gravel. H. Knott is superintendent.

The Clio shaft, near Jacksonville, is down 400 feet.——At the Mustang mine, near Confidence, twenty-two men are at work. A 5-stamp mill has been put up and a short mill run made. J. M. McMahon is manager.——At the New Calico at Stent the shaft is down 220 feet and the ground to that depth has been explored and ore blocked out. At present they are crosscutting at the 200 and drifting north and south on the west ledge. The expense for fuel, for hoist, pump station, drills, etc., runs $5.60 per twenty-four hours.

COLORADO.

(Special Correspondence).—Although W. S. Stratton of Cripple Creek fame has been dead for a number of years, every few months some one files a suit against his estate, claiming that at some time or other during the life of the deceased he had furnished him a sack of tobacco to prospect on, or some other similar charge. The latest suit filed is by a party named Meredith, who claims to be a mining engineer, and who further claims, according to reports, that there is coming to him from the Stratton estate $10,000 commission from a mining deal that never went through and $50,000 for the depreciation of the stock on account of the deal not having been consummated.——According to the U. S. Mint report for 1904 recently sent out, Colorado seems to be in the front rank as a gold-producing State. This year should see a much larger production than during 1904, as the districts affected by the strike are about to their normal condition and others are forging ahead.——During the past few years there is a tendency to put in electric power for operating various machinery employed on a mine. In a number of instances a company has secured control of water rights on certain streams for power purposes and has harnessed same up with electrical machinery, strung wires for a distance of 20 or 30 miles over mountain ranges and are supplying power to the mines for 10% to 40% less than the mines can produce their own power by shipping in coal. When this was first talked of, some said it could not be done on account of the climatic conditions they had to contend with in a mountainous country. It has been done and a number of such projects are now under way throughout the State. Wherever tried it has been a success and a source of revenue, not only to the company selling the power, but to the purchaser of the power. There seems to be considerable agitation for electric roads to the mines. One of the late ones to come into prominence is at Telluride, where a franchise has been granted to a company who intends to build an electric road into Marshall and Savage basins, and will not only carry passengers, but ore and supplies as well. According to report, they have agreed to reimburse the county of San Miguel for the amount of money expended on the county road into these basins. The greatest difficulty to be encountered will be through the winter months on account of heavy snow and slides, but this, like the difficulties with the electric lines for power purposes, will undoubtedly be overcome. If such an undertaking proves successful, it will be the means of others throughout the San Juan and other sections of Colorado.

Denver, Sept. 18.

According to J. H. Pratt in a recent report of the United States Geological Survey, the tungsten deposits of Colorado are located in Boulder, Gilpin, Lake, Ouray and San Juan counties, with the more important deposits in the first-named county. The deposits in Boulder county are in the vicinity of Nederland and Sugar Loaf, ann these localities produced by far the largest proportion of the tungsten output of 1904. According to the reports received from the producers in this county, the ore concentrated on the average ten tons to one, the concentrates averaging from 60% to 68% of tungstic acid. Practically all of these concentrates are shipped East, where they are treated chemically and reduced to the black tungsten metal or powder. Other portions are used directly in the manufacture of the fused metal or in the ferrotungsten alloy.

Chaffee County.

Ore is being shipped from the first vein cut by the Latchaw tunnel being driven in Mount Princeton under the direction of C. N. Sharp of Buena Vista. Stoping is to be started in other veins cut in drivings of 3000 feet.

Custer County.

The Hessite G. M. Co. is said to have struck rich ore at a depth of 50 feet on the Evening Star lode, near Silver Cliff. Manager M. S. Olin will sink the shaft 100 feet deeper.

Gilpin County.

Peter Daly and James Cody of Central City are developing the Mountain Lion, Elk and Alice Taylor lode claims, up Elk creek, by means of a tunnel which has been driven in on the Mountain Lion vein 175 feet.——It is reported that five stamps are to be added to the mill of the Mountain Monarch M. Co., near Rollinsville.——Grading is being done near Rollinsville for the new mill of the Penobscot M. & M. Co. The new mill is to be located below the tunnel entrance, and will be a 10 rapid-drop stamp amalgamating and concentrating mill. A 4-drill air compressor is to be put in, as well as a 100 H. P. boiler, in the new mill building. P. J. Hamble is manager.——Buress & Dowd of Denver have taken an option on the Copper King, in Lump gulch, and are preparing to unwater the main shaft, preparatory to putting in hoisting machinery. The mine is owned by Lunwall & Sons of Central City.——The Imperial M. & M. Co., operating the Mackey and Sarah Jane mines and the Mountz and Palmer mill, at the junction of Elk and Pine creeks, near Apex, has consolidated the holdings of the Cyrene Gold Mines Co., owning the Cyrene, Cyrene Extension, Jack Middleton, Clara Gees and Cronje lodes, in Twelve Mile and Elk Park sections of the Pine Creek district. The work on the Cyrene group at Twelve Mile is rather prospecting, a shaft having been started from surface. Operations were until recently carried on in the main shaft, but were suspended on account of there being too much water to handle. The hoisting engine formerly at the Mackey mine is being removed to the Cyrene shaft, and Manager Mountz has bought a 30 H. P. boiler and a new shaft building will be built. At the Mackey mine the small hoist formerly used has been taken out and will be replaced by the larger hoisting rig from the Cyrene mine in Twelve Mile. The levels at a depth of 150 feet are being extended both ways. The main shaft is down 250 feet, and they intend after the heavier machinery is in place to sink 200 or 300 feet during the winter.——The Fostoria G. M. Co., who leased the right of way to work their property in the Pleasant Valley district, 2½ miles south of Central City, through the Hudson Burr tunnel, have commenced drilling. The mouth of the tunnel is in Clear Creek county and cuts Nighthawk mountain. Before striking the vein of the Fostoria, the company will have to drive 400 feet. They will cut the Fostoria vein at a depth of 600 feet. W. E. Campbell has charge.——The Pleasant Valley M. & M. Co. has graders making preparations for the switch to connect the Gilpin tramway with the Banta-Hill properties.——C. E. Hurlbut of Downsville, N. Y., has purchased a one-half interest in the Great Divide claims, in Mammoth gulch, the other half interest being owned by A. M. Willard of Gilpin. Development is being done by a tunnel now in over 175 feet.——The Portland-Dow M. Co., in developing their claims in Moon gulch, have driven their tunnel 600 feet. Superintendent C. L. Dow reports that they have cut five veins.——Development work is being carried on in the Gauntlet mine, on the east end of Quartz hill, by the Gauntlet M. Co., with L. D. Hobson as manager.

Clear Creek County.

An important strike has been made in the Marshall tunnel, near Georgetown, through which the Colorado Central–Aliunde property is being worked by F. A. Maxwell. The strike was made on company ground and in the east drift recently started on the Aliunde vein No. 2. Considerable zinc is contained in the ore. The first shipment by the lessees from the 1000-foot level has been made by McClusky & Cottingham. John Beyo & Co., operating to the east, expect to start shipments soon. The winze, which was being sunk for the purpose of proving up disputed ground, has broken through and a big body of medium-grade ore is exposed. This ground is being worked out as fast as possible in order to enable Haggart & Patton to cover the winze. —— It is reported that the Vesper group, near Georgetown, will be turned over to Chicago men. D. W. Shepard and E. Williams, owners of the property, are employing men in development work. —— C. G. Mety of Denver has a lease and bond on the Gladstone–Cardigan mines, south of Idaho Springs. W. S. Mety has been placed in charge of the mine work and also the Allan mill on Chicago creek. This mill has been secured under lease for the purpose of running the mill dirt from these properties and such custom ores as may be offered. —— The Mount Theresa G. M. Co. has been formed by A. D. Bullis, C. Arthur and W. E. Garver to operate the Consolidated Moore and Big Chief groups on Mount Theresa, 1 mile south of Idaho Springs, on Soda creek. The company plans to put in a power plant on Soda creek and drive its machinery, hoist, pumps and drills by electric power. An ore shoot exposed in the Moore tunnel will be explored by sinking a shaft. The Moore tunnel is heading toward the ground of the Lexington and Preacher lodes. —— The tunnel on the Little Richard mine is in 2000 feet and two machine drills are forcing it ahead toward the ground on the Lexington vein. G. L. Bingham is manager.

Gunnison County.

The Elk Mountain Pilot of Crested Butte reports a strike of $35,000 gold ore on Cross mountain across Taylor river from the Doctor mine. —— The Doctor mine is to be reopened and operated by some Swedish miners.—— A strike of ruby silver ore is reported near Marcellena mountain.

The Midland mine, south of Gunnison, has been leased and bonded to the Spring Valley Gold M. & R. Co. The cyanide process has been adopted in the mill and the company is treating ten tons per day. The company is driving a tunnel to cut the ore below the shaft 100 feet. It will be driven 1300 feet.

Lake County.

J. W. Bailey of New York has a five-year bond and lease on the Grand Trunk group in the Holy Cross district, near Leadville, and will develop the property. The main tunnel is in 2050 feet, and from a point in this tunnel a crosscut drift will be run 350 feet to tap the chimney of ore opened in the upper tunnel.

T. J. Cash and associates, lessees on the Triumph, Jonny Hill, Leadville, have a lease on the Irene, a parallel claim, and are making preparations for development. The property has not been worked for ten years, the last being the driving of the lower drift, when, it is said, the fault was cut.

Ouray County.

The Atlas M. & M. Co. of Ouray has decided not to build its mill this year. Most of the machinery, dismantled from a mill in Rio Grande county, is laid down near the company's mill site. Instead, the company has rented the Governor 10-stamp mill for three months and will make 50-ton test runs on the Atlas surface ores, as well as upon those of the Mogul, Gilpin county and other lode claims adjoining the property.

San Juan County.

Superintendent A. A. Lamont of the Boston & Silverton M. & R. Co. reports that there is yet 400 feet more of tunnel to run to tap the Uncle Sam vein on the company's property 2 miles up Cement creek from Silverton. This will make the length of the Yukon tunnel bore 2300 feet into the mountain, and the Lamont tunnel on the same group is now into the hill 900 feet.

In level No. 1 of the Highland Mary in Cunningham Gulch, near Silverton, twenty men are developing the new strike.——The Frisco M. Co., working in the Mineral Point section, near Silverton, has let a contract for 5000 feet of tunnel work.

On November 1, the Animas Power Co., with its electric plant located at Rockwood, 25 miles south of Silverton, at the mouth of Cascade creek, will turn on the current and begin supplying the mines of San Juan with the cheapest and most effective power they have had.

San Miguel County.

It is planned to connect the mines of Marshall and Savage basins in Telluride district by an electric traction line, with the chief shipping station of the Denver & Rio Grande Southern Railroad at Telluride. It will connect with the Tomboy, Smuggler-Union, Japan–Flora and Liberty Bell mines, conveying the ores to the mills at Pandora and concentrates to the Rio Grande cars for shipment to the smelters.

Wagner Brothers are increasing their operations on the Smuggler & Sheridan dumps of the Smuggler & Sheridan mines, near Telluride, and the 76 claims on which they have a lease, and are employing 100 men. The dump ore is put through a Crane separator, and then transported over the Smuggler-Union tramway to the Smuggler 80-stamp mill for treatment.

Summit County.

At the Old Union mine on Mineral hill, Breckenridge, more men have been put to work and considerable ore is being opened up in the Moore tunnel. The mill is running steadily.——The Briar Rose properties, on Peak Ten, 5 miles southwest of Breckenridge, have been sold to the Parker Syndicate of Memphis, Tenn., by C. A. Finding. The property, while inconvenient to get to in the winter season, has been a producer of high-grade silver ore. They propose to open the mine with a lower tunnel.——The Hoosier Creek G. M. Co. have struck a vein of gold-bearing pyrite in a crosscut at the 110-foot level.——G. C. Smith, who is operating the Charlie Ross property at the head of McCullough gulch, near Breckenridge, reports striking a new silver-lead vein. At the surface the vein, which has been named the Crater, shows partly oxidized lead ore that shows indication of silver chloride.

Teller County.

A depth of 300 feet has been reached by lessees in the shaft of the Beacon hill Ajax, near Cripple Creek, and at that depth a station has been cut and a crosscut started toward the vein. —— It is probable that work will be resumed on the Perrault group on Mineral hill. ——It is reported that a leasing company will start work on the Extra Session claim of the Grace G. M. Co. of Cripple Creek, putting up a mill and sinking a shaft from the 200 to the 300-foot level. —— Chas. Weider has leased the Finn claim of the Royal Oak of Cripple Creek and proposes to sink the shaft from the 200 to the 400-foot level. A steam hoist is to be put in. —— Articles of incorporation for the Dark Horse M. & L. Co. have been filed by T. R. Cudahy, E. Mitchell and C. L. Bailey. The principal office is Central City and the place of operation Teller county. The company has leased the Flying Cloud, Sarah Ann McDonald, Royal Age and part of the Brinsmaid. The Flying Cloud lies on the southeast slope of Bull hill and near Pinnacle park. Several veins have been exposed from the surface to 100 feet deep, and one of them has surrendered ore. The latter body had a width of from 2 to 3 feet and a metallic content varying from pay to $30. —— Arrangements are being made by the Oro Mines Co., lessee of the Oro claim on the north slope of Ironclad hill, Cripple Creek, to put in a steam hoist. As soon as it is in commission sinking will be resumed. Machine drills will be used in the work. The shaft has a depth of 80 feet. It will be continued to the 300-foot point. —— Hodges & Taubert, leasing on the Little Clara claim of the Work Co., will use machine drills in their prospecting work. They reach the Little Clara through the Moffat tunnel. —— Shipments are to be resumed from the Maybeso mine on Squaw mountain, near Cripple Creek, by Bateman & Co., lessees.

IDAHO.

Boise County.

Manager G. Z. Edwards of the Lincoln Co. of Pearl says the first half of the new cyanide plant with which the properties are being equipped is ready to go into commission with the second half to follow soon. It has a crushing capacity of 150 tons daily. On the 340-foot level he has drifted on gold-bearing ore with some silver and of uniform value for over 200 feet.——Near Pearl a mill is being constructed by the owners of the Black Pearl group, in which much ore has also been blocked out, while another plant has been started at the Osborne group.

Elmore County.

B. J. Erwin, vice-president and general manager of the Provident Investment Co., owner of the Mountain View mine at Pine, reports that a vein of high grade ore has been cut at the Mary Glenn. Work will be continued all winter in charge of Theodore Knutson. For the Mountain View mine, Erwin is putting in an electric power plant on Lime creek. It will have a capacity of 400 H. P. and will be completed ready to run the Mountain View mill within two months. The Mountain View has an 80-ton mill.

Idaho County.

A big strike was recently made in the Jumbo claim, near Grangeville, on the 850-foot level. Milling has begun on the new ore.

Kootenai County.

D. W. Casseday, president of the Panhandle Smelting Co., expects that the smelter being built at Ponderay, 1 mile from Sandpoint, will be finished within a month. This is a 200-ton custom smelter built to treat the ore from the mines near Lake Pend d'Oreille. These include the Minerva M. Co.'s mines near Granite creek, on the east side of the lake, which produce lead-zinc sulphides and gray copper ore; the B. R. & B. mine at Blacktail, producing silver-bearing gray copper ore, which has been opened by an 1800-foot crosscut drain tunnel under the management of J. A. Brown; the B. F. & H. mine near Blacktail, being opened through a 700-foot crosscut tunnel, and the Venezuela, Keep Cool and Weber mines near Lake View.

Lemhi County.

The deposits of nickel and cobalt in Lemhi county,

from which about sixty tons of ore produced in 1903 were shipped as a sample of the ore, did not produce in 1904.

Owyhee County.

The Owyhee Nugget says that the recent strike on the Ruth mine, near Silver City, and the finding of the main vein shows the wisdom of crosscutting a ledge when evidence of ore is to be found, closely connected with the vein. The Ruth mine was acquired by G. W. Westlake and J. Lewis, who proceeded to develop it according to modern methods. The Ruth is an old location, on the northwestern slope of War Eagle mountain. The formation is normal and metamorphic granite. The vein is split by altered granite which the previous owners mistook for the hanging wall, and development was confined to a small stratum of quartz accompanying the foot wall. A tunnel was driven on the ore streak 1100 feet and ore extracted which netted the owners a little over $65,000. The work cost about $30,000 and can be used to advantage, as the main ore vein lies 15 feet from the foot wall and plainly shows the comb structure of the fissure vein system. A shaft is being sunk on the property and drifting on the vein will be done on the 100-foot level.——The War Eagle Consolidated Co. has men cleaning out the old Oro Fino tunnel and the stopes between it and the Golden Chariot shaft, preparatory to pumping out. A. Buckbee has charge.

Shoshone County.

J. H. Nordquist has been given the contract to drive an 800-foot tunnel on the Bull Pen group, a copper property, near Wallace.

At the Idaho Giant, two miles south of Mullan, there are 1200 feet of tunnel, and men are drifting on the vein. A gasoline engine and blower have been put in for ventilating, and a larger force of men can now be employed. The present work is in following the vein, and the company expects to be under the ore shoot in three months.

MICHIGAN.

Houghton County.

The Rhode Island shaft, which was recently started for the Quick lode, has been discontinued before reaching rock, awaiting Franklin results on the Kearsarge lode. The eighth level from the working shaft is in 1200 feet in encouraging ground.

MONTANA.

Beaverhead County.

It is reported that silver ore has been struck in the New Departure mine, 10 miles south of Dillon. The mine is being operated by O. M. Best, John Mackey and W. A. Jones, all of Dillon.

Fergus County.

N. J. Littlejohn of Lewistown and A. S. Wright of Chicago have located 1100 acres of ground as placer claims between the Gold Reef property and Whisky gulch, near Gilt Edge. The land will be prospected with a diamond drill.

At Kendall the Cyanide G. M. Co. has been formed by W. A. Shauls of Kendall, E. Johnson of Portland and J. R. Cook of Spokane to conduct mining operations on property beneath the townsite of Kendall.

Granite County.

It is reported that President Paul A. Fusz of the Granite-Bimetallic Co. and C. D. McLure of the Combination M. & M. Co. have leased the Granite-Bimetallic mines at Phillipsburg, and will sub-let certain portions of them. Such sub-leases have been made to a few.

Silver Bow County.

(Special Correspondence).—The Hancock lode claim purchased by the North Butte Co. is but 500 feet wide and 150 feet long, but it is a valuable piece of ground, because it is probable that the copper vein of the Jessie mine runs through the Hancock. The latter lies west of and adjoins the Jessie, in which the North Butte has been mining ever since it acquired the Speculator properties. The company is trying to buy the Kentucky lode claim west of the Hancock. Another company is being organized to take the Berlin and Lynchburg mines.——The North Butte has been sued for $20,000 damages by a miner who was injured in the Speculator mine, and for which he blames the company.——The Washoe smelter at Anaconda is consuming 11,300 tons of material daily, consisting of 8000 tons of ore, 1300 tons of lime rock, 400 tons of coke, 600 tons of coal and 1000 tons of other materials. The company employs 2500 men, of that number 1850 being at work in the smelter proper and the others at the foundry, brick yard, etc. The daily average of ore shipped from Butte to Anaconda is 8000 tons, though it has reached as high as 10,400 tons in one day. The smelter is able to handle 12,000 tons a day. It seems probable that the Amalgamated Co. will make another attempt to get an injunction against the Minnie Healey mine, owned by United Copper, and stop work on the ore bodies claimed by the Boston & Montana, to apex in the Piccolo, Gambetta and Colusa lode claims. It has been the contention of the Boston & Montana that the big Colusa vein dips under the Piccolo and Gambetta and into the Minnie Healey and that the Heinze Companies which have been working the Minnie Healey have mined on the Colusa vein and not on a separate vein having its apex in the Minnie Healey ground. Last fall a suit for $5,000,000 damages, on account of ore alleged to have been taken from the Colusa vein, was brought against the Heinzes and a restraining order was issued from the court which caused a suspension of operation on the mine for several days, and then the injunction was set aside. Since then the case has been allowed to rest in court until a few days ago when another Heinze Company was added as defendant, and it was stated to be the intention of the Boston & Montana to push the case.——A large body of ore has been found on the 300-foot level of the Lexington mine, which runs 104 ounces in gold and 124 ounces in silver to the ton. The Lexington is a property of the La France Copper Co., which is being floated by F. A. Heinze, and is independent of United Copper. Mr. Heinze has just returned from France, where he had been for several months in the interest of his new company.

Butte, Sept. 18.

The Raven mine is shipping silver-copper ore from a depth of 1200 feet.——A raise is to be made from the end of the crosscut from the 2400-foot level of the High Ore to connect with the Mountain View shaft of the Boston & Montreal Co. at Butte. This is down 1800 feet.

MISSOURI.

According to H. F. Bain and E. O. Ulrich in a recent report of the United States Geological Survey, copper in the form of sulphides and carbonates has been found at many points in southern Missouri, and has been mined in several localities, notably in Ste. Genevieve, Madison, Shannon and Crawford counties. Very large deposits, rivaling those of the West, have not been found and are not to be expected. The character of the ore and the low cost of flux, fuel and labor make it possible to work some, at least, of the deposits with profit. The ores show a preference for certain stratigraphic horizons, and, being bedded, may be prospected with ease and economy. The common association of sulphides with specular iron of the sandstone region points to the advisability of the investigation of the old iron pits. In Shannon county the most favorable localities are along the contact of porphyry and dolomite at points where the conglomerate beds at the base of the latter fill in shallow basins in the crystalline rocks. In the disseminated lead district of southeastern Missouri copper occurs in connection with the lead, and at a few points can be saved to advantage.

NEVADA.

Elko County.

Work has been commenced on the Nevada Northern Railway, which is to connect Elko with Toano, giving the copper deposits about Copper Flat, Pilot Knob and Ely an outlet.

Lincoln County.

The Searchlight Parallel G. M. Co. is putting in a 12 H. P. gasoline hoist, ore cars, rails, blower, pipe and other material at their mine near Searchlight. T. D. Forney is superintendent. The shaft will be sunk to the 500-foot level. Stations will be cut at each 100 feet.——M. W. Hurt, of London, England, has bought the Esther group, near Searchlight, from W. A. Groffs, and will sink to the water level.——The Skylight, Moonlight and Starlight claims, near Searchlight, have been sold to F. Armond of Switzerland and London and J. Koebig of Los Angeles, by W. L. Colton, T. L. Henderson and L. Wheatley.——The shaft in the New Year's Gift ledge of the Duplex M. & M. Co., of Searchlight, is now down 45 feet. The company intends to start shipping.

Nye County.

Articles of incorporation of the Las Vegas Tonopah Railroad Co. have been filed in Utah. The incorporators are: William A. Clark of Butte, Mont.; R. C. Kerens of St. Louis, Mo.; J. Ross Clark, R. J. Waters and W. H. Comstock of Los Angeles, and C. O. Whittemore and Pennel Cherrington of Salt Lake City. The corporation has an authorized capital of $4,000,000, of which $500,000 has been subscribed, as follows: William A. Clark, $100,000; R. C. Kerens, $200,000; J. Ross Clark, $199,600, and each of the other incorporators, $100. The officers of the corporation are: President, J. Ross Clark; vice-president, C. O. Whittemore; secretary, W. H. Comstock; treasurer, R. J. Waters. As stated in the articles of incorporation, the object and purposes of the corporation are to construct and operate a line of railroad from a point of connection with the San Pedro, Los Angeles and Salt Lake Railroad at Las Vegas, Nev., by the most feasible and practicable route, through the counties of Lincoln, Nye and Esmeralda, to the town of Tonopah, Nev., with connections to the mining camps of Bullfrog, Beatty, Rhyolite and Goldfield.

Washoe County.

The Keystone Nevada M. Co., through C. H. Bovee, has purchased the Olinghouse mine and mill, in Olinghouse Canyon.

NEW MEXICO.

Grant County.

On a claim between the Baltic and Flagler at Chloride Flats, near Silver City, a rich gold strike was made recently by Manuel Taylor and Ernest Oughton.

Otero County.

Arrangements are being made to put in washers and amalgamators south of Baird hill at Jarilla by Wells & Bohardt on their placer grounds. The Electric M. Co., which has 100 acres of placer ground, is also preparing for active work.——A contract has been let to sink the Garnet shaft at Jarilla from the 450-foot level to a depth of 500 feet.——An incline shaft has been started from the 690-foot level of the Nannie Baird mine at Jarilla. The incline follows the center of the vein.

OREGON.

Baker County.

Work is to be resumed on the Ross Gulch mine, owned by Basche & Stern, 2 miles southeast of Greenhorn.——Rich ore has been cut by the 50-foot shaft at the Pyx mine, near Greenhorn. The shaft will be sunk to a depth of 100 feet and crosscuts driven.

Josephine County.

N. E. Emerson is getting the Dutch John placer mines ready for the winter run. The mine is on the south bank of Rogue river, between Shan and Pickett creeks, near Grants Pass. The equipment consists of two giants. The water supply is from Shan creek and 1800 feet of pipe is used to give the head of 180 feet.

The smelter and reduction plant for Rogue River S. & M. Co. is being built in Spokane, and will soon be ready for shipment to Grants Pass. Ground has been cleared on the site, by Rogue river, 3 miles above Grants Pass. A straight line copper and gold furnace, 36x89 inches, will be put in. A dam will be built across the Rogue, by the dumping of slag from the plant. Coke can be delivered at the furnace for less than $9 a ton. One ton of coke will reduce six tons of ore, thus making the fuel charge $1.50 per ton. The company estimates that it will cost 50 cents a ton to handle the ore at the smelter. The nearest smelter is at Waldo, 45 miles from Grants Pass.——A new mill has been put in at the Gold Pick mine at Sucker creek, near Grants Pass. Frank Fowler is manager.

SOUTH DAKOTA.

Lawrence County.

A government report on the mineral resources of the United States states that the tungsten deposits in South Dakota are found in the Black Hills in two localities—one almost immediately north of Lead, near the top of the high hill forming the divide between Gold Run and Deadwood gulches, and the other more to the south of Lead, on the divide between Yellow and White Wood creeks. The tungsten mineral is wolframite, and it occurs in an impure dolomite which is very siliceous and grades off almost into a quartzite. The wolframite is found in flat, horizontal, but irregular masses up to 2 feet in thickness, which frequently cover considerable areas, one having been observed to cover 20 to 30 square feet.

It is reported that 120 stamps are to be erected by the Columbus Co. at a convenient site near the main shaft in Sawpit gulch, Central City. The plant will be equipped with cyaniding devices.

Pennington County.

The Cuyahoga Co., near Keystone, has resumed work. Sinking on the main shaft is now in progress.——Otto and Albert Menger of Keystone are making experiments on the treatment of the tailings from the Holy Terror mill.

UTAH.

Juab County

The ore shipments from Tintic for the week ending Sept. 16 were as follows in carloads: Eagle & Blue Bell, 8; Swansea, 8; Eureka Hill (lease), 1; Godiva, 4; Gemini, 11; Bullion-Beck, 1; Centennial Eureka, 67; Ajax, 2; Carisa, 3; Grand Central, 5; Mammoth, 11; Victoria, 5; Total, 127.

Salt Lake County.

The Emma mine at Alta is being reopened under the direction of Manager Thomas of the Maxfield Co.

The Guggenheim Exploration Co. has begun prospecting the property acquired by the recent Utah copper deal with diamond drills. D. McCarty of Leadville, Colo., has been employed to sink holes at various points on the company's holdings. These holes will be sunk both in and out of the mines.

WASHINGTON.

Chelan County.

In the United States the two principal deposits of molybdenum that have been exploited are near Crown Point, Chelan county, Wash., and at Cooper, Washington county, Me. The deposit in Chelan county is 30 miles from the head of Lake Chelan, which extends for 60 miles in a narrow rock gorge from 2 to 4 miles in width. At the head of the valley the gorge extends westward from the lake to where rises a nearly precipitous granite cliff in which is the molybdenite deposit. The first tunnel was started 900 feet up the side of the cliff. The molybdenite occurs in a blanket quartz vein, which outcrops along the perpendicular granite cliff referred to for a distance of several hundred feet. It is nearly horizontal, but in places has an inclination of from 5° to 6° toward the west. The vein varies in thickness from 2 to 3 feet and has been opened by two tunnels, one extending 195 feet toward the northeast and the other 80 feet westerly. The molybdenite is found in the quartz in small seams up to several inches in thickness that appear to ramify through the quartz in all directions, and it has not thus far been found in the biotite granite which incloses the vein. The molybdenite occurs in flakes from minute particles to irregular masses, and also in crystals that, for molybdenite, are well developed.

FOREIGN.

AFRICA.

The production of gold at the Rand in August is officially announced at 428,581 ounces, the largest on record. The production in July amounted to 419,505 ounces, and the outturn in August last year was 312,277 ounces.

AUSTRALIA.

New South Wales.

G. D. Delprat's manager report for half year ending May 31, 1905, to the Broken Hill Proprietary Co., Ltd.: The tonnage of ore mined at Broken Hill was 296,730 tons, as against 324,535 tons for the previous half year. The cost of working during the period under review was approximately the same as in the previous half year, and the grade of the ore showed no appreciable difference. The 1000-foot level is now connected with Delprat shaft. A gallery is being driven northwards in this level in order to explore the northern portion of the leases, and this is now in about 50 feet. The 800-foot level is now supplying ore regularly. Delprat shaft has been sunk a farther 100 feet, preparatory to opening up the 1200-foot level, the total depth now being 1120 feet. Stewart shaft has been sunk a farther 105 feet, its total depth now being 755 feet. The whole of the sulphide ore was sent to the concentrating mills and the oxidized ore to the smelters. At the concentration plant an increase of 1% in the lead recovery was noted. Six new ball mills were put in for regrinding, with satisfactory results. The sintering works treated 61,786 tons of slimes from the two ore-dressing mills and 55,880 tons of sintering product were dispatched to the smelting works. Mechanical feeders were put in and several stoppages occurred owing to shortage of acid. The total quantity of tailings fed in was 41,292 tons, producing 12,851 tons of concentrates. The tailings resulting from this operation form a valuable material for underground filling; it is very cheap to handle and packs well. The capacity of the plant is now 4000 tons per week. The working costs have come down materially. Another chamber was added to this plant, making three in all. One Glover and two Gay Lussac towers have also been erected. Six hundred tons of strong acid were made during the half year. A furnace for roasting zinc

concentrates has been built and will be put into commission immediately. It is proposed to substitute for the present roasting plant a zinc roasting plant, which is expected to give cheaper acid, and at the same time produce roasted zinc concentrates, required for spelter. The magnetic separators were kept idle during this term, as the other process for the same purpose gave more economical and rapid results. An additional electric locomotive has been obtained for use in connection with the transport of mill tailings, and three of these locomotives are now at work. At the smelter at Port Pirie the new 600 H. P. engine and condenser for driving the blowers is now in regular work, and the two Green blowers are in position. One of the smelting furnaces was modified on new lines, and after a trial extending over several months it was found that the recovery was increased very materially and other advantages followed. All the other furnaces are now being modified on these lines; four are already completed and the others will be taken in hand at once. The following shows the quantity of ore treated in the smelters: Kaolin and siliceous ore (inclusive of purchased ores), 3600 tons; sulphide concentrates, 70,167; sintered slimes, 57,301; carbonate slimes, 3112. Total, 134,180 tons. In addition to the foregoing, there were retreated: Flue dust, 1028 tons, producing 3402 tons of lead; raw matte, 409 tons, producing 324,590 ounces of silver; refinery drosses, 4955 tons, producing 2213 ounces of gold. Thus making the total quantity passed through the smelters 140,572 tons. The roasting plant treated: Concentrates and slimes, 70,608 tons; smelting ore and kaolin, 653; matte, 374. Total, 71,635 tons. The substitution of shell for limestone continues to yield good results. The refinery treated 34,838 tons of bullion, as against 35,851 tons for the previous half year, producing: Silver, fine, 2,638,588 ounces; gold, 1564 ounces; lead, soft, 33,195 tons; antimonial lead, 305 tons. The Dore plant treated 44,349 ounces, producing 1564 ounces of fine gold. At the limestone quarries at Point Turton all preparatory works are finished. Storage bins were erected, a flying fox put up, manager's house built and the jetty raised and lengthened. In future all our limestone requirements will be taken from here. A statement showing the total production, together with revenue and expenditure, since the inception of the company in 1835: Gross ore treated, 7,747,306 tons; lead produced, 733,025; copper produced, 4576; antimonial produced, 7201; silver produced, 129,740,728 ounces (fine); gold produced, 82,933 ounces. Receipts—Net amount received, £26,808,743; cash received for sale of blocks 15 and 16, £576,000. Total, £27,384,743. Expenditures—General working expenses, £17,123,774; depreciation, £938,999. Dividends and bonuses paid—From profits, £7,984,000; from sale of blocks 15 and 16, £576,000; from call made, £16,000. Total, £8,576,000. Reserve and insurance funds, £165,500; balance of profit and loss account, £580,470. Total, £27,384,743.

CANADA.

BRITISH COLUMBIA.

Boundary District.

The production of the mines of the Boundary for the week ending Sept. 16 was: Granby Mines, 11,371 tons; Mother Lode, 3808; Emma, 110; Providence, 20; Last Chance, 20; E. P. U., 40; Don Pedro, 20. Total for week, 15,389. Total for year, 619,172 tons.

Rossland District.

The Rossland Miner reports the tonnage of ore shipped from and crushed at the Rossland mines for the week ending September 16 was as follows:

Mine.	Week.	Year.
Le Roi	2,100	86,826
Le Roi (milled)	210	1,350
Centre Star	2,160	70,740
War Eagle	1,290	48,950
Le Roi Two	450	5,872
Le Roi Two (milled)	...	7 030
Spitzee	...	4,809
Velvet-Portland	...	1,977
Gopher	...	180
Homestake	...	30
Lily May	...	90
Inland Empire	...	30
Cascade-Bonanza	...	60
White Bear	...	1,100
White Bear (milled)	...	2,920
Crown Point	60	180
Jumbo	300	7,629
Totals	6,570	239,773

At Le Roi ore shoot on the 1550-foot level values continue to be about $15 to the ton, while the shoot is developing in a satisfactory manner. The dimensions of the shoot will not be known until considerably more work has been done. Drifting and crosscutting on the shoot is in progress. The Black Bear ore shoot, where it has been found on the ninth level, is looking well, and promises to yield a large tonnage of ore.——At the Le Roi Two the shoot on the fifth level is looking very well and will yield a good-sized tonnage. The other portions of the mine are developing well, and it is stated that at present the Josie is looking as well as it ever did in its history. The shaft that is being extended from the 900-foot level is making good progress. The 250 H. P. electric motor which is to be used in sinking the shaft from the ninth level has not yet arrived.—— The Spitzee has closed down pending the completion of the reorganization. Under this the company shares are made assessable, and the funds realized from the assessments will be ample for all requirements to place the Spitzee upon a profit making basis. The shut down will be short.——At the Center Star the main shaft has reached the tenth level and is being extended from the tenth to the eleventh level. At the rate of progress which is now being made it will not be a great while before the 2000-foot level will be reached. This will be level with the Columbia river and on the level of the water line. —— The Le Roi concentrator has started up. The management of the Le Roi states that the concentrator is doing better work than ever. Since the concentrator started operations tests on a large scale with several hundred tons of ore at a time were made, and in each instance the smelter returns suggested changes. These changes have increased the efficiency of the plant. The Le Roi 2 concentrator continues to treat second-class ore, concentrating it at the ratio of 20 to 1.

Nelson District.

The Nelson News states that the Hendryx cyanide plant has been successfully tested at the property of the Reliance G. M. Co., the values saved being 95%. The ore is received in a bin at the lower terminal of the aerial tram, 1700 feet in length. The coarse ore passes over a slanting grizzly, then to a Blake crusher, and then, with the ore that was already fine, passes between rolls 36x14. From the rolls, the crushed ore falls to the feed bin, from which, by gravity, it is passed into the Chilian mill. There it is reduced to pulp and mixed with a cyanide solution, which passes over amalgamation plates on which nearly 60% of the gold is saved. The liquid solution then passes through a series of ten storage settlers, and thence conveyed by launders to the Hendryx agitator. After from six to eight hours in the agitator the remaining gold values are on the plates that are contained in it. In the agitator the solution is continually exposed to the air by the revolution of the propellor, which hastens the separating process. The solution and the tailings pass from the agitator to a decanter, from the bottom of which the tailings are drawn away to the creek. The then clear solution of cyanide passes to a sump tank, from which, by centrifugal pumps, it is returned to the storage settlers, and from there to the original storage tank, so that the same solution is available for use again. The amount of cyanide required for the process is never more than a pound to a ton of ore, and averages two-fifths of a pound. The same solution may be used repeatedly, with small additions, and the cost of cyanide is 23 cents a pound. S. Lay, the company's superintendent and metallurgist, has increased the sensitiveness of the plates in the agitator by using galvanized plates. Hendryx is making a further improvement by enclosing the plates in a vacuum, covered with a filtering envelope. The vacuum will then draw only the clear solution to the plates and precipitate the gold. The mill treats ore from the May & Jennie mine on 49 creek.

Slocan District.

Work is to be resumed October 1 on the Fisher Maiden group on Four-Mile creek, near Silverton. The property is being opened up by tunnels.——Zinc ore has been struck in a tunnel being driven on the Grey copper claim, near Sandon, under the direction of J. A. Whittier.

Vancouver Island.

The Tyee Copper Co.'s smelter at Duncans Station ran twelve days during August and treated 2018 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $39,110.

Duncans Station, Sept. 16.

MEXICO.

Chihuahua.

The Almoloya M. Co., of which N. O. Bagge of Los Angeles, Cal., is the principal owner, and D. W. Shanks general manager, is putting in a 60 H. P. gas producer power plant for air drills and electric lighting at Sierra Almoloya. —— A hoist has been put in at the Johnson mine, near Santa Cruz.

The supreme court of Mexico has granted the injunction of Eduardo Barcenas, G. C. Harding and others against J. F. Johnston, the Stallforths and others restraining the award to the latter of their locations of 10,000 pertenencias known as the Bazatan denouncement in the Sierra Almoloya district. This scramble for locations on the 10,000 pertenencias mentioned was going on for several months, and in July last the property was to have been raffled off among 1400 locators. The mining agent at Santa Rosalia awarded it to Johnston, Stallforths and others, but the award was immediately enjoined in the federal court at Juarez, and this has been sustained by the federal supreme court to await trial on the merits of the case.

The Waterson G. M. Co., Ltd., at Ocampo has resumed operations after several months' shut-down to remodel the mill and put in a cyanide plant. This is the first cyanide plant to be put in at Ocampo.

Guanajuato.

The Peregrina M. & M. Co., operating the Peregrina mine at Guanajuato, is preparing plans for a new 100-stamp mill and cyanide tanks. The company now has twenty stamps and several cyanide tanks in operation. G. W. Bryant is general manager. —— T. H. Leggatt of London has bonded the El Cubo mine at Guanajuato from H. P. Hollis and associates of Chicago. —— The Guanajuato River M. Co. is preparing to put in centrifugal pumps, jigs and concentrators along the river, near Guanajuato. R. H. Ramsden is superintendent.

Jalisco.

The 30-ton experimental reduction plant at the Santo Domingo mine, near Etzatlan, is in operation. It is expected that within two months the exact treatment demanded by the Santo Domingo ores will be determined, and following that plans will be made for the proposed 100-ton plant. Manager Sustersic states that the erection of the big plant will be rushed. A new air compressor and ten new drills are to be put in.——The Independence M. Co., C. O'Brien manager, is putting up a 10-stamp mill at its properties, 25 miles southwest of Ameca.

Michoacan

Contracts have been made for fifty additional stamps for the reduction plant at the Dos Estrellas mine at Tlalpujahua.

Sonora.

(Special Correspondence).—The Minas Nuevas mill at Alamos is working full blast and giving satisfaction. The new electric-light plant is in, and the underground work is being pushed.——The shaft of the Santo Domingo mine at Alamos is down to a depth of 300 feet, and is now crosscutting to the lode on the east side of the shaft. ——The Quintera, at Alamos, is working full blast, and the smelter is turning out rich matte. Seaboldt is in charge of the smelter. Superintendent Ortiz is running a tunnel west, between the Quintera and Santo Domingo.

Alamos, Sept. 12.

The Yaqui S. & R. Co. is putting in a new reverberating furnace at Toledo. It will have a daily capacity of 100 tons of calcined ore.

Work at the Concordia copper mines, east of Hermosillo, is progressing favorably, with ten men at work under Superintendent C. H. Rankin. —— The mill at Minas Nuevas, Alamos, having been overhauled and repaired, is running full blast.

The Arizona M. & D. Co. has decided to build at Naco, Sonora, a 10-stamp mill to treat the ores of the Gold Treasure mine, 8 miles distant. E. T. Sparrow is general manager of the company, and Charles McHenry is superintendent.——The Democrata Cananea-Sonora C. M. Co. of Cananea is preparing to put in a new furnace with a daily capacity of 300 tons of ore, and to resume production again. The Democrata has nearly 2 miles of underground workings, which has exposed a large ore body. P. F. Hook of Cananea is the superintendent.

SOUTH AMERICA.

Peru.

The Cerro de Pasco M. Co. continues to work in the shafts already sunk, and is prospecting the Cerro de Pasco district and in the districts of Goyllarisquisca, Quishuarcancha and Vinchuscancha by means of diamond and other machine drills. The company has finished the construction of the railway from Oroya to Cerro, which is now open for public traffic. A branch line has also been constructed for 9 miles from Cerro to Vinchuscancha. It has also constructed branch lines to its shafts for the transportation of ore from the mines to the large smelter now being built at Tinahuarco, about 3 leagues from Cerro. This smelter will be finished within eight months and have a capacity of 500 tons per day.

Personal.

NORRIS ENGLISH is examining mines near Chloride, Ariz.

T. A. RICKARD has returned from Halifax, N. S., to New York.

G. P. UPTOS is manager Oro Grande mine, near Wickenburg, Ariz.

F. W. SMITH has resigned as manager Snow Creek mines, near Sumpter, Or.

J. M. CLEMENTS, of New York City, has been examining mines near Globe, Ariz.

W. H. WHITESIDE succeeds B. F. Warren as president the Allis-Chalmers Co.

WM. BARENSCHEER is superintendent Denver Ore Testing Works, Denver, Colo.

A. F. HOLDEN, a mining man of Salt Lake City, Utah, has been in San Francisco, Cal.

F. A. DARRENOUGHE has been made superintendent Shawmut Con. M. Co. at Bingham, Utah.

H. C. TABOR has been appointed superintendent Maud S. Gold M. & D. Co., at Cripple Creek, Colo.

F. J. CLARK has succeeded J. F. Heating as manager Butterfly-Terrible M. Co. at Telluride, Colo.

JOHN H. MACKENZIE of San Francisco has taken the management Le Roi M. Co. at Rossland, B. C.

MALCOLM MCGREGOR is superintendent Hermosa Copper Co., working near Hanover, Grant county, N. M.

SAMUEL FIELDS has been made superintendent Arizona-Mexican mines at Stockton Hill, near Kingman, Ariz.

A. F. HOLDEN, general manager United States M. Co., has been examining the company's new smelter at Kennet, Cal.

C. C. IRWIN has been appointed superintendent Goodenough M. & M. Co., working near Riggins, Idaho county, Idaho.

E. H. DAVISON, superintendent U. S. & Mexican Mining Syndicate at Santa Lucia, Sinaloa, Mexico, is in San Francisco, Cal.

MARK B. KERR has returned from Silver Peak, Nevada, and is examining mines near Cuyamaca, San Diego county, Cal.

C. P. OVERFIELD, western manager American Stoker Co., is in California en route to the Northwest, returning to Salt Lake City, Utah.

J. E. SPURR has resigned from the United States Geological Survey to become mining geologist for the Guggenheim Exploration Co.

R. P. WHEELOCK has resigned as superintendent Enterprise M. R. & I. Co., but will continue assaying and laboratory work in Kingman, Ariz.

W. J. WATSON has been appointed as manager Tyee Copper Co.'s smelter at Ladysmith, Vancouver Island, B. C., in place of Thomas Kiddie, resigned.

JOHN E. ROTHWELL, engineer with the Colorado Iron Works Co., Denver, Colo., is making an extended trip through the Black Hills and the Northwest.

JOHN GROSS, formerly manager the Horseshoe mill, Lead City, S. D., has formed a partnership with Louis Cohen and opened an office in the Jackson block, Denver, Colo., as metallurgists and mining engineers.

Obituary.

E. G. MORRISON, a mineralogist, was accidentally killed at Los Angeles, Cal., Sept. 17.

Books Received.

"Advanced Mechanical Drawing," by A. P. Pierce, will prove valuable to students wishing to know why they conform to certain practices in their work. The treatment is concise and practical. The author opens the theoretical instruction with a chapter on isometric drawing and cavalier projection, continues with a discussion on shadows, and concludes with a chapter on perspective. The problems are well chosen. The text is for advanced students and corresponds to the second year's work in a college course on descriptive geometry. It is published by John Wiley & Sons of New York City and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $2.

There are few technically educated engineers of to-day who have not at some time advantageously consulted "Mechanics of Materials," by Mansfield Merriam. The fact that a tenth edition is necessary and has appeared is in itself good evidence that the author's treatment of this important subject has been appreciated throughout the past thirty years. In this time many advances have been made in this important branch of engineering, making necessary certain additions and in many cases a more extended treatment. The subject is introduced by a discussion of elastic and ultimate strength, explaining the simple stresses and their varying effects on different materials. Then various beams, columns and shafts are discussed and analyzed, the principles explained being illustrated by a number of practical problems. This part of the book is much like previous editions, but the subjects of impact on bars and beams, resilience and work, and apparent and true stresses have been changed with the intention of rendering the presentation more clear and accurate. Among many new topics introduced are those of economic sections for beams, moving loads on beams, constrained beams with supports on different levels, the torsion of rectangular bars, compound columns and beams, reinforced concrete beams, plates under concentrated loads, internal friction, rules for testing materials, and elastic-electric analogies. A few changes in algebraic notation have been made in order that similar quantities may always be designated by letters of the same type, Greek letters being used only for angles and abstract numbers. Compared with the ninth edition, the number of articles has been increased from 151 to 188, the number of tables from 8 to 20, the number of cuts from 85 to 250, and the number of problems from 222 to 305. The length of each page has been increased 8%, smaller type has been used for formulas and problems, and the number of pages has been increased from 378 to 518. The main purpose in rewriting and enlarging the book seems to have been to keep it abreast with modern progress. The treatment is mathematically concise, yet detailed enough to be clear to the student. It is published by John Wiley & Sons, New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $5.

Commercial Paragraphs.

THE Standard Machinery & Supply Co. has been organized to handle mining and other machinery at 427-29 Mission street, San Francisco, Cal.

F. J. FROST AND JOHN C. HALL have opened a brokerage office in the Cooper Building, Denver, Colo., and will sell various kinds of mining machinery. They now represent several Kansas City firms.

THE Denver, Colo., office of the Crocker-Wheeler Co. are furnishing four large motors for the new tube mills at the Portland Cement Co., Portland, Colo., and have the contract for the electrical apparatus for the paper mills at Denver, Colo.

L. S. PIERCE, Denver, Colo., has recently received orders for his amalgamators from the Black Pearl M. Co., Pearl, Idaho; Alice M. Co., Boise, Idaho; J. H. Bemis, Quartzsite, Ariz.; U. S. Mint at Denver, Colo.; J. H. Reilley, Johannesburg, Cal.; Z. A. Harris, Red Rock, Mont.

THE California Ore Testing Works, 559 California street, San Francisco, has recently sampled a car of high-grade tungsten ore shipped to them en route for Germany, where it is used in the manufacture of armor plate. The ore is from the southern part of the State and will be followed by other shipments.

THE Geo. W. Lord Co., Philadelphia, Pa., have resumed shipment of Lord's boiler compounds to Japan and Russia. They report that since the signing of the treaty of peace, in addition to filling standing orders, they have received from their Vladivostock agent an order for a carload of compound to be shipped direct.

W. S. DORAN, formerly associated with the British Westinghouse E. & M. Co., Ltd., has been appointed manager of the power department of Allis-Chalmers Co. He will have entire charge of the company's commercial affairs pertaining to reciprocating steam engines, steam and hydraulic turbines, condensers, gas engines, blowing engines for iron and steel blast furnace service, and rolling mill engines, with headquarters at the general offices of Allis-Chalmers Co., Milwaukee, Wis.

THE Sullivan Machinery Co., of Chicago, reports the addition of two branch offices to its list, one at Knoxville, Tenn., and one at Joplin, Mo. The Knoxville office, with quarters in the Houston Building, is in charge of E. L. Thomas, for several years connected with the New York branch. Rock drills, stone channelers and quarrying machinery are carried in stock. S. A. Allison, who has been the company's representative at Joplin for the past two years, now becomes district manager at that point. A stock of Sullivan compressors, rock drills and duplicate parts and supplies is carried at the company's warehouse at Joplin. The new office is in the Keystone Hotel Block, corner of Fourth and Virginia avenue.

Trade Treatises.

Chas. C. Moore & Co., engineers, 63 First street, San Francisco, Cal., have issued a handsome and interesting illustrated description of "Gas Engines." Concisely, yet thoroughly, the construction and operation of Alamo and National gas and gasoline engines are explained. These engines are of the 4-cycle type.

Latest Market Reports.

SAN FRANCISCO, September 22, 1905.

METALS.

SILVER. — Per oz., Troy: London, 28⅜d (standard ounce, 925 fine); New York, bar silver, 62½c, refined (1000 fine); San Francisco, 62½c; Mexican dollars, 47c, San Francisco; 47c, New York.

COPPER. — New York: Standard, $16.35; Lake, $16.00@16.25; Electrolytic, $16.50; Casting, $15.75@16.20. San Francisco: $16.50. Mill copper plates, $17.50; bars, 18@24c. London: £69 5s spot per ton.

LEAD.—New York, $4.90; Salt Lake City, $3.60; St. Louis, $4.50; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £14 6s ℔ long ton.

SPELTER.—New York, $5.95; St. Louis, $5.75; London, £26 10s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¼c.

TIN.—New York, pig, $32.00@32.10; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔ lb., 40c. London, £145 10s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 2s 6d; San Francisco, local, $38.50@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 33@37c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.50; gray forge, $16.50; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$24.00; open hearth billets, $23.00@$25.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@5.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¾c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.50; single tape, $3.10; Hemp, $2.75; Cement No. 2, $3.00; Cement No. 1, $2.65, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 64c; cs., 68c; raw, bbl., 61c; cs., 66c; Lucol oil, boiled, bbl., 51c; cs., 56c; raw-bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 57½c; cs., 62½c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c.

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING SEPTEMBER 5, 1905.

798,861.—HOISTING APPARATUS—C. J. Allen, San Francisco.
798,593.—FENDER—W. J. Birchell, Phœnix, Ariz.
798,664.—BELT LACING POINT—D. Daniels, San Francisco.
798,891.—BRAKE—G. Eisenkramer, San Francisco.
798,953 —STIRRUP—C. F. Eldenburg, Spokane, Wash.
798,603.—INSECTICIDE—W. D. Everette, Tacoma, Wash.
798,778.—NUT LOCK—C. C. Garrison, Truckee, Cal.
798,782.—BALING PRESS—W. H. Gray, San Leandro, Cal.
798,783.—UMBRELLA—B. M. Greene, Myrtlepoint, Or.
798,674.—AIR BLAST NOZZLE—J. Haas, San Francisco.
798,734—ARM SUPPORT—J. C. King, Callahan, Cal.
798,805.—COMPRESSING HAMS—H. A. Kurfiinke, San Francisco.
798,810.—RAKING APPARATUS—J. R. Lewis, Biggs, Cal.
798,744.—RAILWAY CROSSING—E. F. Meisner, San Francisco.
799,015.—MUFFLER—E. H. Moffitt, San Francisco.
798,623.—FIRE EXTINGUISHER—Poole & Bartlett, Pomona, Cal.
798,974 —WHEEL TIRE—W. C. Poole, Marysville, Cal.
798,977.—DUST CONVEYOR—I. A. Putnam, San Francisco.
798,701.—FISHING REEL—F. J. Rabbeth, Redlands, Cal.
798,979.—PLEASURE RAILWAY—J. C. Reckweg, Los Angeles, Cal.
798,926.—MOTOR TRUCK—C. Schmidt, San Francisco.
799,020.—OILER—E. A. Strause, Los Angeles, Cal.
798,840.—DECORTICATOR—J. B. Sutherland, Seattle, Wash.
798,755.—HYDRATING LIME—J. Thomlinson, Portland, Or.
798,715 —SCALE REMOVER—L. W. Thompson, Hobart Mills, Cal.
798,717.—SPIRIT LEVEL AND SQUARE—C. G. Weatherly, San Francisco.
798,088.—STEAM GOVERNOR—T. M. Wilkins, Seattle, Wash.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

SINGLE-TRACE HARNESS.—No. 799,294. Sept. 12, 1905. George V. Beckman, Lodi, Cal. This invention relates to harness, and especially to a harness for use in plowing or cultivating in orchards, vineyards and the like. Its object is to provide a simple practical means which will permit plowing or cultivating close up to vines and trees with no possible chance of breaking the vines or tearing the bark off of the trees, as so frequently occurs with the ordinary double-trace harness and whiffle and swingle-tree arrangement. It comprises a rigid trace member, having means for attachment to the horse and extending along one side and to the rear thereof, said trace member having a rigid lateral projection approximate to its rear end for the attachment of the plow or cultivator, and an evener appliance for said trace member.

GAS GENERATORS FOR EXPLOSIVE ENGINES.—No. 799,341. Sept. 12, 1905. Adolph W. Jones, Alameda, Cal. This invention relates to an apparatus for converting liquid hydrocarbons into a suitable gas for use in explosive engines. Its object is to provide an apparatus whereby may be produced a cheap practical gas, and which shall utilize the heat of the exhaust from the engine to assist in the vaporization of the hydrocarbons, such as petroleum distillate and the like, which are not very volatile under normal conditions. It comprises three concentric domes inclosing outer and inner gas chambers and an intermediate heating chamber, a source of heat for said heating chamber, means for delivering oil into the outer chamber to be vaporized, connections between the outer and inner chambers and connections between the inner chamber and the inlet of an engine.

Aetna Dynamite

Now for Sale in DENVER

This brand of dynamite has heretofore been difficult to obtain in the Western mining States because the entire product of the factory has been eagerly taken up in markets near home. Increased facilities for manufacturing now enable them to supply more distant trade.

To the man who has used it, "AETNA" means something extra in the way of quality and uniformity.

For Sale in Denver by Geo. T. Kearns, 520 McPhee Building.

MADE BY

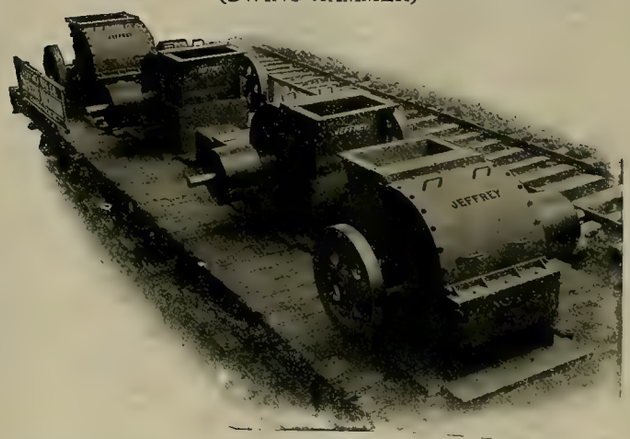
The Aetna Powder Co.

CHICAGO

A CARLOAD OF

JEFFREY COAL CRUSHERS

(SWING-HAMMER)



READY TO SHIP ON A SECOND ORDER FROM AN EASTERN COAL COMPANY.

Accessibility of Working Parts;
Material Partly Crushed in Suspension,
Are among the desirable features.

CATALOGUES FREE ON

ELEVATING CONVEYING PULVERIZING
SCREENING DRILLING MINING

THE JEFFREY MANUFACTURING COMPANY,

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JOSHUA HENDY MACHINE WORKS, San Francisco Agents for Electric Mine Locomotives.
HENSHAW, BULKLEY & COMPANY, San Francisco Agents for Elevating and Conveying Machinery.

The Merrell Pipe Threading and Cutting Machines

—FOR—

MINES, MILLS, POWER PLANTS, AND FACTORIES.

MACHINES FOR HAND,
MACHINES FOR POWER,
Combined Machines for Hand and Power,
Motor and Engine Driven Machines.

SEND FOR CATALOGUE.

HAND MACHINE.

THE MERRELL MFG. CO., Toledo, Ohio, U. S. A.

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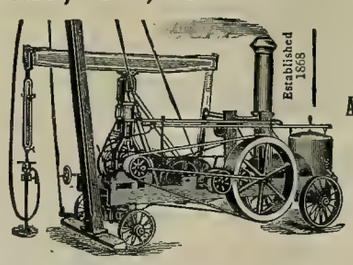

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THERE is no unsupported "theory" in our advertising columns. What there appears has cost millions in experiments; has been proved to be efficient and represents the most advanced state of the art.

MINING AND SCIENTIFIC PRESS.

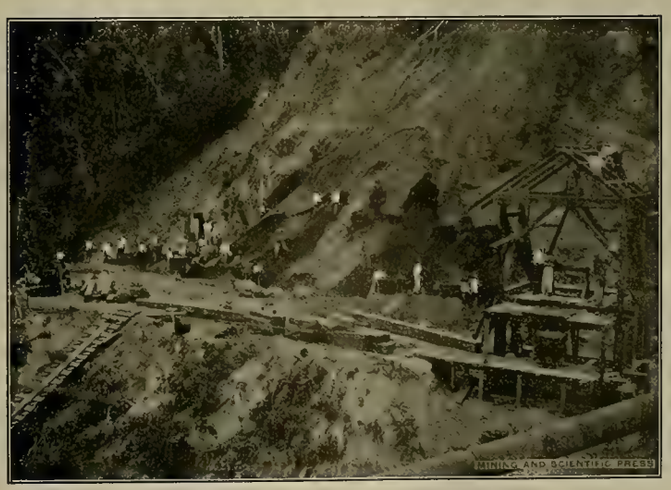
Whole No. 2358.—VOLUME XCI. Number 14. SAN FRANCISCO, CAL., SATURDAY, SEPTEMBER 30, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

THE prevalent lack of uniformity in the mining laws of the several States hampers mine development. Federal authority being paramount, the United States revised statutes applicable to mining take precedence, and in case of conflict overrule State legislation. There never can be the requisite uniformity in mining law that would best inure to the advantage of mining men until there is a national department of mines and mining with a Cabinet officer at its head, which is an additional argument for the necessity of the creation of such a department. This journal is credibly informed that President Roosevelt seriously contemplates in his December message to Congress a recommendation that such a department be created. If he does he will occupy even a higher place in the good will and affection of millions of his fellow citizens than he does at present. He is broad gauge enough to see that it is but a tardy act of justice to the American miner that such a department be created for the greater development of the greatest industry of the nation.

THE two new smelters to be built on the bay of San Francisco, Cal., together with recently increased facilities in existing plants, will tend to render unnecessary any further shipments of silver ore from Chile to Pueblo, Colo., via Galveston, Tex., a more direct form of transportation being conducive to economy. Fuel oil and improved transportation of necessary fluxes aid in such advance.

Section of Tram Road, Four and One-Half Miles From Cana.

Cut on Tram Road Four Miles From Cana.



Gallows Frame of Lodin Shaft During Construction.

Maisounabe Shaft House, Boiler House, Mill and Shop.

Maisounabe Shaft House During Construction, Heenan Shaft in Background.

MINE WORKINGS OF THE DARIEN GOLD MINING CO., PANAMA, CENTRAL AMERICA. (See Page 224.)

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IN former years the geologist and the miner did not get along very well together, neither being in favor with the other. With mining and scientific advance, they realize how inter-dependent they are and how they can mutually aid each other. The geologist primarily collects his facts from the miner. The facts thus systematized and arranged are within the reach of every intelligent miner, who is of more value to himself by their use. Rudimentary knowledge regarding rock formation, forces past and present, the constituents of the rocks, the general relation of rock groups and their modifications are of economic value to the miner and are good examples of "applied science." "Science" is simply organized knowledge, and with the miner, as with everybody else, the more he knows about the business in which he is engaged the more valuable he is to himself and all concerned.

ON pages 226 and 227 is reproduced a graphic portrayal of the mineral and metal production of the United States from the years 1895 to 1904 inclusive, as furnished by the U. S. Geological Survey. It will be noted that the aggregate value of $1,419,288,117 in 1903 dropped in 1904 to $1,289,660,788, occasioned by the lesser yield in coal and iron. An increase in the gold and copper yield of 1904 over that of any other year therein specified is noted. From the $69,303,319 given as the value of the 53,603,000 troy ounces silver mined in 1904 should be deducted de facto $37,141,519, leaving $32,161,800. The former figure represents the coining value, the latter the commercial value at 60 cents per ounce. As in 1903, the value of the copper yield of the country exceeds that of the gold yield. The chart is interesting to every mining man and is reproduced in its entirety.

Developing Mine Prospects.

The present low rate of interest obtainable and the obvious profit in mining occasions a desire to invest capital, and there is existing demand for gold and copper properties. None but the very wealthy care for "going" mines, because a developed mine is usually worth more to its present owner than to any one else, unless he be offered an unusually tempting price, and a comparatively small amount will secure a good "prospect." A prospective mine is always an attractive proposition—provided it be opened up sufficiently to indicate some real value, something more than a mere "prospect," no matter how well located. One trouble is that when the original owner has opened up his prospect sufficiently to show that investment of capital would probably make a mine out of it he often gets the idea that he should have as much for it as though it were a developed mine, ready to yield ore in paying quantities. The point is that a little work in addition to that already done will enable many a prospect owner to make a showing that would justify him in asking a reasonable price with more likelihood of getting it. There are a great number of "prospects" (over 17,000 in the State of California), the vast majority of which cannot be considered in shape to show a possible purchaser, and as things go there is no form of work that would pay better than for the owner of an undeveloped prospect to put it in such condition, if possible, as to justify its examination with a view to purchase at a fair figure by one who has the money to make a mine if the makings of the mine exist. Of course objections will arise right here to this argument by many readers, the first being, "If by development I make my prospect valuable enough to be bought, why not keep on developing it and make a mine of it for myself?" By all means, if you have the money. If not, were it not well to let it go at a profit to some one who has? The other objection is an occasional one, and in the light of twentieth century business ideas is almost comic. It is, "If I do much more work on my prospect I will spoil it," which carries with it its own refutation.

Until recently the Eastern investor wanted only "going" mines; to this day the foreign investor discards the proffer of a prospect, and looks for a developed property paying present profit. Both Eastern and foreign investors looked at the matter just as they would in buying industrial stocks or bonds, for immediate dividends—a prospect or a partially developed property was not worth considering. The California or Colorado or other Western investor, on the contrary, has always shown a desire to get hold of a good prospect and develop it. Frankly, that is where the biggest profit lies. Almost without exception, every big mining operator has made most of his money by developing a good prospect. The great fortunes of the great miners living or dead were not made by buying developed mines, but by developing prospects into mines. It is in that way millions are made in mining, and one might almost say the only way.

In this connection the MINING AND SCIENTIFIC PRESS offers a suggestion. Instead of as now in so many cases waiting for "foreign capital" to come in, it were well for local capital to take hold. This is being done in a good way in Colorado. A good example of the same kind of work is afforded by the residents of Nevada county, Cal., where merchants, mine owners, working miners and others take shares, pay assessments and enable good mines to be developed, and when they are developed, keep the money in local channels, to the general profit of the entire community. In many a deserving mining district throughout this west half of America are owners of prospects awaiting "capital." The local bankers, storekeepers, office holders and others can, with a little effort, put up enough to develop a promising local prospect into a paying mine, and then own it themselves. And it may be said in no way could they quicker secure the wished-for influx of capital than in the manner indicated.

THE United States patent office has a yearly increasing surplus which should be devoted to the needs of that overworked and overcrowded department, instead of being piled up in the treasury. It was never intended that the patent office of the United States Government be a money-making proposition, and every dictate of justice and business policy is in favor of needed change in this matter. Inventions in mining and metallurgical appliances and machinery constitute a large percentage of the great number of patents weekly issued, and hence the subject is an important one to the mining and manufacturing industry. There should also be some radical changes in the present patent laws, which are as antiquated as the building in which the patent office business is conducted. No patent agent or attorney should be allowed to practice until he had passed an examination showing sufficient knowledge, and the myriad of shyster solicitors who prey upon inventors should be treated by the Government the same as other swindlers, who are denied the use of the mails and otherwise suppressed by the Government postal authorities.

Mining Stock Speculation.

There is lack of reason or judgment in the senseless cry one often hears against speculation in mining stocks. Nor is the fact that money may be lost in such speculation any business argument. Money may be lost in buying any kind of stock—railroad, industrial or other sort; it may be lost in purchase of city lots, or stocks of goods, yet people will go on buying these things. The cry is from timid souls or those who do not think. The point is that in any sort of speculation judgment is a necessary attribute. After careful study and observation, the man who speculates in mining stock is just as likely to win as though he speculated in anything else. His chances for success are as good; true, they are also as bad, but the business view of such things is to exercise all possible precaution and then be resigned to the inevitable element of uncertainty that enters into everything one can do. Men have made unfortunate speculations in matrimony, yet people go right on marrying and giving in marriage, as though there were no such thing as divorce courts or a domestic fight to a finish. In like matter it is said and sung that a bear is a bad element in the stock market. Yet he is just as necessary as the bull. The average man abhors a stagnant market; he doesn't care much which way the stock goes, up or down, just so there is something doing. He wants to get action for his money. It is neither our province nor our purpose to uphold or justify gambling in mining stocks, but it is to be remembered in connection therewith that some of the biggest and best mining enterprises in the world's history were made possible only by the active dealing in the stock. The public who followed its fluctuations knew little and cared less whether the ore shoot at the 800 level pinched out or the breast of the drift in the 1200 level was in bonanza, and when assessment after assessment was levied it was the public, by holding up the stock and paying the assessments, who furnished the funds necessary to prosecute the heavy and expensive dead work that made the mine so great an ultimate success.

PROMINENT among the things that help Western mining interests is the great present activity among the railroads. The "Moffatt" road, now building from Denver, Colorado, to Salt Lake City, Utah, will open up a new section of rich mining country to the certainty of development and increase of wealth that follows facility of transit. Of the "Clark" road from Salt Lake City, Utah, to Los Angeles, Cal., precisely the same may be said. This week comes news that that line is to be extended from Los Vegas, Nev., up through that State to Tonopah, Goldfield and other new rich camps of southeastern Nevada. By the "Hazen cut-off" the Southern Pacific has placed that same section in standard gauge railway connection with the rest of the world. The Western Pacific Co., which will build from Salt Lake City, Utah, to San Francisco, Cal., has begun actual work at both ends of the line on what will be practically a new transcontinental route, traversing for a considerable part of its length a mineral region hitherto isolated but susceptible of development similar to that enjoyed by other mineralized territory to which the railroad always brings life by suitable transportation. In Arizona the Santa Fe Co. is doing the same thing by numerous branches and connections. In the last six months

all of the above work has assumed tangible shape, and much of it has been accomplished. It means a great deal to the mining man, manufacturer, merchant, and the great numbers who always hail a newly opened country as a chance for the success that should attend honest effort.

Assessment Work and Patents.

The annual required $100 work on an unpatented mining claim to prevent it from lapsing to be again a part of the public domain and thus subject to relocation, is not cumulative in its effect. One can do $100 worth of work or improvement on his claim every year right along, for twenty years, and if he omits so doing for any one year the claim is just as subject to relocation as if he had done no work thereon at all. If, on the other hand, he does no work on his mining location his "title" thereto is undisturbed so long as no one else thinks the claim is worth jumping. If he wants to take the chances on no one wanting to relocate it he can let the claim alone for as many years as he chooses. How the locator treats his claim is usually indicative of what he thinks of it himself. The better way is to do sufficient development work on it to entitle him to apply for a United States patent thereto. In case he wants to sell it such patent would be a splendid investment, for ability to show a title from Uncle Sam goes a good way with a buyer who is as careful in the purchase of a mining property as he would be in buying any other kind of real estate. The lenient requirement of all State and Federal enactments regarding annual assessment work is merely to incite development and discourage the pernicious practice of holding claims without working them. Discovery and appropriation are the sources of title to mining claims, and development by working, as a condition of continued ownership, until a patent is obtained, the latter being the ultimate intent.

Objection has been made to this journal against patenting a claim that it then immediately becomes taxable. Such argument is not tenable. While, as a matter of fact, it does "become taxable," the unpatented claim itself is subject to taxation, and even if the patented claim were taxed a few dollars every year, such amount would be much less than the $100 necessary annual assessment work. Those objections to patenting or even to the annual assessment work itself usually come from those who are trying to hold several claims without complying with legal requirements and endeavoring to hang on to more mining ground than they can legally work or claim. The spirit of the liberal law is that each man must make use of what he has or else give it up to somebody else. Whether it be the capitalist, the promoter, the speculator, the miner or the prospector, each has equal rights that must be respected.

The man who bonds or buys wants no question raised as to title, so that he can not be attacked by lawsuits that often crop up when the property becomes valuable, and in case he wants to sell or transfer the property "the ironclad potency of a U. S. patent" is most desirable.

Assessable and Non-Assessable Stock.

"Which is best, assessable or non-assessable mining stock?" is a question from a Colorado subscriber that merits editorial reply. The question involves matters of more interest commercially than locally, and in its broader sense is unaffected by made law. In Colorado and other States it is optional in the organization of a mining company whether the stock be assessable or non-assessable. In California all stock is by law issued only on the assessable plan. Whether it be Colorado, California or anywhere else, it is our belief that assessable stock is the best for all honest purposes. Non-assessable stock offers better opportunities for swindling. Because of this, some self-styled "mining men" object to assessable stock. It is largely a question of intent. Where a mining company is organized to make a mine out of a prospect, or to mine for the legitimate profits likely to result, an assessable stock is preferable. Should more money be needed, the stock can be assessed. In a non-assessable company, unless there is enough money at the start, there is ordinarily no way of raising it except by selling treasury stock, and, that resource failing, nothing remains but to shut the mine down or freeze the smaller stockholders out, for the knowing few to have the property sold at sheriff's sale and buy it in themselves. Mines must be made, and it takes money to make them. Equable assessment of the owners of stock therein is the best device ever invented for securing such necessary money. Of course, the custom can be abused, and has been many times.

Unjust or unnecessary assessments for stock jobbing purposes are not uncommon, but of late years the courts have thrown safeguards around the owners of assessable stock, and the directors are liable to be brought up short to answer why a receiver should not be appointed in case of any suspicious levying of assessments. As stated, the question resolves itself into one of intent. If the intent be to make a mine, assessable stock is better; if the desire be to swindle the public, the non-assessable plan presents superior possibilities.

As to "par values" of stock, there is a possibility on the part of the vendor of juggling with terms. "Par value" is an elastic term. The selling value more nearly represents the actual value, on the principle that a thing is always worth what it will fetch. There is nothing in the contention in some quarters that there should be a small par value on all assessable mining stocks, on the ground that assessments must cease as soon as the par value has been paid up in full. That used to be argued, and so used the statement be made that a mining company whose capital had been paid up in full by means of assessments could only continue to assess the stock by reorganizing with enlarged capital. But there is nothing in such argument. Assessments can be levied upon an assessable mining stock even after the capital has been paid up in full, provided the money so collected is put into the company's plant in the way of enlargement or improvement.

Better Roads Needed.

Throughout many mining districts there is a great and constant loss to miners, merchants and manufacturers because of bad roads. Ofttimes, especially in the winter months, there is a delay of supplies and machinery and an enforced stoppage of work because of sheer inability to transport goods. In the one State of California alone this loss is enormous. In regions ramified by narrow gauge roads it is not so appreciable, but where wagon roads are still depended on, the condition of such excuses for roads is ofttimes deplorable.

The reason for present allusion to this state of affairs is that the fall elections are coming on, and with the county residents of most of the districts so held back lies largely the remedy, which is to elect to the boards of supervisors men who will see that the roads are properly attended to. Public sentiment is not so lax in this regard as might be supposed, but, ordinarily, people forget their most immediate needs in the fuss and fight over who shall be sheriff or county clerk, or some other good paying position, and overlook the need of putting intelligent, broad gauge men in as supervisors. The ordinary county supervisor wants to see how little can be spent and how low the tax rate can be made. This, in the abstract, is a commendable idea, but it is not always good practice. The taxes levied by State and county lie less heavily upon a community than the tax levied by the residents upon themselves by lack of proper means of transportation. Economy is well, but it should be true economy—which is only another name for judicious expenditure of money. If necessary, five cents should be saved; but, if necessary, ten thousand dollars should be spent. Economy takes a more broad gauge view of things than the immediate "saving" of a few dollars in taxes. Such saving is often the most costly form of financial folly. This is generally understood, but, as stated, if in the coming elections the "German vote" or the "Scandinavian vote," or any other kind of vote be solely figured on in the effort to get some favorite son elected to a paying position, and the more important post of supervisor be thrown to geographical sections of the county "just to fill up the ticket," there can not be much improvement expected in the present backwoods system of roads in so many mining districts. As a cold business proposition it would pay. The saving in one year in the loss now entailed and the improvement in values would more than justify the slightly increased tax rate. The subject is a homely one, but of close concern to the mining industry, and those who have given any observation to it will concede that the remarks are as true as they are trite.

New Nevada Mining Camps.

The greatest present general interest in mining development still centers in the southeastern Nevada gold discoveries, even to the extent of railway building to the new districts. The gold is there and the country is "new." There is a charm about "a new mining country" that would call the prospector and the miner anywhere. Because it was a new country is what sent so many to the Klondike and to Nome. It is the lure of the new region that calls the miner. It was always so, and probably always will be.

In the early days of the world an altar was built to the rising sun, and that altar has ever been thronged with worshippers. Men have a feeling that in a new mining region their individual chances are better. When the news of Tonopah, Goldfield, Columbia, Bullfrog, etc., was first told, men instinctively felt that there was a new El Dorado with all that that implied. No matter that there were good mines and fine prospects elsewhere. In so many parts of the "elsewhere" matters had settled down to ordinary commercial requirements. There "one man's chances were as good as another's," and there thousands have flocked. When in 1901 and 1902 was told in these columns the extent and wealth of the new Nevada gold strikes it was felt that in the hazard of new fortunes lay larger possibilities of quick success, and since then new discoveries in that vicinity vindicate the faith felt in Nevada's revival as a mining State.

In the days of the first discoveries of gold in the famous mining camps of Tonopah and Goldfield, Nev., and the newer camps adjacent, much was said in these columns, and the press throughout the country has since spread the news to so great an extent that many have thought all they had to do was to go there and they would get on somehow. The general idea is not a bad one, but an unskilled man going to a new camp with intent to work the mine and not the street is often a misfit. A letter from Goldfield this week says there are "too many idle men here." That is always the case. There never yet was, and probably never will be, a rich mining camp without its undue quota of idle men, some from choice, many from necessity.

What is here meant to be said is, that while no advice is needed by the prospector or another class, who live by their wits, or skilled miners who can get on anywhere, the unskilled man who wants to earn daily wages working in a mine would do better to go elsewhere than to a new mining camp. He should choose an older mining district, for there exist more opportunities to learn and to get employment than in a new mining community, where men are obliged to depend to a greater degree on their own resources.

STRONG protest has been made for some time against the importation of foreign zinc ore under present conditions. Effort is being made by the Missouri & Colorado zinc mine operators to have the Government levy a 20% advalorem duty on zinc ore from Mexico and British Columbia, as present conditions tend to keep down the price of the ore. Another question affecting American zinc miners also comes up. The tariff provides that minerals crude or not advanced in value, not specifically provided for, shall be admitted free of duty, and that metallic mineral substances in a crude state shall pay a duty of 20%. There is a present effort to have definitely determined in which class zinc ore belongs; also whether lead-bearing zinc ores, which are subject to duty on the lead contained therein, includes the case where the ore contains so little lead as to simply appear in too small a quantity to justify commercial consideration. On the 21st inst. the Treasurer of the United States heard argument pro and con in Washington, D. C., on the subject, and turned the question over to the United States Attorney General for his opinion.

CONCENTRATES.

CAST iron in cooling contracts $\frac{1}{8}$ inch per foot.

USE a lower power explosive to lessen the amount of fines produced in blasting the brittle rock.

IT is best to admit air to the compressor as cold as possible and to the motor as hot as possible.

THE electro chemical equivalent of a metal is the weight in grams precipitated by a current of one ampere flowing for one second.

THE absolute scale of temperatures has its zero point 460.66° F. below the ordinary zero, or 492.66° F. below the freezing point of water.

THE burning of one pound of average crude petroleum requires 190 cubic feet of air and produces 19,500 B. T. U., 3.1 pounds CO_2 and 1.25 pound H_2O.

IT is incorrect to say "ore in sight" unless the ore body has been opened on three sides, e. g., two levels with a connecting raise shaft or winze all in ore.

TAR OR ROSIN should not be used on belts, as excessive power is required and the belt soon destroyed. Some graphite preparation would give good satisfaction.

TO CLEAN and remove the pencil lines from the tracing cloth apply a rag saturated with gasoline or benzine. Water will destroy the surface and render it unfit for use.

FOR single-hand drilling an octagon steel rod $\frac{7}{8}$ inch to $\frac{3}{8}$ inch in diameter is commonly used, with $\frac{5}{8}$ inch to 1 inch as limits; double-hand work requires a heavier steel.

THE melting points of gold and silver are 1065° C. and 962° C., as carefully determined with the hydrogen thermometer for use in standardizing the Le Chatelier pyrometer.

THE average gold extraction at Johannesburg, South Africa, is about 85% of the total gold contents of the ore sent to the mills. As high as 93% has been obtained in special cases.

A CUBIC FOOT of coal gas will sustain two-thirds of an ounce, avoirdupois, in mid-air. One hundred pounds at the surface of the earth would weigh 99.75 pounds 5 miles above the earth.

IF telluride and highly arsenical ores are very finely pulverized and no copper is present, an extraction of 90% to 98% is often obtained by using the filter press process without roasting.

SPROUTING or vegetation of molten silver when cooling is due to the escape of oxygen, which is absorbed during melting. It may be avoided by cooling slowly and keeping the surface warm.

TO get the horse power safely transmitted by a steel line shaft with bearings every 8 feet, multiply the cube of the diameter in inches by the number of revolutions per minute and divide by 75.

THE best way to distinguish the dolomite from the limestone is to touch the rock in question with a drop of dilute hydrochloric acid; if it effervesces strongly it is limestone, otherwise it is dolomite.

THE grease on the amalgamating plate is either from candle ends in the ore or the use of too much lubricating oil in the machinery. Caustic potash will remove the grease and benzine will remove the mineral oil.

EIGHT POUNDS of sulphur in iron pyrites has the same calorific power as three pounds of coke for producing heat in the furnace and smelting the charge. It can be burned and utilized by using a hot blast, not a cold one.

STRAIN is the extension or change of form of a body under the influence of a stretching or distorting force called stress. The ratio of tensile stress per unit cross-section to tensile strain is the modulus or coefficient of elasticity.

CALIFORNIA crude oil makes a good road with almost all kinds of soils, because it contains an asphalt base. On the other hand, Pennsylvania and other oils containing a paraffine base have proven unsatisfactory in road sprinkling.

CYANIDE OF POTASSIUM solutions may be protected from decomposition by the carbonic acid of the air according to the reaction $2KCy + CO_2 = K_2CO_3 + 2HCy$, by covering with heavy petroleum oil and drawing the solution off from the bottom.

APPROXIMATELY, handling earth with pick and shovel would cost about as follows: Excavating and loading in a wagon, 54 cents per cubic yard for hardpan; 27 cents per cubic yard for tough clay; 20 cents per cubic yard for ordinary clay, gravel or loam, and 16 cents per cubic yard for very light sandy soil; this is reckoned on the basis of 20 cents per hour for wages.

THEORETICALLY the horse power necessary to elevate water to a given height, multiply the total weight in pounds of the water discharged per minute by the height in feet, and divide by 33,000; practically this result should be about doubled.

THE Betts process for the treatment of lead bullion is based upon the solubility of lead in an acid solution of lead fluosilicate. The lead is deposited at the cathode, while the gold and silver accumulate in the slimes, and are recovered by ordinary metallurgical methods.

THE use of lime forms the cheapest and least troublesome way for clearing water from a stamp mill so that it can be used over again. This could be done by settling tanks and decantation, or by the use of a settling pond from which the water could be pumped as needed.

NO. 16 wire gauge copper plates are ordinarily used for amalgamating and weigh four pounds per square foot; No. 13 wire gauge, weighing five pounds per square foot, is used for heavy work, and No. 11, weighing six pounds per square foot, is used for mortar plates.

THE failure of the oil burning boiler to supply sufficient steam may be due to the layer of nonconducting soot from black smoke. This can be prevented by thorough combustion obtained by an accurate combination of oil and steam in the atomizer and a proper admission of air.

PLATINUM may be quickly and thoroughly cleaned by rubbing with sodium amalgam applied with a cloth and then putting in water to oxidize the sodium and leave the mercury free to alloy with foreign metals. The platinum is then cleaned and washed with moist sea sand.

IN its application to the generation of electricity the steam turbine is certainly making noticeable progress, and in some cases is displacing the horizontal steam engine for this class of work. Probably the aggregate power of steam turbine sets now in use may be approximately estimated at 200,000 KW.

SLAG-ROASTING galena has been almost abandoned because of excessive volatilization of lead. Desulphurization of zincblende is becoming obsolescent for the same reason. Dust chambers aid in the partial recovery of the volatilized lead, though there is always trouble in condensing and settling lead fume.

TO TEST cyanide solutions for potassium cyanate (KCNO), first convert the KCN into K_2CO_3 by passing CO_2 through the solution and precipitate it with alcohol. The filtered solution contains potassium cyanate if it turns blue upon the addition of cobalt acetate, owing to the formation of cobalt cyanate.

IN assaying zinc ores, preparatory to titration of the zinc solution, the use of aluminum in removing copper is not to be recommended on account of the action of aluminum salts, which are formed on the indicator, and the liability of aluminum to be precipitated as ferrocyanide. Lead should be used in place of aluminum.

IN the case of black powder there might be something in the idea in using the fuse of placing the cap in the middle or the bottom of the charge to occasion a more thorough explosion, but in the case of using dynamite it goes off so quickly that it makes no noticeable difference whether the cap be placed in the bottom, middle or on top.

A SERVICEABLE clinometer may be made by pasting a graduated scale of degrees on a note book cover and suspending a small weight by means of a thread fastened through the center of the arc. The dip of the vein is found by holding the edge of the note book parallel to the vein inclination and noting where the vertical thread cuts the scale.

THE Canyon Ferry, Mont., electrical transmission plant delivers power at Butte, 65 miles distant at 50,000 volts. This is exceeded in volt power and distance of transmission by other systems in Utah and California. As to whether "the limit has been reached" is not possible to answer. The great game of scientific progress is played without a limit.

IT has been found almost impossible to get an air valve-gear which would work satisfactorily at speeds much above fifty revolutions per minute on low-pressure work where the air cylinders are very large, and where the valve area, particularly that of the inlet, must be a very large percentage of the piston area in order to prevent a suction loss in filling the cylinder.

TO make an inch hole in the center of a glass plate, dissolve camphor in turpentine; in this dip the blunted end of a round file; with this file by a slow twisting motion grind a hole in the glass plate, which must rest evenly all around on a perfectly flat surface. Great patience and considerable skill is requisite; when the opening is made through the glass it can be worked to the required size by the file, which must be kept wet all the time of operation by frequent immersion in the camphorated turpentine.

THE difference between mechanical and free hand drawing lies in the point of view. The former represents objects as they are, the point of sight is at an infinite distance and the lines of sight are parallel. In the latter the observer's eye is the point of sight, and the radiating straight lines extending to the different points of the object from the lines of sight. The point of sight may be real or imaginary, the line of sight is imaginary.

IN all overhead construction the electro-static leakage takes the form of a brush discharge between wires with high pressures, and is considerable. One recent test showed loss of energy due to air leakage with 47,300 volts, to be 1215 watts per mile when the distance between the wires was 15 inches. When this distance was increased to 52 inches the leakage was reduced to 122 watts per mile. With high pressures it is usual to place the wires about 10 feet apart.

FEW California mines have a higher altitude than 8000 feet; few Colorado mines are so low. There are "going" mines in that State at an elevation of 13,000 feet. Altman is the highest mining town in the State. "Concentrates" does not know what is "the highest town in the world." Probably Cerro de Pasco, in Peru, is. Its altitude is slightly over 15,000 feet. For 300 years the Cerro de Pasco mine was worked for silver; now it is America's greatest copper mine.

TURQUOISE of a fair quality is found in Pinal county, Ariz. The turquoise was obtained by the ancient inhabitants of that section of the country and worked into articles of personal adornment by them. Turquoise beads and pendants are often found in the ruins in the Gila and Salt River valleys. A genuine turquoise is a gem of slight transparency, sky-blue in color, and is usually found in the veins of rocks composed of gray and yellow quartzite, sandstone, and porphyry dikes.

THERE are several mining papers published on the Pacific coast. In Los Angeles, California, is published the Mining Review; in San Francisco, California, the Mining and Engineering Review; in Grant's Pass, Oregon, the Mining Journal; in Portland, Oregon, the Pacific Miner; in Seattle, Washington, the Northwestern Miner. The different newspapers published in the various mining districts also furnish excellent local accounts of mining progress and development and are of material value therein.

NO coal is mined in Idaho on a large scale. The Boise district, in front of the Boise mountains and between the Boise and Payette rivers, extending north 30 miles from a point 6 miles north of Boise, includes the Horseshoe Bend district, with one 3-foot high-grade lignitic bed, and the Jerusalem district with four beds from 3 to 8 feet thick of lignite. The mines near Salmon City, however, with their 6-foot vein, promise to prove of great importance whenever a railroad supplies them with an outlet.

THE machine drill must have had unfair usage to have broken as stated, for those drills are carefully constructed of tested material. Great care is exerted throughout, and to secure uniform temper the several parts, bolts, nuts, moving pieces are packed in bone ash in a steel box on which a cover is luted, and heated to a bright red in a furnace, whence the several pieces of steel are given a bath in a tank of cold water to give all of them the same degree of hardness, temper and uniformity of texture.

IN the case of Hough vs. Hunt, Supreme Court of Colorado, 70 Pac. Rep., 1079, it was decided that where the locators of a quartz mine after being in possession for several years, and expending $1000 in developing it, suspended work, and during a year did only $25 work on the mine, but hired a man to live in a house on the location and watch the property, the amount paid to him could not be counted to make up the $100 worth of work each year required to conform to the statute concerning preserving the right to the claim.

FINES coming from the extractor boxes 42% in gold and silver often contain no more than 15% to 20% zinc, and of this amount only a small proportion is in the form of metallic zinc; it will be found upon treating it with acid that the hydrogen evolved is small in proportion to the zinc actually in the product, and this is the reason why in acid treating fines one finds it difficult to remove so much of the zinc as he would naturally expect. The zinc is doubtless combined with some organic acid difficult to dissolve in dilute sulphuric acid.

AT the Granby, B. C., smelter the copper matte converting plant comprises a steel building 160x68 feet, containing two horizontal barrel-type converters, 72 inches diameter, 100 inches long. A 40-ton traveling crane handles the shells and matte; a 10-ton traveler brings the molten matte from the furnace building. The blast

pressure is ten pounds per square inch. After sufficient slag is formed it is removed, after which the pure matte is converted into blister copper. The slag is granulated. Each set of converters has a daily capacity of from fifty to seventy tons of matte.

LINSEED OIL is of commercial value solely because of the comparative rapidity with which it absorbs oxygen. To electrical workers a method of arresting the oxidation of a film of linseed oil at any desired point would be of great value. But that seems at present impracticable. It continues to oxidize until it becomes a brittle, cracked and defenseless mass, so far as its capacity to prevent the passage of a stray electric current is concerned. More electrical apparatus has had to be reconstructed or repaired because of the oxidation and other defects of linseed oil than for all other causes combined.

THE California oil holes are not "drilled down into a lake of oil." The oil is in the sand; the hole is drilled down to and through this stratum of oil sand. This stratum may be 1 foot or 100 feet thick. The oil under internal pressure seeps through inch holes in the casing surrounding the perpendicular hole driven through the sand and is pumped to the surface; if there be gas enough the oil will be forced to the top of the well without pumping. About 25% of the sand is oil in a good district. An acre of good area with an oil sand 100 feet thick ought to yield about 150,000 barrels. One well will not ordinarily drain more than an acre of oil land. The local custom is to sink wells 100 feet inside one's boundary.

NATURAL BITUMEN is brownish black in color. In structure it is amorphous. The specific gravity varies from 0.950 to 1.5 or more, according to the mineral matter present. Its melting point varies widely from 180° to 600° F., sometimes only softening and melting with decomposition at over 600° F. It burns with a smoky flame. It varies from the liquid form of maltha through tough and leathery substances to brittle solids. Its value to the maker of compositions for electrical purposes depends on many things, but chiefly on the nature of the pure bitumen, which can be prepared from the natural substance, its melting point, and most of all its capability of being drawn out into threads. Should it possess natural elasticity it is of exceptional value.

GIANT powder will freeze at 42° F.; water at 32°; dynamite when frozen is hard to load and uncertain of effect. Thawing is a simple operation if rightly done, a most dangerous one if carelessly or ignorantly undertaken. Because a stick of giant can be lit with a match and carried while burning in the open air with safety (sometimes) is no reason that it can be thawed before a fire or on top of a stove. If lit with a match there is only a little bit of the mass that is heated, the rest being cold; but if any one starts to roast, bake or fry it, the usual result is disaster, for when the whole stick of giant is exposed to direct heat the entire mass heats up to the danger point very quickly, and at a temperature of 360° F., it is liable to explode. Just how to thaw frozen giant has been stated herein repeatedly. The intent is here to emphasize how not to do it.

THE modus operandi of the filter press process is as follows: Assuming the pulp properly mixed and aerated with the gold partially in solution in weak cyanide previously introduced, it is discharged into the pressure tank or forcing receiver (montejus), where it is first thoroughly agitated to dissolve the gold and then forced by compressed air into the filter press at from fifty to eighty pounds per square inch. When the press is completely filled alternate charges of solution and compressed air are forced through the washing channels of the machines to extract the balance of gold remaining after the preliminary agitation. The final charge of compressed air is continued long enough to dry the cakes after the final displacement of the wash water. The contents of the filter press are then discharged into tip trucks or on conveyor belts by unscrewing the bolts and lifting the frames and plates apart.

A GOOD way to temper the drill is to first heat the bit till cherry red, then plunge into water for a moment, till partly cooled, when it is rubbed on a stone to remove the scales so that the play of colors can be seen in the dark corner of the shop. Between 430° F. and 600° F. these vary from a very pale yellow, through a straw, a brown, a purple and a full blue to a dark blue. If the cooling is uniform the colors should advance parallel to the cutting edge, otherwise that side of the bit on which the colors are moving most rapidly should be held in water. When the colors move parallel with the edge (this is important to insure uniform hardness), watch until it is a straw color and quickly plunge into the water a short distance, moving it about until the steam ceases to form, when it may be left in a quenching bath, usually water, but often brine, tallow or coal tar, which vary the rate of cooling in the order given.

TO MAKE a drift air tight is feasible, though expensive. Some time ago in one of the lower levels in the Moose mine, Raven hill, Cripple Creek, Colo., a drift was run, along the length of which fissures were cut, from which large volumes of gas issued into the workings. The miners worked with difficulty, although the ventilating plant was unusually large. The drift was timbered with square sets and tightly lagged; but the gas made breathing difficult. Then was tried lining the drift from the shaft to the face, 600 feet, top, bottom and sides, with asbestos sheets reinforced with a sheeting of tin plates. This shut off the flow of foul gas. Swelling ground might similarly be held. Ground which swells in mine excavations does not do so rapidly, it often being several days before the swelling becomes troublesome. It is supposed to be partly due to the effect of the contact of the rock with the atmosphere.

HILL'S Ann. Laws, section 3669, provides that material men shall have liens for materials furnished for improvements on land, and that every contractor having charge of the construction of any building or improvement for another shall be held to be the agent of the owner. A contractor constructed a stamp mill and tramway in connection with a mine for defendant, and material men filed liens against the property. In an action to enforce the liens, judgment was given against the defendant for the amount, directing that the mill and tramway be sold to satisfy the judgment, and that any surplus of the proceeds should be paid defendant, with no provision in case of a deficiency. Held, that the defendant could have a personal judgment for the deficiency, notwithstanding the recitals in the judgment of the amounts found to be due. Watson vs. Noonday Min. Co. et al., 60 Pac. Rep., Or., 994.

CODE Civ. Proc. 1895, section 592, authorizes a tenant in common to sue for an injury to the property by a cotenant; and Laws 1899, p. 134, amending the same, declares that nothing contained therein shall prevent the occupancy and enjoyment of mining property by cotenants, or the operation of the same, subject to accounting to a nonjoining co-tenant for net profits, nor prevent such joint co-tenant from receiving his proportionate share of all ores on the dump, on payment or tender of the cost of mining the same. Held, that a cotenant not joining in the operation of a mine, and suing for damages for the removal of ore therefrom through another mine, owned by his tenants in common, to which plaintiff had no right of access, was entitled to an injunction pendente lite to restrain such removal, though defendant offered to account for ore extracted therefrom. Butte & B. Con. Min. Co. vs. Montana Ore Purchasing Co. et al., 60 Pac. Rep., Mont., 1039.

THE discharge which a stream has at a certain height of water is usually found by taking a cross-section at right angles to the direction of the current and multiplying the submerged surface or wetted perimeter of this profile by the mean velocity of the current, according to formula. The section should be taken at a point where the river is of uniform width and of regular form for some distance above and below, so that the directions of the currents may be practically parallel, thus avoiding oblique velocities. As sections of a river bed are quite irregular and would not be the same at points but little separated, it is usually best to take several sections at established intervals, and thus secure a mean cross-section. The stage of water at the commencement of the work, together with changes which take place during its progress, should be known and recorded. When the soundings have been completed, and levels taken for that portion of the river bed which lies above the water at the time of sounding, the whole can be plotted and the area determined for any stage proposed. The points at which soundings are taken along the range line should be accurately located, so that each day's notes may be referred to the same ground.

THE following artificial preparations are of more or less use in compositions or in refining bitumen: Pittsburg flux, produced by heating petroleum oil, such as Pennsylvania residuum, with sulphur. Hydrogen sulphide is given off and the oil becomes tough and sticky, and only melts at a very high temperature. This formation is due to condensation of the unsaturated hydrocarbons by the action of sulphur, the finished product still containing about 4% of sulphur. It will not pull into strings and is very short. Sludge asphalt, made from the sludge tar of the refiners, and is much more like natural bitumen, as it pulls out in threads, melts easily and has the general physical properties of ordinary bitumen. Byerlite, an artificial bitumen of a hard type, produced by the action of oxygen on heavy petroleum oils. No sulphur is employed, and sulphur is not present in the product. Asphaltine, a petroleum residuum specially prepared for the asphalt paving industry, and may be heated for seven hours at 400° F. without losing more than 2% to 5% of volatile oils, while the residue will still continue to flow at ordinary temperatures. Other petroleum or shale oil residuums may lose up to 15%, and the residue will not flow owing to the amount of paraffine present, but in neither case is the resulting residue solid or brittle.

REFINING copper by the copper-bottom process is not a new method; the matte is merely enriched by washing and resmelting till it carries from 55% to 65% copper. This enriched matte is then subjected to a roasting by which occurs a reaction between the oxide and the sulphide, setting free a certain per cent of metallic copper and carrying down much foreign matter, including almost all the gold. It has been recently thought feasible by metallurgists to extend this copper-bottom process to the separation of the gold from the copper. Say ten tons of 65% copper matte are put upon the hearth of a small reverberatory furnace, the doors left open; the charge fired for eight hours; the doors then closed, and the charge melted down. The reaction cited above would set free about 14% copper; the whole charge being tapped into moulds would result in sheets of impure copper—"copper bottoms"—being found beneath the slag blocks nearest the furnaces. At this stage there would be the bulk of the gold concentrated into a ton and a half of material for further treatment, that is returned to the same furnace, roasted again as were the original ten tons, again smelted down, the copper oxide slagged off, and the copper tapped into sheets or granulated for further treatment upon a copper test or other furnace, where it is again roasted, and slagged with silica until sufficiently reduced in quantity to refine the gold with litharge or other suitable flux.

TO quickly determine the amount of sulphur in coke, intimately mix 700 milligrams of finely powdered coke with thirteen grams of sodium peroxide, in a nickel crucible of about 30 c. c. capacity. The peroxide must be finely powdered and dry, and should be weighed rapidly and brushed off the watch glass with a glass brush. The crucible is to be covered and a 3-inch fuse inserted under the edge of the cover and extended well into the mixture. The crucible is then supported on a triangle and placed in about ¾ inch of water; the fuse is ignited and in three or four minutes, when the mass has cooled sufficiently, the crucible and cover are placed in a small beaker and 30 c. c. of water added. The mass dissolves completely in about two minutes. After rinsing off the crucible and cover, the solution is made just acid with hydrochloric acid and filtered through a small filter. The filtrate is boiled and precipitated with barium chloride in the usual way. The fuses are made by nitrating cotton wicking with a mixture of one part fuming nitric acid and two parts concentrated sulphuric acid for twelve hours at 15° C. The nitrated cotton is then washed in running water for twelve hours, to remove every trace of acid, and dried at laboratory temperature. When dry, it is treated with a cold, nearly saturated solution of potassium nitrate for an hour, then the excess of solution is pressed out, dried as before, and finally cut into lengths of 3 inches ready for use.

DRY BATTERIES which have become exhausted can be recharged. Remove the outer cardboard casing from each cell and drill six small holes in the zinc casing about 1 inch from the bottom. As four cells are generally used for ignition purposes in connection with the induction coil, get four small glass or stone jars, about 1 inch larger in diameter than the cells and about three-quarters the height of the same. Dissolve about half an ounce of powdered sal ammoniac in each jar, in a sufficient quantity of water to bring it almost to the top of the jar when the cell is in it. Get four cells of gravity battery and put them in series with each other by connecting the zinc element of one cell to the copper element of another. Put each dry battery cell in the solution in its respective jar and connect the three binding posts on the zincs together, and the three carbon posts also, by means of insulated copper wire. Then attach the wire from the zincs to the zinc element of the gravity batteries, and the wire from the carbons to the copper element of the gravity batteries. Allow the cells to remain over night, and if they are of good, reliable make they will be found in the morning to be almost as good as new. This process of recharging dry batteries can be repeated twice, but after each recharging their renewed life will be shorter than formerly. After the batteries have been recharged the small holes which were drilled in the casing can be stopped by a strip of adhesive tape, covered with bicycle tire cement, and tightly wrapped around the zinc casing over the holes. The cells should be wiped thoroughly dry and then replaced in their cardboard casings when they are ready for use.

THE largest nugget or mass of silver ever mined of which "Concentrates" has authentic detail was a piece weighing 1340 pounds, which was taken from the Smuggler mine, Aspen, Colo., in 1894. In regard to this nugget S. I. Hallet says: "The nugget in question formed part of a consignment of 15,031 pounds of ore, which with silver at 58 cents or thereabouts netted us, free and clear of all expenses, very close to $82,000. This particular nugget was gotten out by itself, and seemed to be extremely pure, so that I photographed it. It was impossible to assay it in the ordinary acceptation of the word, and it was put directly into crucibles and the crucible returns given to us by the company. The smelting charges on such ore were naturally high. This streak of silver occurred as a core in some very rich ore, averaging about 1000 ounces per ton. At times it would be half an inch in thickness, and then widen out to 2 feet or 2½ feet. It was a little purer than a silver dollar and almost as bright. We were obliged to mine by the side of it, allowing it to hang down into the stope until we had reached a natural crack or very thin place, when we could break it off. It extended along the stope for 20 or 30 feet in height, was 3 or 4 feet in length, width as given. As to just how it was made it is hard for me to give a theory. It was sometimes found crystallized in connection with argentite, which might lead one to think that it had simply been argentite, and that by the enormous pressure exerted on it the sulphur had been expelled. Again, I found pieces in which the outer surface was a very thick mass of wire silver practically welded together, which would, of course, account for it in a very different way."

Darien Gold Mines.*

Written for the MINING AND SCIENTIFIC PRESS.

Ever since the time of the early Spanish explorers South and Central America have been looked upon as possible sources of fabulous wealth. But, as has proven true in all other countries, while the mineral may be in the ground, it is not to be taken out without hard and persistent effort. As an example of such effort that has been finally crowned with success, a description of the Espiritu Santo mine of the Darien Gold Mining Co. cannot fail to be of interest. Situated in a densely timbered tropical country among an indolent and often hostile people, difficult of access and inimical to the health of the white man, it is a proposition whose working requires the utmost persistence and courage.

The mine is on the south side of the Cana river, 200 feet above the Cana plateau, which has an elevation of 1800 feet above sea level. Cana is in the province of Darien, and is reached most conveniently from Panama, 80 miles northwest. A steamer runs from Panama down through the Gulf of Darien into Darien harbor, thence up the Rio Tuyra to El Real. At this point freight is transhipped to small light-draught river steamers during the wet season and to native dugout canoes during the dry season. These run 40 miles up the Tuyra to Boca del Cupe at the confluence of the Cupe and Tuyra rivers. From this point, during the dry season, the freight is hauled overland in wagons a distance of 30 miles to the mine,

Maisounabe Shaft from Near Lodin Shaft.

but during the wet season it is taken up the Cupe river 16 miles to Citura station, whence it is packed into the mine, on mules and bulls. An ordinary mule load is 130 pounds and a pack ox can bring up 200 pounds. Most of the machinery at the mine was made for muleback transportation.

The mine had been worked to a depth of 200 feet by Spanish miners working intermittently from 1665 to 1727. These workings followed the soft rich streaks and were mainly shafts irregularly connected by drifts, often timbered and separated by pillars of high-grade ore. These works were finally abandoned because of caves and the intrusion of great quantities of water.

Various unsuccessful attempts were made to clear the mine by pumping, but finally in 1894 the problem was solved by running a 1100-foot adit tunnel which drained the mine to a depth of 150 feet, and made possible the sinking of the Heenan shaft to a depth of 180 feet below the adit level. Considerable rich ore was taken out in the upper levels, but the work was hampered by the number and intricacy of the old workings, the shaft being finally abandoned and filled.

In the meantime in 1898 the Maisounabe shaft was sunk with five compartments, two being 4½x3½ feet, two 4½x3 and one 4½x5. This shaft is 154 feet deep at level No. 1, the adit and drain tunnel, to which the water from the lower levels is pumped by a 4-stage turbine pump direct connected to a hydraulic turbine, placed at the sixth level. The water for power is conducted from the collar of the shaft to the sixth level, 538 feet below, where, after use, it is pumped through the same pipes as the mine water to the drain tunnel. The pump has a capacity of 330 gallons of water per minute. In addition there are auxiliary Cameron pumps operated with compressed air.

Until the new Lodin shaft is completed all hoisting of ore is being done through the Maisounabe shaft. Heretofore, this has been done with an 8x12 double cylinder band friction hoist, but at present a new 14x18 double cylinder, double drum friction hoist is being erected and will soon be ready for use.

The Lodin shaft, started in 1902, is now down to the sixth level. It has three 4x5 compartments and is being sunk on an incline of 70°. During sinking a single drum 8x12 double cylinder, double reduction gear steam hoist is being used. Compressed air is used in pumping. This shaft is to be continued until as deep as the Maisounabe shaft before any ore is hoisted through it. From the Maisounabe shaft levels have been opened up and some stoping done at No. 2, 100 feet below the adit level, at No. 3, 80 feet below, at No. 4, 80 feet deeper, at No. 5, 40 feet below, at No. 6, 84 feet below and at No. 7, 85 feet below.

Quoting Woakes' "Modern Gold Mining in the Darien," Vol. XXIX, Transactions A. I. M. E., "the country rock is essentially andesite in an extremely decomposed state. There are two predominating series of "cleavage planes apparent, the first, generally the most marked, running N. 55° W. with a westerly dip, and the second running N. 65° E. with a southerly dip. Roughly speaking, the ore deposit appears to have been formed in an irregular quadrilateral, the boundaries of which are formed by these cleavage planes, the N. 55° W. cleavages forming the east and west walls, while the N. 65° E. form the north and south walls. In adopting this theory liberal allowance must be made for the variations of bearing, such as naturally would occur in fissures running through such brittle and jointy rock. The sides of the quadrilateral are by no means equal or parallel in their entire length The longer side or base of the figure may be taken as that forming the north wall of the deposit, the shortest is then the opposite or south wall. This gives to the figure the shape of an irregular truncated cone.

"It is, however, the formation and character of the ore body itself which forms the most interesting study to the mineralogist, and is so striking in appearance to the miner. By far the greater part of the ore body is composed of boulders and rock fragments from the adjoining country rock, varying in size from pieces as small as a walnut to masses of many tons weight. They are generally completely angular, but at times as round as a pebble. In the writer's opinion this rounding is not due to the action of the water, but rather to a process of decomposition The rock fragments are completely surrounded by concentric shells of brilliant crystalline sulphides and calcite. The order of deposition of these minerals around the matrix is generally iron-pyrites, then blende, and then galena, with an outer coating of calcite in which occur acicular quartz crystals.

"The gold occurs for the most part in a crystalline form, but often as wires or strings. It is found adhering to the sulphurets, and no doubt the very fine gold is disseminated through them. It is a rule that the greater the percentage of zinc and lead sulphides in the ore, the richer it is in gold. Three distinct classes of ore have been observed in the lode mass. In the vicinity of the walls, especially on the north and west sides of the deposits, the cementing materials of the breccia are chiefly calcite and quartz, while the matrix is softer from more advanced decomposition. Here, therefore, we find low-grade rock. Immediately inside this mass, which varies from 15 to 40 feet wide at different levels, and reckoning from north toward the south we find the interstices in the breccia not entirely filled up with cementing material, an infinity of vugs being left. Here calcite, quartz and iron pyrites, all more or less crystalline, form the cement. This class of gold assays from 1 to 1.5 ounce of gold per ton, according to the amount of the matrix present. To the center and southwest of the lode mass we find the ore very rich in the sulphides of zinc, lead and iron, all more compact, the vugs being entirely absent. This may be said to be the best class of ore in the mine. Occasional pockets and veins of a soft and friable mixture of all the lode-forming constituents are met, containing free gold in quantity. * * * * The conclusion seems to be forced on us that an explosive eruption took place, at a comparatively weak spot, primarily formed by a complicated intersection of a number of fracture planes. The filling up and cementing together of the resultant rock fragments would follow as a natural sequence were the necessary ingredients at hand."

In 1902 a 40-stamp mill was put up, and now treats all the ore from the mine. The ore is very free milling and no attempt is made to concentrate the tailings, as they are of low grade. The ore from above the 180-foot level, the old Spanish workings, gave high values in the concentrates, which were saved by cyaniding. It is thought that this was due to the presence of fine rusty or tarnished gold, which escaped amalgamation rather than to special richness of the sulphurets. This tarnish upon the free gold was probably caused by contact with water impregnated with decomposition products from the timbers and other vegetable matter in the old timbers.

There are 800 men employed about the mine and mill. These are chiefly Jamaican negroes. They are lazy, obstinate and show no interest in their work, working like animals, simply because they are obliged to do so. They constitute 80% of the labor, 10% being natives of the West Indies and 10% natives of Darien. The shift bosses and all in authority are necessarily white men, nearly all being Californians. Construction work on the Panama canal has increased the wages and reduced the efficiency of the labor, as heretofore the supervision of canal work has not been strict, and men, naturally indolent, become more so. The wages range from $1.60 for top labor to $3 for timbermen, being paid in the silver currency of Panama, which is worth 50 cents on the dollar.

The climate is such that white men can not live there more than two or three years without change. There are two seasons—the wet and the dry. From the end of December until the middle of May but little rain falls; but during the balance of the year, especially in June and July and in September and October, the rainfall sometimes totals 100 inches. Henry Loew, a French engineer, is superintendent and manager, and Norris English of California is assistant.

*See Illustrations on Front Page.

Mine Ventilation in Montana.

The Butte, Mont., Miner of the 17th inst. has an extended interview with Benj. Tibbey, former superintendent of the Parrot mine, on his system of supplying fresh air to that mine when in control. Superintendent Tibbey's theory and practice were along the following lines:

The old system used to be to carry the air through every place in one current and take the impure air from one portion of the mine to another, which resulted in its being loaded down with gas so heavily that they could not work on certain days in some parts of the mines. When the weather was stormy or cloudy and the barometer fell there would be a greater discharge of gas, and consequently they would not be able to work more than half time in such weather. The barometer, thermometer, hygrometer and airmeter are as necessary for the mining man as for the sailor. The barometer indicates a change in atmospheric pressure, the thermometer tells the temperature of the air, the hygrometer tests the humidity of the air and the airmeter tells the velocity of the air. If the barometer fall 1 inch it marks a difference in atmospheric pressure of seventy-two pounds to the square foot. In a drift 7 feet high and 4½ feet wide, making an area of 30 square feet, this fall in the barometer shows that there is 2160 pounds less air in that drift, and this condition will remain until the barometer rises again. Approximately the air pressure at the sea level is fifteen pounds to the square inch, 2160 pounds per square foot. It is figured that the pressure diminishes half a pound for every 1000 feet up or down. The atmospheric pressure at 6000 feet is three pounds less than at the sea level,, so the pressure in Butte is 1728 pounds per square foot or one-fifth, which is 432 pounds per square foot less than at the sea level. Less air means less oxygen, requiring one to breathe faster to get the amount of oxygen required. One's average respiration is fourteen to sixteen times a minute, and at each respiration one takes in from 30 to 40 cubic inches of air; 57% of this is exhaled as carbon dioxide. The atmosphere is composed of 21% oxygen and 79% nitrogen, approximately, with a trace of carbonic acid gas. To make a test for carbonic acid gas, take two saucers filled with lime water, and place one on the floor and the other near the ceiling. The one near the floor will turn white, which indicates the presence of the gas, while the one near the ceiling will not change its color. Carbonic acid gas is a third heavier than the air, and consequently always falls; the air will pass through it, like it will through a lady's crepe veil, and it is hard to move.

There is much carbonic acid gas in the mines of Butte. All quartz mines produce carbonic acid gas; coal mines produce the hydrogen gases. Dynamite No. 1 contains 75% nitroglycerine, and one pound of this powder in exploding develops one-third of a pound of carbonic acid gas. The gas created by powder is heated and more mixed with the air immediately after an explosion, and if not given time to settle to the floor, it can be carried away at once, if there is a good circulation of air in the mine. If there is not good ventilation the gas falls to the floor and remains.

This gas also injures the timbers in the mines. Timber rots or decays quicker in a return airway than in an intake. In air return courses is a larger amount of carbonic acid gas and watery vapor than in the intake, and timber, like other vegetable structures, takes up a great amount of carbonic acid gas and watery vapor, and these two ingredients, with the timber, form a chemical action resulting in the rapid decay of the timber. The timber will last many times longer in pure air, and this itself is a vast saving when the cost and the amount of timber used in Butte are considered. The timbers in a downcast shaft will not decay nearly as rapidly as the timbers in an upcast shaft.

In the Parrot mine Superintendent Tibbey divided

the air system up into five different currents from the downcast shaft. Each current had about 4000 feet to travel, about 1500 feet along one level and back through the stopes, and delivered to the upcast and thrown to the elements above for nature to purify. Under his system it required ten minutes for air entering the downcast to be discharged by the upcast to the surface. The air was changed every ten minutes in the mine, as shown by the air-meters, which indicated its exact velocity.

He had a standing reward of $1000 for any man who could find smoke in the face of any working place five minutes after a shot had been fired.

The hygrometer showed the humidity of the air going into the mine and also the increase in humidity of that returning to the surface. If the air showed a humidity of 80% to 85% on leaving the mine, and if the upcast shaft was wet, it indicated the necessity of increasing the air current in the lower levels, for the current was too feeble to raise the heavily laden, moist air. He had five currents in the mine, and the lowest levels were always the wettest. By dividing the air, sometimes he did not have sufficient draught to raise that extra percentage of moisture from the lower levels, which occasionally would result in reversing the current in some levels, and he would have to put in more air to counterbalance this humidity. There were about 200 tons of water carried out of the mine by the air every day. The timbers never bore any fungi. The presence of the fungi indicates carbonic acid gas.

Superintendent Tibbey says that when he took charge of the Parrot he considered well and profited by the mistakes he had seen others make, and he resolved to make the Parrot an example of what good ventilation should be in a mine. He carried the mine workings to the depth of 1100 feet and the air improved with each 100 feet in depth. He thinks he could have carried it to the depth of 1 mile with equally good results. When he left the upcast shaft averaged 60° temperature; the temperature in the face of the workings would not average over 40°, and lower in winter.

His explanation of the cause of heat underground is as follows: The atmosphere is the earth's great boiler valve, preventing the outbreak of gases which are pressed and penned up in the earth's strata like steam in a boiler. The slips and seams of the earth, known to some as crevices in the rocks, are the pores of the earth, the same as the pores of one's hands and body. A fall in the barometer allows these gases to escape owing to the air being lighter. Mines are affected by a change of weather, because the weight of the atmosphere which presses gas in the strata is diminished when the barometer falls. When a change of weather takes place the weight of the atmosphere may be diminished from fifteen to fourteen pounds, figuring at sea level. This diminishing weight of atmosphere causes an extra discharge of gas as an extra discharge of steam would blow out of a boiler if a little weight were taken off the safety valve. The moment the pressure of the atmosphere is reduced, gas expands every place into which it is compressed. Miners often say on seeing a cloudy, wet morning, that they will not be able to work that day. The miner knows the weather affects his working place. The condition of the air in a mine depends much on the state of the air at the surface. The weight of the atmosphere is shown by the height of the barometer. When the barometer has sunk the air has become lighter, and the pressure which before assisted to keep in the gas, now being diminished, allows it to escape. As the gases coming out of the slips and seams of the earth come in contact with air, and the air being hot, the moisture in the mines naturally makes it oppressive, as there is so much humidity in the air, the same as it is in the East. When it is 85° or 90° in the shade, the air being of low humidity, we do not feel the heat here as much as we do in the East. The humidity existing there makes it oppressive, and so it is in the mines when the ceiling is only 7 feet high as in a drift or stope. Compare how much cooler a room with a high ceiling is to one with a low ceiling. Take it in Arizona and Mexico, where it is from 110° to 130° in the shade at times, the atmosphere there contains so little humidity that it is not so oppressive as 90° would be in the East, but if the temperature of Mexico existed in the East with the humidity common there, thousands would die. The powder smoke, the gases of the earth, the carbonic acid gas given off by the men in breathing and perspiring forms a combination of gases. To get rid of it is to remove the cause which produces the effect, and the effect ceases. That can only be done by plenty of fresh air.

The mines in the Lake Superior district are not hot. The reason for their not being so is the ore carries little or no sulphur. The mines of Butte carry 20% more or less. Decomposition of the minerals results in setting up heat. Air expands with heat and contracts with cold. Air at a temperature of 32° weighs 550 grains per cubic foot, and its volume is 100; air at a temperature of 42° weighs 539 grains, and its volume is 102; at 52° its weight is 529 grains, and volume 104; at 62° its weight is 518 grains, and its volume 106; at 72° its weight is 506 grains, and its volume 109; at 82° its weight is 495 grains, and its volume 111; at 92° its weight is 487 grains and its volume 113.

The increase in heat is the greatest ventilating power that there is, if it is properly utilized, for the warm air is so much lighter than the cold air. Like a balloon in the air or a cork in water, the cold air is so much heavier that it rushes down and takes the place of the warm air, forcing the latter out. A current of air is affected by friction, just as water is. Friction increases with velocity. By one system of ventilation you can prevent 80% of the gases from escaping out of the strata of the earth, except as you work the ore out. Under another plan you release these gases of the earth. The extra percentage of gases mixing with the air of a mine increases its volume, thus increasing the friction of the air current, and these gases may become too prevalent, even to the extent, at times, of blocking your ventilating system, and the deeper you go the more poisonous and noxious gases you must expect.

When the Parrot mine only had one downcast and one upcast to a depth of 1100 feet, it was well ventilated. Now there are five shafts more and the temperature is 87°. This increase of raises from each level and shafts to the surface does not show that they improve ventilation, but rather that they have made it worse, as shown by the increase in temperature and the deterioration of the air.

There are too many openings and no man can handle them. Cold will go to heat, but heat is never known to go to cold. The difference in temperature which exists here shows a variation from 80° to 90° in summer to 30° or 40° below zero in winter, and it will be noticed that under these conditions some shafts are downcast in summer and upcast in winter, and the air goes at will and is not conducted as one would water. Air is elastic and can be taken anywhere as long as the laws of nature are obeyed; you cannot drive hot air down and cold air up.

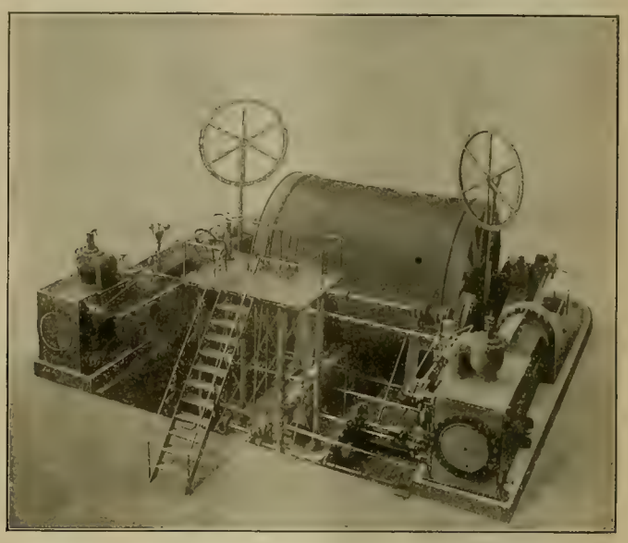
Poor ventilation costs Butte millions of dollars. Say there are 5000 men working in poorly ventilated mines in Butte. One-third of eight hours' pay is $1.17; let us put it at $1 a day for 5000 men. In thirty days that would be $150,000, or $1,800,000 per year—6% on $30,000,000. This is a loss that is no benefit to the working man, no benefit to the companies, but a loss of that amount of money to the world.

Copper Queen Smelter.

Herewith is illustrated a portion of the new Copper Queen smelter at Globe, Ariz. The Copper Queen Co. is locally stated to be the largest producer of copper in the United States. It certainly is one of the foremost factors in the production of this important metal at the present time. The Copper Queen Co. is putting in additional furnaces and converters, and enlarging the power house in connection with an increase of the output. For the use of the engraving acknowledgment is due to the courtesy of the Humphries Photo Co., El Paso, Texas.

New Hoist for Centennial Copper Co.

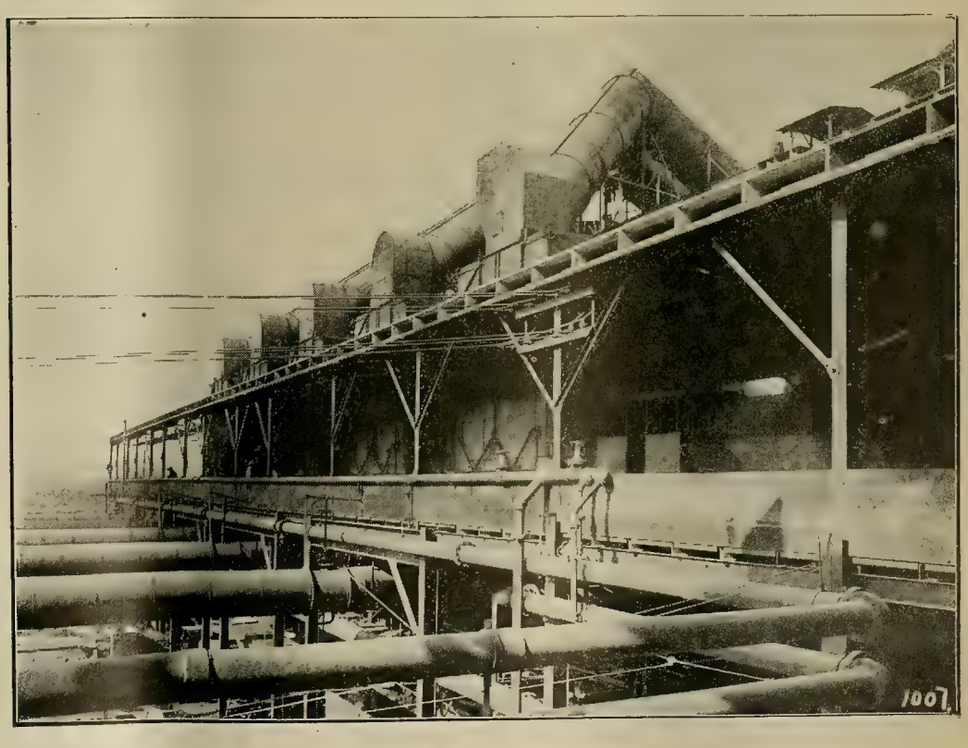
Herewith is illustrated a hoisting engine of heavy design, shipped to the Centennial Copper Co. from the Chicago works of the Sullivan Machinery Co. It is of the direct-acting type and consists of two 36x60-inch simple, reversible Corliss engines of the heavy duty type, connected to a straight-faced drum, 15 feet in diameter by 15 feet winding face. The drum is grooved for 1⅛-inch wire rope and is keyed direct to the engine shaft. The plant is designed to hoist from a vertical depth of 5000 feet at the rate of 4000 feet per minute, with a boiler pressure of 150 pounds. The reverse engine may be operated by either steam or air.



Hoist for Centennial Copper Co.

The brake mechanism is arranged for steam, hand or gravity operation, with independent control in each case. The main throttles are on the cylinders, moved by hand from the engineer's platform, which is elevated to a point higher than the drum. The dial indicators are provided with fast and slow-moving pointers. A sensitive automatic stop and throttle-closing device diminishes the danger of overwinding, with the high speed used.

A QUARTZITE is a sandstone silicified by underground waters. It can be distinguished from vein quartz precipitated from underground waters with a microscope, which will usually show the faint outlines of the original grains of sand.



Copper Queen Smelter, Globe, Arizona.

DEPARTMENT OF THE INTERIOR

UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, Director.

MINERAL PRODUCTS OF THE UNITED STATES.

Calendar Years 1895 to 1904.

PRODUCTS.	1895.		1896.		1897.		1898.		1899.		1900.		1901.		1902.		1903.		1904.		PRODUCTS.
	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.	QUANTITY.	VALUE.	
METALLIC.																					
Pig iron (spot value *a*)..... long tons (*b*)	(*c*) 9,446,308	$105,198,550	(*c*) 8,623,127	$90,250,000	(*c*) 9,652,680	$95,122,299	(*c*)11,773,934	$116,557,000	(*c*)13,620,703	$245,172,654	(*c*)13,789,242	$259,944,000	(*c*)15,878,354	$242,174,000	(*c*)17,821,307	$372,775,000	(*c*)18,009,252	$344,350,000	(*c*)16,497,033	$233,025,000	Pig iron.
Silver, coining value (*d*)..... troy ounces	55,727,000	(*d*)72,051,000	58,834,800	(*d*)76,069,236	53,860,000	(*d*)69,637,172	54,438,000	(*d*)70,384,485	54,764,500	(*d*)70,806,626	57,647,000	(*d*)74,533,495	55,214,000	(*d*)71,387,800	55,500,000	(*d*)71,757,575	54,300,000	(*d*)70,206,060	53,603,000	(*d*)69,303,329	Silver.
Gold, coining value (*e*)..... do.	2,254,760	46,610,000	2,568,132	53,088,000	2,774,935	57,363,000	3,118,398	64,463,000	3,437,210	71,053,400	3,829,897	79,171,000	3,805,500	78,666,700	3,870,000	80,000,000	3,560,000	73,591,700	4,090,176	84,552,300	Gold.
Copper, value at New York City..... pounds	385,913,404	38,012,470	460,061,430	49,456,603	494,078,274	54,080,180	526,512,987	61,865,276	568,666,921	101,222,712	606,117,166	98,494,039	602,072,519	87,300,515	659,508,644	76,568,956	698,044,517	91,506,006	812,537,267	103,629,845	Copper.
Lead (*g*), value at New York City..... short tons	170,000	11,220,000	168,000	10,528,000	212,000	14,885,728	222,000	16,650,000	210,500	18,945,000	270,824	23,561,688	270,700	23,280,200	270,000	22,140,000	282,000	23,520,000	307,000	26,402,000	Lead.
Zinc, value at New York City..... do.	89,686	6,278,020	81,499	6,519,920	99,980	8,498,300	115,399	10,385,910	129,051	14,840,865	123,886	10,654,196	140,822	11,265,760	156,927	14,625,596	159,219	16,717,995	186,702	18,670,200	Zinc.
Quicksilver, value at San Francisco..... flasks (*h*)	36,104	1,337,131	30,765	1,075,449	26,648	993,445	31,092	1,188,627	30,454	1,452,745	28,317	1,302,586	29,727	1,382,305	34,291	1,467,848	35,620	1,544,934	34,570	1,503,795	Quicksilver.
Aluminum, value at Pittsburg..... pounds	920,000	464,600	1,300,000	520,000	4,000,000	1,500,000	5,200,000	1,716,000	6,500,000	1,716,000	7,150,000	1,920,000	7,150,000	2,238,000	7,300,000	2,284,590	7,500,000	2,284,900	8,600,000	(*i*) 2,477,000	Aluminum.
Antimony (*j*), value at San Francisco..... short tons	2,013	304,169	2,478	347,539	3,061	442,300	3,238	532,101	2,861	559,189	4,226	837,896	2,639	539,902	3,561	634,506	3,128	548,433	3,057	505,524	Antimony.
Nickel (*k*), value at Philadelphia..... pounds	10,302	3,091	17,170	4,464	23,707	7,823	11,145	3,956	22,541	8,566	9,715	3,886	6,700	3,551	5,748	2,701	114,200	45,900	24,000	11,400	Nickel.
Tin..... do.	(*none.*)		(*none.*)		(*none.*)		(*none.*)		(*none.*)		(*none.*)		(*none.*)		(*none.*)		(*l*)		(*l*)		Tin.
Platinum, value (crude) at San Francisco..... troy ounces	150	900	163	944	150	900	225	1,913	300	1,800	400	2,500	1,408	27,526	94	1,814	110	(*m*) 2,080	200	2,600	Platinum.
Total value of metallic products		$281,479,931		$287,860,155		$302,531,147		$343,748,268		$525,779,557		$550,425,286		$518,266,259		$642,258,584		$624,318,008		$542,081,983	
NONMETALLIC (Spot Values *a*).																					
Fuels:																					
Bituminous coal (*n*)..... short tons	135,118,193	$115,779,771	137,640,276	$114,891,515	147,617,519	$119,595,224	166,593,623	$132,608,713	193,323,187	$167,952,104	212,316,112	$220,930,313	225,828,149	$236,422,049	260,216,844	$290,856,483	282,749,348	$351,687,933	279,153,718	$305,842,268	Bituminous coal.
Pennsylvania anthracite..... long tons	51,785,122	82,019,272	48,523,287	81,748,651	46,974,714	79,301,954	47,663,076	75,414,537	53,944,647	88,142,130	51,221,353	85,757,851	60,242,560	112,504,020	36,940,710	76,173,586	66,613,454	152,036,448	65,318,490	138,974,020	Pennsylvania anthracite.
Natural gas.....		13,006,650		13,002,512		13,826,422		15,296,813		20,074,873		23,698,674		27,055,077		30,867,863		35,815,360		38,496,760	Natural gas.
Petroleum..... barrels (*o*)	52,892,276	57,632,296	60,960,361	58,518,709	60,475,516	40,674,072	55,364,233	44,193,359	57,070,850	64,603,904	63,620,529	75,989,313	69,389,194	66,417,335	88,766,916	71,178,910	100,461,337	94,694,050	117,063,421	101,170,466	Petroleum.
Structural Materials:																					
Brick clay.....		9,000,000		9,000,000		8,000,000		9,000,000		11,250,000		12,000,000		13,800,000		15,000,000		15,000,000		13,000,000	Brick clay.
Cement..... barrels (*p*)	8,731,401	5,482,254	9,513,473	6,473,213	10,989,463	8,178,283	12,111,208	9,859,501	15,520,445	12,889,142	17,231,150	13,283,581	20,068,737	15,786,789	25,753,504	25,366,380	29,899,140	31,931,341	31,675,257	26,031,920	Cement.
Stone (*q*).....		35,943,105		32,202,661		36,791,772		39,245,264		49,785,875		48,008,739		60,275,762		69,830,351		72,945,908		74,200,361	Stone.
Abrasive Materials:																					
Corundum and emery..... short tons	2,102	106,256	2,120	113,246	2,165	106,574	4,064	275,064	4,900	150,600	4,305	102,715	4,305	146,040	4,251	104,605	2,542	64,102	1,932	57,235	Corundum and emery.
Crystalline quartz..... do.	9,000	27,000	6,000	18,000	7,500	22,500	8,312	23,990	13,600	39,000	14,461	40,705	14,050	41,500	15,104	84,335	8,938	76,908	31,924	74,600	Crystalline quartz.
Garnet for abrasive purposes..... do.	3,325	95,050	2,686	68,877	2,554	80,833	2,967	86,850	2,765	98,325	3,185	123,475	4,444	158,100	3,926	132,820	3,950	132,500	3,854	117,581	Garnet (abrasive).
Grindstones.....		205,768		326,826		368,058		489,769		675,586		710,026		580,703		667,431		721,446		881,527	Grindstones.
Infusorial earth and tripoli..... short tons	4,954	20,514	3,846	26,792	3,833	22,835	2,733	16,691	4,334	37,032	3,615	24,207	1,020	52,950	5,665	53,244	9,219	76,273	6,274	44,164	Infusorial earth and tripoli.
Millstones.....		22,542		22,567		25,932		25,934		28,115		32,658		57,179		59,806		52,552		37,338	Millstones.
Oilstones, etc.....		155,881		127,098		149,970		180,486		208,283		174,087		158,300		221,762		366,857		188,985	Oilstones, etc.
Chemical Materials:																					
Arsenious oxide..... short tons													300	18,900	1,353	81,180	611	36,691	36	2,185	Arsenious oxide.
Borax..... pounds	11,918,000	595,900	13,508,000	675,400	16,000,000	1,080,000	16,000,000	1,120,000	40,714,000	1,139,882	Refined, short tons 1,602 Crude, short tons 24,235	170,036 848,215	Refined, short tons 5,344 Crude, short tons 17,697	697,307 314,811	Refined, short tons 17,404 Crude, short tons 2,600	2,447,614 91,000	Crude, short tons 34,430	661,400	Crude, short tons 45,647	698,810	Borax.
Bromine..... do.	517,421	134,343	546,580	144,501	487,149	129,094	486,979	126,614	433,004	108,251	521,444	140,790	552,043	154,572	513,893	128,472	598,500	167,580	897,100	269,130	Bromine.
Fluorspar..... short tons	4,000	24,000	6,500	52,000	5,082	37,159	7,675	63,050	15,900	96,650	18,450	96,500	19,586	113,603	46,018	271,832	42,523	213,617	36,432	234,755	Fluorspar.
Gypsum..... do.	265,503	797,447	224,254	573,344	288,982	735,864	291,638	735,290	486,235	1,287,080	594,462	1,627,203	633,791	1,506,641	816,476	2,089,341	1,041,704	2,792,943	940,917	2,784,325	Gypsum.

Pyrite																								Pyrite.
Sulphur	short tons	1,800	42,000	5,260	97,200	2,275	48,590	1,200	32,960	4,830	107,500	3,525	88,100			(r) 307,874	947,089	(r)333,127	1,109,815	(r) 333,848	3,460,563			Sulphur.
Salt	barrels (s)	13,669,649	4,423,084	13,850,726	4,040,839	15,973,202	4,920,020	17,612,634	5,312,554	19,708,614	6,867,467	20,869,342	6,944,603	20,566,661	6,617,449	23,849,231	5,668,636	18,966,089	5,286,988	22,030,002	6,021,222			Salt.
Pigments:																								
Barytes (crude)	short tons	21,529	68,321	17,068	46,913	26,042	58,295	31,306	108,339	41,894	139,528	67,680	188,089	49,070	157,644	61,668	203,154	50,397	152,150	65,727	174,958			Barytes.
Cobalt oxide	pounds	14,458	20,675	10,700	15,301	19,520	31,232	6,247	9,371	10,230	18,512	6,471	11,648	13,360	24,048	3,730	6,714	120,000	(t) 228,000	22,000	42,600			Cobalt oxide.
Mineral paints (u)	short tons	50,693	621,552	48,032	552,955	60,913	795,793	58,850	695,856	63,111	728,389	72,222	881,363	61,460	789,962	73,049	944,332	63,687	635,557	59,785	631,171			Mineral paints.
Zinc white	do.	20,710	1,449,700	20,000	1,400,000	25,000	1,750,000	33,000	2,310,000	40,146	3,211,680	48,840	3,667,210	46,500	3,720,000	52,645	4,016,499	62,962	4,801,718	63,363	4,808,482			Zinc white.
Miscellaneous:																								
Asbestos	short tons	795	13,525	504	6,100	580	6,450	605	10,300	681	11,740	1,054	16,310	747	13,498	1,005	16,200	887	16,760	1,480	25,740			Asbestos.
Asphaltum	do.	68,163	348,281	80,803	577,563	75,945	664,632	76,337	675,649	75,085	553,904	54,389	415,958	63,134	555,335	105,458	765,048	101,255	1,003,446	81,572	903,741			Asphaltum.
Bauxite	long tons	17,069	44,000	18,364	47,338	20,590	57 652	25,149	75,437	35,280	125,598	23,184	89,676	18,905	79,914	27,322	120,366	48,087	171,306	47,661	235,704			Bauxite.
Chromic iron ore	do.	1,740	16,795	786	6,667	(none.)	(none.)	(none.)	(none.)	(none.)	(none.)	140	1,400	368	5,790	315	4,567	150	2,250	123	1,845			Chromic iron ore.
Clay (all other than brick v)	short tons	403,200	800,000	403,200	800,000	563,115	978,448	585,450	1,384,766	843,279	1,645,328	1,221,660	1,840,377	1,367,170	2,576,932	1,455,357	2,061,072	1,641,635	2,594,042	1,508,752	2,320,162			Clay (all other than brick)
Feldspar	do.	8,523	30,000	10,203	35,200	12,516	43,100	13,440	32,395	24,202	211,545	24,821	180,971	34,741	220,422	45,287	250,424	41,891	256,733	45,188	266,326			Feldspar.
Fibrous talc	do.	39,240	370,697	46,089	399,443	57,009	396,936	54,356	411,430	54,655	438,150	63,500	499,500	69,200	483,600	71,100	615,350	60,230	421,600	64,005	507,400			Fibrous talc.
Flint	do.	13,747	21,038	12,458	24,226	13,466	26,227	21,425	42,670	29,852	180,345	32,495	86,351	34,420	149,297	36,365	144,209	55,233	156,947	52,270	100,590			Flint.
Fuller's earth	do.	6,900	41,400	9,872	59,360	17,113	112,272	14,860	106,500	12,381	79,644	9,698	67,535	14,112	96,835	11,492	98,144	20,693	190,277	29,480	168,500			Fuller's earth.
Glass sand	do.															943,135	807,797	823,044	855,628	858,719	796,492			Glass sand.
Graphite	pounds	Crystalline, lbs. 644,700	52,582	Crystalline, lbs. 333,858	48,460	Crystalline, lbs. 1,361,706	65,730	Crystalline, lbs. 2,360,000	75,200	Crystalline, lbs. 2,900,732	167,106	Crystalline, lbs. 3,507,855	197,579	Crystalline, lbs. 3,967,612	167,714	Crystalline, lbs. 3,936,824	182,108	Crystalline, lbs. 4,538,155	225,554	Crystalline, lbs. 5,681,177	361,372			Graphite.
	short tons	Amorphous, sh. tons 2,793		Amorphous, sh. tons 760		Amorphous, sh. tons 1,070		Amorphous, sh. tons 890		Amorphous, sh. tons 2,324		Amorphous, sh. tons 611		Amorphous, sh. tons 809		Amorphous, sh. tons 4,739		Amorphous, sh. tons 16,591		Amorphous, sh. tons 19,115				
Magnesite	do.	2,220	17,006	1,500	11,000	1,143	13,671	1,263	19,075	1,280	18,480	2,252	19,333	3,500	10,500	2,830	8,490	3,744	10,595	2,850	9,298			Magnesite.
Manganese ore	long tons	9,547	71,769	10,088	90,727	11,108	95,505	15,957	129,185	9,935	82,278	11,771	100,289	11,995	116,722	7,477	60,911	2,825	25,335	3,146	29,466			Manganese ore.
Mica	pounds	Sheet, lbs. 44,325	58,831	Sheet, lbs. 49,156	65,441	Sheet, lbs. 52,676	80,774	Sheet, lbs. 129,520	103,534	Sheet, lbs. 108,570	70,587	Sheet, lbs. 456,283	92,758	Sheet, lbs. 350,060	98,859	Sheet, lbs. 272,266	83,643	Sheet, lbs. 619,600	118,088	Sheet, lbs. 668,350	109,462			Mica.
	short tons	Scrap, short tons 140		Scrap, short tons 222		Scrap, short tons 740	14,452	Scrap, short tons 3,999	27,564	Scrap, short tons 1,505	50,878	Scrap, short tons 5,497	55,202	Scrap, short tons 2,171	19,719	Scrap, short tons 1,400	35,006	Scrap, short tons 1,659	25,040	Scrap, short tons 1,096	10,654			
Mineral waters	gallons sold	21,463,543	4,254,237	25,795,312	4,136,192	23,255,911	4,599,106	28,853,464	8,051,833	39,562,136	6,948,030	47,558,784	6,245,172	55,771,188	7,586,962	64,859,451	8,793,761	51,242,757	9,041,078	67,718,500	10,398,450			Mineral waters.
Monazite	pounds	1,573,000	137,150	30,000	1,500	44,000	1,980	250,776	13,542	350,000	20,000	908,000	48,805	748,736	59,262	802,000	64,160	862,000	64,630	(x) 765,999	85,038			Monazite.
Zircon	do.																	3,000	570					Zircon.
Precious stones			113,621		97,850		130,675		160,920		185,770		233,170		289,050		328,450		307,900		315,900			Precious stones.
Pumice stone	short tons					158		600	13,200	400	10,000	(none.)	(none.)	(none.)	(none.)	700	2,750	885	2,665	1,530	5,621			Pumice stone.
Rutile	pounds	100	350	100	350	100	350	140	700	230	1,030	300	1,300	44,250	5,710						7,000			Rutile.
Sand, molding, building, etc	short tons																				4,931,607			Sand, molding, etc.
Talc and soapstone	do.	21,495	266,495	22,183	354,065	21,923	365,629	22,231	287,112	24,765	330,805	27,943	383,561	28,643	424,888	26,854	525,157	26,671	418,460	27,184	433,331			Talc and soapstone.
Uranium and vanadium	do.															3,810	48,125	30	5,625	45	10,600			Uranium and vanadium.
Total value of nonmetallic mineral products			$338,287,291		$334,045,487		$327,695,828		$353,849,268		$445,428,451		$512,252,767		$567,284,612		$617,243,314		$793,970,109		$747,178,805			Nonmetallic.
Total value of metallic products			281,479,931		287,860,155		302,531,147		343,748,268		525,779,557		550,425,286		518,266,259		642,258,584		624,318,008		542,081,983			Metallic.
Estimated value of mineral products unspecified (x)			1,000,000		1,000,000		1,000,000		1,000,000		1,000,000		1,000,000		1,000,000		1,000,000		1,000,000		400,000			Unspecified.
Grand Total			$620,767,222		$622,905,642		$631,226,975		$698,597,536		$972,208,008		1,063,678,053		1,086,550,871		1,260,501,898		1,419,288,117		1,289,660,788			Total.

a. By "spot" value is meant value at the point of production.
b. Long tons are tons of 2,240 avoirdupois pounds; short tons are tons of 2,000 avoirdupois pounds.
c. Production of iron ore. 1885: 15,937,614 long tons; value at mines: $18,219,684. 1896: 10,009,449 long tons, value at mines: $22,789,069. 1897: 17,518,046 long tons; value at mines: $18,053,221. 1898: 19,433,716 long tons; value at mines: $24,999,077. 1900: 27,653,161 long tons, value at mines: $56,680,804. 1901: 28,887,479 long tons, value at mines: $49,256,545. 1902: 35,654,135 long tons; value at mines: $65,412,869. 1903: 35,019,308 long tons, value at mines: $66,328,415. 1904: 27,644,330 long tons; value at mines: $43,186,741.
d. Figures of production furnished by the Bureau of the Mint, Treasury Department. Coining value, $1.2929 per troy ounce. Commercial value 1880: $36,445,000. 1896: $39,055,000. 1897: $32,316,000. 1898: $32,119,420. 1899: $32,858,700. 1900: $35,741,160. 1901: $33,128,400. 1902: $30,415,000. 1903: $29,329,000. 1904: $30,992,534.
e. Figures of production furnished by the Bureau of the Mint, Treasury Department. Coining value, $20.6718 per troy ounce.
f. Including copper made from imported pyrites.
g. The product from domestic ores only.
h. Of 76½ avoirdupois pounds net; of 75 avoirdupois pounds net after June, 1904.
i. Consumption in 1904.
j. Includes antimony smelted from imported ores and antimony contained in hard lead.
k. Including nickel in copper-nickel alloy, and in exported ore and matte.
l. No metallic tin; about 20 short tons of high-grade concentrates shipped to England from South Carolina in 1903. In 1904: about 150 short tons of concentrates from South Carolina, South Dakota, and Alaska shipped to England.
m. Not including $6,000 worth of platinum reported as contained in slimes from copper ore from the Rambler mine, Wyoming.
n. Including brown coal and lignite, and anthracite mined elsewhere than in Pennsylvania. Coke, 1902: 23,401,720 short tons; value at ovens $63,339,167. 1903: 25,274,281 short tons; value at ovens $66,498,664. 1904: 23,621,520 short tons; value at ovens: $66,026,183.
o. Of 42 gallons.
p. Of 300 pounds for natural cement, and 400 pounds for Portland cement.
q. Including limestone for iron flux, but not including grindstones.
r. Included under pyrite in 1901, 1902, 1903, and 1904.
s. Of 280 pounds net. Value is for net product exclusive of cost of packages.
t. Not including value of 60 short tons of cobalt ore produced in Idaho.
u. Including metallic paint, ocher, umber, venetian red, siennа, ground soapstone, ground slate, and mineral black.
v. Value of clay products in 1880: $65,409,806. 1896: $62,110,408. 1897: $62,359,961. 1898: $74,487,960. 1899: Census returns $85,797,370. 1900: $94,212,345. 1901: $110,211,587. 1902: $122,169,531. 1903: $131,062,421. 1904: $131,923,248. Value of sand-lime brick in 1904: $463,150.
w. Including small quantities of zircon, columbite, and gadolinite.
x. Including nitrate of soda, carbonate of soda, sulphate of soda, and alum clays used by paper manufacturers, and bismuth $314; amorphous, $3,175; tungsten: $184,000; and peat, $4,300.

TOTAL VALUE OF THE MINERAL PRODUCTS SINCE 1880.

	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	
Metallic products	$190,039,805	$192,892,408	$219,755,109	$203,128,859	$186,100,599	$181,586,587	$214,897,825	$248,925,054	$253,731,822	$267,247,033	$305,872,422	$300,403,748	$307,936,189	$250,207,406	$218,382,494	$231,470,981	$287,980,155	$302,531,147	$343,748,268	$525,779,557	$550,425,286	$518,266,259	$567,284,612	$617,243,314	$624,318,008	$542,081,983	Metallic products.
Nonmetallic products	173,279,135	200,783,144	231,340,150	243,812,214	221,879,506	241,312,093	230,088,769	276,989,420	286,150,114	282,622,812	312,776,598	321,767,846	339,958,842	323,257,318	307,714,785	338,287,291	334,045,487	327,695,828	353,849,268	445,428,451	512,252,767	567,284,612	617,243,314	793,970,109	747,178,805	542,081,983	Nonmetallic products.
Unspecified	6,000,000	6,500,000	6,500,000	6,500,000	5,000,000	5,000,000	800,000	800,000	900,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	400,000	400,000	Unspecified.
Total	$369,319,000	$400,175,552	$457,595,259	$453,441,073	$412,980,105	$427,898,680	$445,786,594	$530,714,474	$540,781,936	$550,870,845	$619,648,925	$623,171,594	$648,895,031	$574,464,724	$527,097,279	$620,767,222	$622,905,642	$631,226,975	$698,597,536	$972,208,008	$1,063,678,053	$1,086,550,871	$1,260,501,898	$1,419,288,117	$1,289,660,788		Total.

Crushing Machinery for Mines.

NUMBER II—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS.

The problem which often confronts the mine superintendent when equipping a new mine is: What kind of crushing machinery shall be installed? This is a question which prejudice should not be permitted to decide. There is a very great difference in ores and some kinds of ore are crushed more effectively and are better prepared for further treatment by one kind of mill than another. For instance, there are numerous examples of the oxidized croppings of a vein carrying gold which is tarnished by iron oxide, coated with a fine film of silica, or which in some other way is unsuited to ready amalgamation. For such an ore stamps are usually found unsuited, and some form of grinding mill should be chosen.

Which type to choose is for the superintendent to decide by test, or, perhaps, he may be able to go far in this through the advantage of previous experience. Machines of the arrastre type remove the foreign coating from the gold, burnish it and render it more readily susceptible to amalgamation. Of course, if the gold is difficult to amalgamate because of chemical combinations, grinding may have no advantage over other methods, and stamps, rolls or some of the various forms of pulverizers may do equally as well as a grinding mill. The future treatment of the ore must always be an important factor in determining by what means it shall be pulverized, and is as important, if not more so, than rapid crushing at low cost.

Where it is undesirable to make a large percentage of slimes, grinding machines would be inadvisable. The character of the ore must then decide whether stamps or rolls are preferable.

In the case of a free-milling gold ore, in which the only element which may be considered rebellious is a small percentage of auriferous pyrite, and where the tendency to create slimes is not pronounced, stamps would probably be chosen, in the absence of any foreign influence, for stamps have been and are still being employed in crushing a very large part of all the gold ores reduced in the world, whether free-milling or not; but the free-milling quartz gold ore is pre-eminently a stamping ore.

Where the ore is more heavily sulphuretted, carrying galena, pyrite, blende, chalcopyrite, etc., and it is desired to concentrate after crushing, it is doubtful if stamps will in every case produce the most satisfactory results. The principles upon which rolls operate suits that class of crushing machinery to the pulverization of ore for concentration. Rolls crush by direct pressure. They are set to crush to a given size, and therefore the tendency to slime is greatly reduced, as the granules of crushed ore which are small enough to pass between the rolls drop down and are not subjected to further comminution, excepting, possibly, in those types of roll-crushing machines which are provided with devices to return a portion of the coarser particles for re-crushing. In these machines often a considerable portion crushed sufficiently fine fails to pass the screens and is returned with the coarser particles, and thus subjected to a further crushing. Nevertheless, rolls have a tendency to create the minimum quantity of slimes and should be employed in those cases where slimes are particularly objectionable, or where the percentage of sulphides, or, rather, heavy mineral to be concentrated, is above 3%. Where the ore contains metals or minerals which are malleable, such as native copper, or native silver or horn silver, each of which will flatten out when passing rolls set for fine crushing, the product would be difficult to concentrate, for the reason that the flat flakes are unsuited to ready concentration on jigs or other concentrating machines, and the percentage of loss is consequently heavy. Stamps, therefore, are superior to rolls on such ore. Some silver sulphides, though somewhat sectile, do not flatten out like flakes of horn silver, but slime so badly that stamps, though suitably preparing the ore for amalgamation in pans, are undesirable where concentration is to follow. This has led to the belief that silver sulphides, particularly argentite, can not be concentrated; but this is not a fact, as this class of ore is being crushed and successfully concentrated at Virginia City by rotary crushing mills.

The flattening of grains of gold is not particularly objectionable in any type of crushing mill, for the reason that the fineness of crushing is usually determined by a screen, and if the flakes of gold, being flattened, are unable to escape through the meshes of the screen, it will be more readily amalgamated in the battery or pan. All gold ores are not so readily amalgamated; but, without doubt, much unnecessary expense is entailed in the treatment of ores by processes and machines unsuited to the ores, and where simpler processes would not only be less expensive but altogether more satisfactory.

The peculiar physical characteristics of ores must be seriously considered when deciding upon the kind of crushing machinery to employ, for more often this is far more important than the chemical combinations occurring in the ores. Where there is a tendency to produce slimes, either this characteristic should be taken advantage of and machinery introduced which will not only crush the ore but produce in the operation the greatest percentage of slimes at the lowest cost, or the class of machine selected should be that which produces the least slimes.

The ore should be carefully studied and experienced opinions solicited as to the kind of machinery to install, if the superintendent has not had sufficient personal experience. It is very easy to make a mistake at the beginning, but it is almost as easy to avoid such errors by employing competent advisers to aid in reaching the proper determination, and not place orders for machinery without knowledge of its adaptability to the conditions as they actually exist.

As to capacity and size of the plant, this is an entirely different matter; but it may be said that it should be as large as the development of the mine can keep constantly supplied with ore. Undoubtedly the tendency is to over equip mines. Mills are built the demands of which can not be met by the mine. The writer visited a new mine some years since, and, although the shaft was only down 125 feet, an underhand stope was found at the 100-foot level. The inquiry was made: "Why are you stoping underhand here?" The reply was almost pathetic: "Great Scott, man! I have to keep a 100-ton smelter going!" To this the encouraging response, "I can see your finish," seemed to lend little hope to the unhappy superintendent in his desperate situation. The expected happened—the smelter was soon closed down for lack of ore.

Here was an instance where the equipment, though of the proper kind, was premature—a mistake almost as serious as the selection of a class of machinery unsuited to the ore.

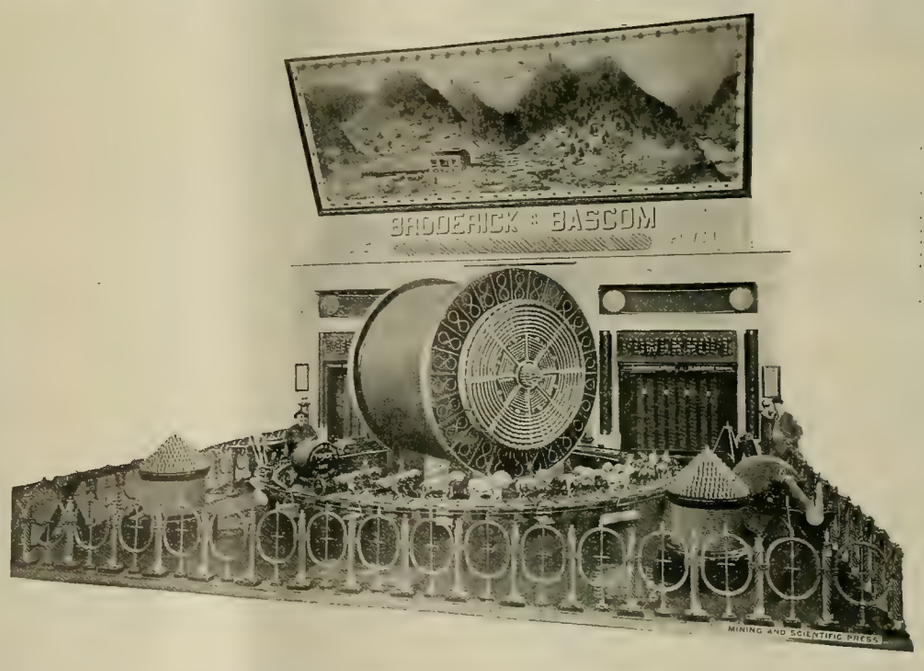
Another important phase of the equipment proposition is the likelihood of the character of the ore changing in depth; but, if the mine be developed far enough ahead, disaster in this direction may be easily averted. In many cases the ores of the oxidized zone are sufficiently abundant to warrant a milling plant in themselves, and modifications or radical changes may be made later suited to the change in the character of the ore.

There appears to be crushing machinery for every class of ore—machines which slime and those which do not, or which, at least, produce a minimum of slimes. It remains for the person or persons in whose hands the decision lies to carefully study the requirements of their ores and to decide along those lines which are proven to produce the most satisfactory economic results.

Wire Rope Exhibit at Portland, Or., Exposition.

That "a thing of beauty is a joy forever" has long been recognized. When such a prosaic thing as wire rope can be transformed into a "thing of beauty" it certainly deserves special mention.

Herewith is portrayed an exhibit now on display in the Liberal Arts Building of the Lewis & Clark Exposition at Portland, Or., and which is an artistic display.



Wire Rope Exhibit at the Portland, Or., Exposition.

The central figure is a spool of cable, 1½ inch diameter, 32,000 feet long, weighing 137,000 pounds, made for the Metropolitan Street Railway of New York. It required fifty-six horses to haul it through the streets. The spool is 10 feet in diameter and 8 feet wide, mounted on a turntable and revolves. On the outside flanges of the spool are two 7-foot diameter revolving disks, containing various sizes and styles of rope. Around the spool is a 20-foot diameter circular track on which is run a miniature spool of cable on a model of the "Jumbo" steel wagon, drawn by thirty miniature horses, all mounted in a complete manner, running in opposite directions to cable and spool. There is also a trainload of wire rope supplies drawn by a miniature locomotive. On the outside of the circular track is a miniature aerial tramway, showing the manner in which ore, timber, etc., are transported in midair. The whole effect is a fine illustration of what is and can be done with wire rope.

In the rear are two cabinet cases containing 5-inch diameter power steel ropes, capable of sustaining 2,500,000 pounds. These ropes revolve and present a handsome appearance.

An interesting feature of the exhibit is the carving set made entirely from power steel rope. The knife is 3 feet long with a perfect rope handle; the fork and steel are in proportion. The set is perfectly made and highly finished in silver.

In the rear and on top of the exhibit is a painting, 30 feet long by 12 feet high, representing a mountain mining aerial tramway scene.

The entire exhibit is from the factory of Broderick & Bascom, St. Louis, Mo., who make wire rope of every design, and for all purposes for which wire rope is adapted and was designed by the company's general superintendent and mechanical engineer, E. P. Frederick.

Placer Mining in Alaska.*

NUMBER VII.

On a 4-foot thickness of pay this amount of fire will thaw, in the time specified, from five to six cubic yards of gravel, at the rate of 9.2 cubic yards to the cord of wood, which is considerably less efficient than the method of thawing with steam. Time, delays and awkwardness of the method, moreover, make wood-fire thawing the most expensive that can be adopted. The figures per foot for shaft sinking range from $3.16 to $7.50 in taking gravel from prospect shafts. The efficiency given in the above-cited case on Deadwood creek appears to be very nearly the same as that given by E. D. Levat for the operations in eastern Siberia.

The direct application of jets of dry steam to the gravel bank through the agency of driven pipes has been found to be the most efficient method in general practice for thawing frozen gravel. The amount of moisture contained in steam can be judged by the color of a jet of steam issuing from a small brass pet cock. If it is transparent or whitish near the orifice it contains less than 2% of moisture; if pure white, the moisture is above 2%.

Fig. 15 shows the details of the steam point and some of the fittings which its use entails.

In creek claims exceeding 15 feet in depth where solidly frozen ground occurs, as, for example, in the new Fairbanks district of Alaska, the method of drifting with the use of the steam point is as follows: A 20 H. P. boiler, capable of running ten steam points, is put on the ground, and frequently one or two extra long points are provided for sinking holes. These long points, from 10 to 12 feet in length, are not so strongly made as the 5-foot points used in the drifting operations. In some cases pieces of ½-inch hydraulic pipe are used. The point is set up on the ground and steam or hot water is turned on. The

*Bulletin 263 U. S. Geological Survey.

time for sinking a hole by this method to bedrock is from twenty-four to forty-eight hours. If large, flat stones are encountered in the gravel underlying the muck it is sometimes advisable to use strong, specially made points to prevent breaking. The average radius of a vertical shaft thus thawed by a single point is 2 feet, and the hole when cleaned out has a cylindrical or tube shape.

If timbering is required after the shaft is sunk it is generally found that the hole will thaw sufficiently to allow the shaft to be carried 4 by 5 feet or 4 by 6 feet inside the timbers. As a rule, however, winter shafts are not timbered. When bedrock is reached a tunnel or runway is run for a distance varying from 50 to 100 feet from the tunnel lengthwise of the claim. From this central drift, which is generally timbered, lateral drifts are run to a distance not exceeding 50 feet, or from this down to 10 feet, or the width of the pay streak. Two tunnels parallel with the central runway are carried at the ends of the cross drifts and connections made from them to the shaft. These are rarely timbered.

The frozen condition of the overburden allows a firm roof to stand without timbering while the gravel is being extracted. This is a great advantage and in part offsets the difficulties attending the breaking up of the frozen ground. The ground is now ready for working. The drifts and main ways are run as low as possible in cases where the pay is thin, but a height of 3½ feet is the lowest that can be worked with economy.

During the night shift sufficient gravel is thawed to occupy the men in extracting it in the day time. In handling, not only the picking and shoveling from the bank must be allowed for, but the wheeling to the shaft, the time of return to the face, and the hoisting of the gravel to the surface and conveying to the dump. The face exposed by the cross drift at the far end of the runway is worked back toward the shaft, and the gravel is trammed in wheelbarrows to the shaft and hoisted. Points 5 feet in length are used to thaw the gravel, and are generally used in batteries and crossheads of four. The points are supplied with steam from a crosshead of iron gas pipe, ¾ inch in diameter, fitted with elbows and short pieces of ½-inch pipe leading to the steam hose, to which the points are attached. The valves are generally set in these short pieces of pipe. The points are driven in with a mallet by the point man working on the night shaft. The points are left in the bank from ten to fourteen hours. The thawing is nearly always done on the night shift, the only men occupied being the point man below and the fireman at the boiler above. Each point thaws a block of gravel on an average 6 feet into the bank, 18 inches on each side of the point and 4 feet high. The crosshead is laid on the floor of the drift, at a distance of 10 feet away from the face, and the steam hose connecting each cock of the crosshead with the individual points must be long enough to reach the desired distance for placing the point in the bank. The cross pipe, to which the hose clamp attaches the hose, should be carried through the steel head and brazed on the opposite side so that it will not break off by a chance blow from the mallet.

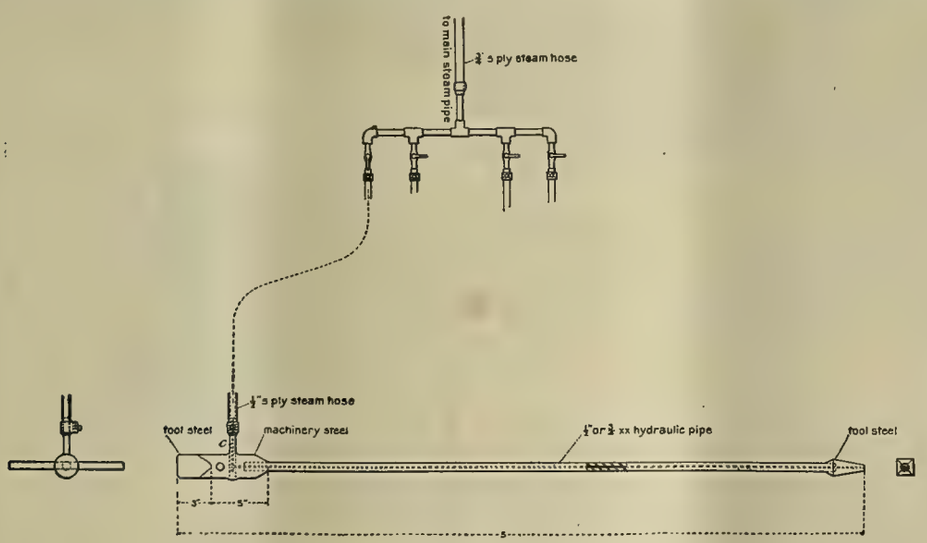


Fig. 15.—Details of Steam Point and Crosshead.

It is considered good practice as a rule to start the points with hot water turned through the hose. The points must be driven carefully and slowly, and for ten points distributed along a face the average time needed is from one to three hours. The amount of steam required for each point has been found to vary in amount from 1 to 2 boiler horsepower. One and one-half may be taken as a safe average. The amount of gravel which a point will thaw appears to vary with the length of the point, and this is regulated somewhat by the character of the gravel. The 5-foot point has been found the most economical size for the small operator.

A typical illustration of the efficiency of the points in the Fairbanks district is the experience at No. 8, below Fairbanks creek. Points of Dawson manufacture, 5 feet long, costing $15 each laid down, were used in crossheads of four. They were put in at distances of from 2 feet 6 inches to 3 feet apart. The points were started with hot water, and it took three hours to drive them in. A 12 H. P. boiler supplied the steam for ten points, three-fourths of a cord of wood being burned on the night shift, when the thawing was done. In twelve hours the ten points thawed a block of gravel 30 feet in length by 5 feet in height by 6 feet into the bank—an average of 3.3 cubic yards to the point.

The above is a little high for the average duty in the Fairbanks district, but is low for the Klondike drifting operations. A typical result on Hunker creek, where 1¼ to 1½ H. P. was used for each 5½-foot point running ten hours, was 4½ cubic yards Three cords of wood, at $13 per cord, were burned in twenty-four hours to generate steam for operating fifteen of these points 10 feet long. These thawed ground 14 feet deep to bedrock. As four cords of wood were burned in addition on the steam shovel, and twenty men, at $6 a day, were employed in the twenty-four hours to get out less than 500 cubic yards a day, the operations were not economical. In connection with a dredging operation the thawing by means of steam conducted through gas pipe in 11-foot lengths was estimated to add 40 cents per yard to the cost of working the ground.

The only drifting and steam thawing plant at Nome gave an efficiency for each point of only 1¼ cubic yard. The points were using in this case a little less than 1 H. P. each and were run only for eight hours. Moreover, the gravel was small and was mixed with much ancient beach sand, which in a frozen condition is extremely difficult to thaw with steam.

The method of thawing with hot water by means of a force pump set in the underground workings, which forces hot water through a small nozzle against the bank, has been tried successfully in the Klondike district. At a claim on Gold Run, where it was desired to extract a 3-foot pay streak of gravel capped by 27 feet of barren gravel at a depth of 50 feet below the surface, a small force pump of the ram pattern, with outside packed valves, was placed in the main runway near the shaft. It drew water from a 6-foot sump near at hand, to which the workings drained. The pump had 4-inch intake, 3-inch discharge choked to 2½-inch, and the water was pumped to the face by means of cotton hose and discharged through a 1-inch brass nozzle at forty pounds pressure. Six thousand gallons of water were used over and over, and by discharging the exhaust from the pump into the suction the water was kept at a temperature of 150° F. In a shift of ten hours the pump, using 30 H. P., thawed and broke down ready for the shovelers 175 cubic yards of gravel. This is vastly superior to the average Klondike duty of the 1½ H. P. steam point, even allowing 4 cubic yards to the point, as the 30 H. P. would supply only twenty points and the maximum duty would be 80 cubic yards

Only under certain very favorable conditions, however, can the hot water method be used. There must be no silt in the gravel, otherwise the water becomes thick and cannot be settled in the sump. If the bedrock is in large flakes, and the pay sinks into it, the hydraulic method is inefficient in thawing the valuable ground. The method is worthy of the serious attention of the Fairbanks placer miners, however, as will be pointed out in the discussion of that district.

(TO BE CONTINUED.)

Compound Condensing Pump.

Herewith is illustrated a compound condensing pump with 200 gallons per minute against 950 feet vertical lift, with no part over 300 pounds in weight. This pump has just been delivered to the Compania Beneficadora Del Concheno, where it is now reported

Compound Condensing Pump.

to be successful operation and doing better than the guarantee. This piece of pump designing was done by the Jeanesville Iron Works, Hazleton, Pa., its builders.

Concerning Forest Fires.

Forest fires are almost always unnecessary. They usually result from failure to realize that carelessness will be followed by injury and distress to others. The resident or traveler in forest regions who takes every precaution not to let fire escape, and who is active in extinguishing fires which he discovers, contributes directly to the development and wealth of the country and to the personal profit and safety of himself and neighbors. He who does not, assumes a great responsibility by endangering not only his own welfare, but that of countless others.

Care with small fires is the best preventive of large ones. The following simple rules may easily be observed by all:

1. Never drop burning matches or tobacco where there is anything to catch fire.
2. Camp fires should be as small as will serve.
3. Fire should not be built in leaves, rotton wood, or other places where it is likely to spread.
4. Fire should not be built against large or hollow logs, where it is difficult to be sure that it is completely out.
5. In windy weather and in dangerous places, camp fires should be confined in holes, or by clearing all vegetable matter from the ground around them.
6. A fire should never be left, even for a short time, before it is completely extinguished.
7. Except as specifically permitted by law for logging redwood or back firing, fire or explosives should not be used to clear land during the dry season without permission from an authorized fire warden.
8. No engines or boilers using fuel other than oil should be operated near forest, brush or grass lands, unless provided with spark arresters and firebox protectors.

The last three of the above rules are law in some States and their infraction directly punishable. Failure to observe the others would be considered willful negligence, should the fire escape and spread.

Any person discovering a fire too large to be put out at once should immediately seek help in the vicinity and, if necessary, notify the nearest fire warden. If no fire warden is available, the local justice of the peace, constable, or road overseer should be called upon. All of these officers are authorized to call upon able-bodied citizens for assistance. Failure upon the part of any person who allows a fire to get beyond his control to take every practicable step to secure assistance is considered willful negligence.

The best tools for fighting fire are the shovel, mattock and ax.

If possible, a fire should be stopped or checked by plowing, trenching, or the use of earth; but if this is impracticable, back firing may be resorted to. The use of back fires is attended by danger of useless burning and loss of control, therefore they should never be set by inexperienced persons except in great emergencies. If a fire warden can be reached in time, such measures should be left to his judgment; if not, and the fire is large, an experienced leader should be chosen to direct the work and his directions followed, so that there may be no loss through unorganized effort.

Back fires should always be set from a road, stream, cleared space, or natural fire line. Since fire rushes up hill, is checked by air currents at the crest, and usually works down hill slowly, it should be attacked from the top of a ridge if possible. If it is burning down hill, endeavor to meet it before it reaches the bottom. If it is working up hill rapidly, it seldom pays to try to stop it before it approaches

the top. The night or early morning hours are the best time to work, when any choice exists, for nearly all forest fires die down more or less at night and spring up during the heat of the day. Never trust a fire which is smoldering or "under control." Continue work until it is out, if possible. If not, watch it closely for fear wind or drying weather will cause it to break out again. Protect valuable timber rather than brush or waste. Young trees suffer more from fire than old ones.

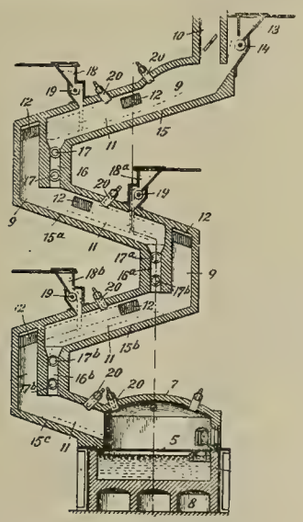
A surface fire in open woods may not seriously injure old growth, but it destroys reproduction by killing the seedlings. Dry sand or earth thrown on a fire is usually as effective as water and easier to get. With a large fire in the vicinity, do not allow yourself and your neighbors to stay at home watching your fences and buildings when organized effort will put the fire out and save not only your property but that of others. Here, more than anywhere else, "In unity there is strength." A little thinking often saves work and makes it successful. Haste and excitement rarely lead to success.

Mining and Metallurgical Patents.

PATENTS ISSUED SEPTEMBER 12, 1905.

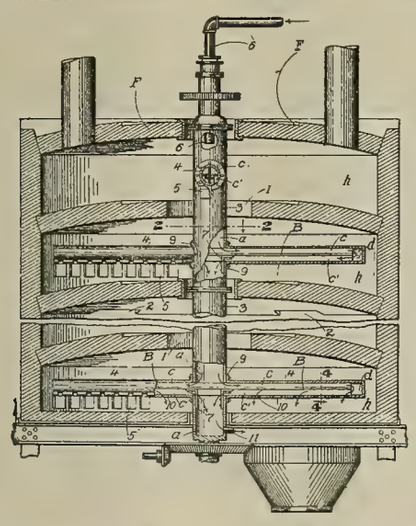
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

METALLURGICAL FURNACE.—No. 798,258; G. H. Benjamin, New York, N. Y.



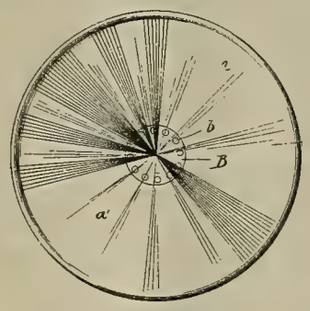
Metallurgical furnace embodying in construction series of oppositely inclined and connected hearths, means for feeding material to be acted on upon uppermost of hearths, means for charging fluxes or other combining materials on surface of material as it passes over each hearth, and means for subjecting material to high temperature as it passes from one hearth to next.

ROASTING FURNACE.—No. 799,063; F. Klepetko, New York.



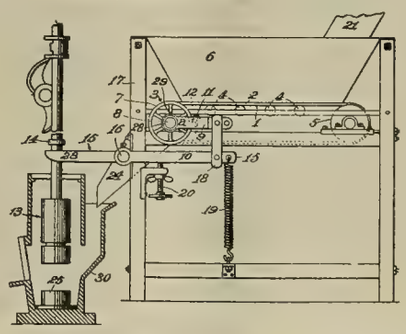
In furnace, hollow rabble shaft, structural members radiating from axis of shaft outwardly through walls thereof, suitable formations conjointly forming, with adjacent portions of members, partition walls dividing shaft into series of contiguous compartments, hollow arms passed over projecting portions of members, forming conduits therewith, arms establishing communication between two consecutive compartments through conduits aforesaid.

MINER'S WASHING PAN.—No. 799,059; J. Johansen, Paramaribo, Dutch Guiana.



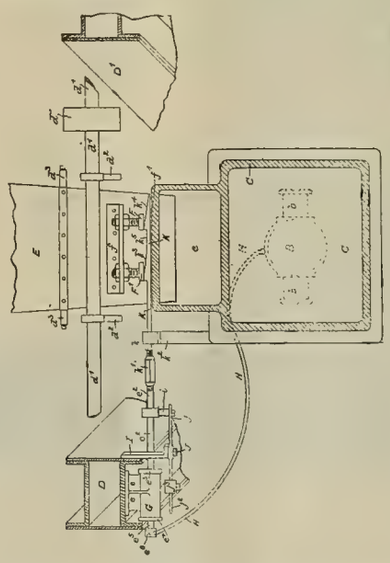
Washing pan for extracting precious metals from foreign substances by manipulation, comprising conical basin of sheet iron, having conical recess in bottom, cup of copper, conforming to and fixed within recess, copper-headed rivets fastening plate therein, inner surfaces of body of basin, plate, and heads of rivets being closely fitted, smoothly polished on common inclined plane, whereby precious metal may be readily caused to move down surface, accumulate on plate, and be there amalgamated.

FEEDER FOR STAMP AND OTHER MILLS.—No. 799,376; C. C. Hamill, Barstow, Cal.



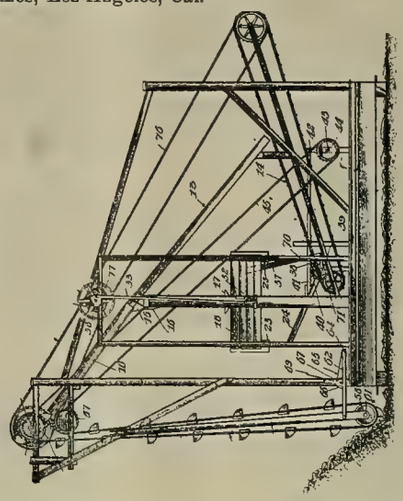
In ore feeder for crushing mills, an open-bottomed hopper, series of rollers beneath bottom thereof, end ones being beyond ends of hopper, each provided with flange at each end, belt on rollers, edges of which belt extend beyond sides of hopper, each edge of belt being flanged portion of surface between flanges being provided with protecting shields, and means for moving belt forward.

ORE-FEEDING MECHANISM OF PNEUMATIC STAMP MILLS.—No. 799,101; J. J. R. Smythe, Johannesburg, South Africa.



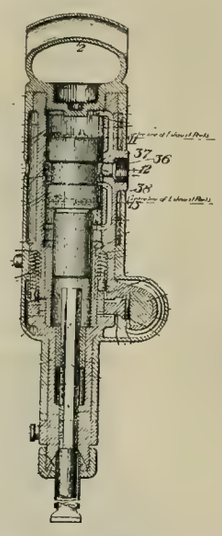
In ore-feeding mechanism for pneumatic stamp mills, combination of cylinder placed in communication with top of pneumatic cylinder, piston working in cylinder operated by excess of pressure in pneumatic cylinder, piston operating means for controlling feed. In combination, stamp stem A, reciprocating pneumatic cylinder B, mortar box C, vibrating feed chute E adapted to deliver ore into feed slot c of mortar box C, means for moving feed chute E in rearward direction, buffers F F′ fixed on under side of feed chute E adapted by impact to deliver ore into mortar box, wedge K formed with inclines k^3 k^4 and flat or plane part k^5 between inclines, bracket k^2 for guiding and supporting wedge K, cylinder G, pipe H placing top of pneumatic cylinder in communication with cylinder G, non-return valve e^6 between cylinders, relief valve e^7, piston e′ and piston rod e^2, means for connecting ends of piston rod e^2 and wedge K, pin or projection i on piston rod e^2, arm j of bell crank lever J formed with slot j′ engaging pin i, arm j^2 of lever J and adjustable weight j^3 arranged thereon.

GOLD SAVING MACHINE.—No. 799,161; J. B. Holmes, Los Angeles, Cal.



In a placer gold separator; a frame; an elevator therein; screening hopper into which elevator empties at upper end of frame; screens in hopper; trough below screens near lower end of hopper; separating boxes below trough; feed hoppers opening into boxes; flexible tubes leading from trough to feed hopper; hackle pins projecting upwardly from bottom of boxes; haggle pins being staggered; riffles extending transversely of boxes; inclined swinging gates above riffles; gangue spouts at ends of boxes; traveling apron below boxes adapted to receive gangue and carry same out of machine; means to cause boxes to reciprocate; means to cause ends of boxes to be alternately raised and depressed.

PNEUMATIC ROCK DRILL.—No. 799,406; A. P. Schmucker, Franklin, Pa.



In portable pneumatically operable drill, combination of cylinder, piston operable therein, second cylinder, piston operable therein, port connecting one end of first-mentioned cylinder with corresponding end of second-mentioned cylinder, port connecting opposite end of first-mentioned cylinder with corresponding opposite end of second-mentioned cylinder, whereby pressure is admitted directly from first-mentioned cylinder to corresponding ends of second-mentioned cylinder, piston in second-mentioned cylinder having rack formed on one side thereof, serrated ring having segment of gear engaging rack, annulus, drill-bit holder provided with ratchet teeth adapted to engage teeth of serrated ring, and teeth of annulus, whereby drill-bit holder is rotated and backward movement thereof prevented, and drill bit seated in holder.

PROCESS OF EXTRACTING GOLD FROM ITS ORES.—No. 799,548; F. W. Dupre, Leopoldshall, Germany.

Process of extracting gold from its ores consisting in subjecting the ores to the dissolving action of aqueous solutions of cyanides in the presence of ethyl alcohols.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Chas. Kirchhoff in a report of the United States Geological Survey on copper production states that there was an increase in the production of copper in the United States of 114,492,750 pounds, from 698,044,517 pounds in 1903 to 812,537,267 pounds in 1904, and an increase in the net exports of 231,638,043 pounds, from 151,614,632 pounds in 1903 to 383,252,675 pounds in 1904. In other words, the enormous export trade absorbed not alone the increase in production, but 117,145,293 pounds additional. The domestic consumption fell off in 1904 as compared with 1903, so that instead of drawing upon stocks to the extent of 117,000,000 pounds they were drawn upon only to the extent of 56,000,000 pounds.

ARIZONA.

Gypsum can be obtained in the Santa Rita mountains, Pima county, southeast of Tucson; the low hills along the San Pedro river in Cochise and Pinal counties; the Sierrita mountains, south of Tucson; the foothills of Santa Catalina mountains, north of Tucson, and the Fort Apache reservation in Navajo county.

Cochise County.

(Special Correspondence).—At the 400-foot level of the shaft of the Tombstone Consolidated mines a large body of carbonate ore showing native silver has been cut. The opening of these ore bodies above the water level shows that the old Contention was not worked out. The old storage plant at the Tombstone has been completed and is in use. An additional station pump has been put in. Since its installation the daily pumping capacity of the plant has been increased from 4,000,000 gallons to 5,500,000 gallons. —— Another rich strike said to have been made in the Tombstone district shows reported values of 4041 ounces in silver, 32 ounces of gold and 5½% lead. The property from which this ore was taken is owned by John Heminger, and adjoins the Independence.

Tombstone, Sept. 24.

(Special Correspondence.)—The new furnace of the Calumet & Arizona Co.'s smelter at Douglas is to be blown in October 7. The new furnace is complete and material for another furnace has been ordered to be built immediately. The smelter is 25 miles from the mine. The first stack was blown in November 15, 1902, the second in the spring of 1903, the third in October, the fourth in 1904, and the fifth just completed. The furnaces are of 300 tons daily capacity each. The fifth furnace will be held in reserve to replace any one of the others out of blast, giving an actual capacity of 1200 tons. Matte is discharged by furnaces into tilting wells and taken thence by electric crane to the four converters, which turn out 99.2% blister copper carrying small gold and silver values.

Douglas, Sept. 25.

(Special Correspondence.)—The flume at the Bonanza Circle mines is taxed to its utmost capacity. The Junction and Briggs shaft of the Calumet & Pittsburg are now discharging, approximately, 4700 gallons a minute. Four pumps, with a capacity of 800 gallons per minute, are now handling the water in the mine, and are lifting 2700 gallons a minute. The flume carries this water to the farm south of the Mule mountains, where the farm company has started a lake. The Hoatson shaft of the Calumet & Pittsburg is down 400 feet and sinking continues. A new boiler is being set and a larger hoist being put in. A larger cement tank for holding oil has been completed and a change house has been finished. A building for framing timber has been added to the surface improvements. The shaft is passing through a stratum of barren limestone.—— At Bisbee drifting has begun in the 800-foot level of the Shattuck-Arizona. Drifting on the 700-foot level will begin again. A new boiler is being set to furnish more power for the pumps, as it is expected the flow of water will increase as development work goes on.——At Dos Cabezos, Collard Bros. have opened up another property near the Gold Nugget which shows a good sized ledge of galena ore. ——The Dos Cabezos G. M. Co. has men taking out nuggets in their placer claims. The recent rains have deposited a large quantity of new gravel in the claims which is showing up good values.

Bisbee, Sept. 25.

(Special Correspondence.)—It has been decided to build the mill of the Arizona M. & D. Co. on the Sonora side of the line for economic reasons. At present a 10-stamp mill will be built. The machinery has been ordered. For the work of excavating for the mill foundations, and the grading of the spur from the railroad to the mines, the contract was awarded to G. McCarty of Naco.

Naco, Sept. 26.

W. K. Maull of the Slimes Tailing Co., who is operating a plant at the Grand Central mill, near Tombstone, states that his company has completed six of the tanks and commenced to handle tailings. Work on the other tanks, twenty in number, is being completed. These tanks are 31 feet in diameter and 7 feet deep and are capable of holding 30,000 gallons of solution. They expect to handle from 200 to 500 tons per day. Cyaniding the entire tailing bed will take some time, as the bed in some places is 15 feet deep.——It is reported from Pearce that the management working the Commonwealth under lease will start the other forty stamps and increase the number of men employed. J. Metcalf is acting as foreman of the mine.

Gila County.

The Payson Milling Co. has built a stamp mill, to work custom ores, 1½ mile below Payson. The mill will be ready for work within a month. On Spring creek, near Payson, P. G. Ellison and Van Duzen & Mankins are developing gold claims and are working the ore in arrastras.——Superintendent W.S. Sultan of the Arizona Commercial C. Co. has made a new contract with the Old Dominion Co. for the treatment of Copper Hill ores and will resume shipment. The sulphide ores will go to the smelter direct and the more siliceous ores to the concentrator. Shipments will be restricted temporarily on account of the lack of bin room at the United Globe where the Copper Hill ores are delivered. ——Near San Carlos the Stanley Butte Co. have finished a wagon road to their property.——Superintendent J. C. Erman of the Live Oak C. Co., near Globe, now has fourteen teams hauling ore.

Graham County.

At the concentrators of the Shannon Copper Co., where acid waters from the mines have played havoc with jig screens, eating up steel wire and punched screens in a few days and wearing out copper and brass screens from abrasion in a month, a new device has been successfully applied. This is said to be so satisfactory that there is no reason why it may not prove excellent in all cases where acid water, containing sulphuric acid and copper sulphate, attacks metal of the mining and dressing plants. The device is a low-voltage electric plant attached to the jig, whereby the screen becomes the cathode to the circuit. This attacks hydrogen and disintegrates it from water, the hydrogen then decomposing the metallic salts in the water and permitting the freed copper to deposit upon that part of the screens formerly reduced by abrasion and destroying the action of the acids upon that part of the screens which it formerly ate out. The system is giving satisfaction.

Mohave County.

At the Gold Road mine at Acme the ore is unbroken from the shaft 550 feet west. In the breast the main ore body is 8 feet wide and samples taken across the entire width gave results of $221 gold to the ton. Eighteen machines are in use. The results obtained at the mill are good, the ore remaining neutral. Leasers are at work in the Billy Bryan mine and are getting out considerable high-grade ore, which is handled through the mill.——Superintendent J. D. Spargo has his machinery put in at the West Gold Road mine at Acme and sinking is going ahead rapidly.——Sinking is progressing rapidly at the Vanderbilt mine, near Cerbat. At the 200 level a crosscut will be driven to the foot wall vein.——F. Dunham of Los Angeles has been examining the Fay mine, south of Kingman. The shaft is down a depth of 165 feet and will be continued to the 200, where levels will be run. A mill may be placed on the property.

Pima County.

The Santa Rita M. Co. at Greaterville is short of water for placer mining, but until recently has done considerable work.——The Robinson-Arizona Co., operating placer mines at Greaterville, is also waiting for water and for the Interior Department at Washington to allow it the privilege to build a reservoir of 3,500,000 gallons' capacity.——Eugene Larrieu and John Plance of Tucson are at Charleston, examining into the feasibility of opening up a vanadium mine at that place. A 12-inch vein is uncovered, and a shipment of the ore will soon be made to New York to test its value.

Santa Cruz County.

(Special Correspondence).—At the Red Rock mine, 13 miles from Patagonia, work has been suspended pending the arrival of a pumping plant to handle the water recently met in the main shaft.

Patagonia, Sept. 25.

Yavapai County.

The Poland mill at Poland is to resume crushing on October 1. It has been repaired and equipped with steam and electric power.——It is reported that Manager C. J. George of the Poland Extension at Poland will start work at both the mine and the mill.——The Arizona Smelting Co. expect to have their 500-ton smelter at Humboldt, formerly Val Verde, completed by December 1. C. E. Finney is manager.——The Davis mine, 15 miles south of Prescott, has been sold to N. O. Murphy, who will start development work.

CALIFORNIA.

The United States Geological Survey's report on copper production for 1904 states that an addition to the future copper production of California will come from the undertaking entered into by the United States M. Co. in Shasta county. The Mammoth mines have been acquired after examination of the property, which indicated that there are in sight 200,000 tons of ore running 5% copper and better. Based upon the development, a smelting plant is now under construction, with an estimated capacity of 1000 tons per day, the smelter being equipped with three stacks, two of which will be in operation at the same time, the third being held in reserve. It is estimated that the copper product will amount to 1,250,000 pounds per month. An English company, the Fresno Copper Co., is building at the mines in Fresno county a works which is to have two furnaces and a converter plant. The plant of the Great Western Gold Co. at Redding was not started in 1904, but will be a contributor to the product of the State during the current year. The Balaklala mine in Shasta county has been purchased by the White Knob Copper Co., which has abandoned its mines at Mackay, Idaho. The smelting plant at the latter property is to be removed to California. The Bully Hill Co., which produces a little over 4,000,000 pounds of copper per annum, has been acquired by interests identical with the General Electric Co.

Amador County.

The Jose Gulch mine at Butte City has started up under the management of W. E. Stewart. A new tunnel has been run 50 feet.

Butte County.

B. C. Clark and E. A. Stent intend working the Yuba mine, in Morris ravine, near Oroville. They have five men developing the property. A shaft is being sunk to below the gravel, then a bedrock tunnel will be run and an upraise to the gold-bearing gravel.

El Dorado County.

Work has been resumed at the North Weber gravel claim, above Camino.——Operations are to be resumed at the Gold & Silver mine, near Kelsey.——The Gopher-Boulder mine, near Kelsey, has been started on a test run.

Kern County.

A 10-stamp mill and cyanide plant is to be put up near Amalie to treat the ore from the Zada, Cowboy and Zenda mines.

Mariposa County.

The Hunt brothers of Bear valley, who have a lease on the Josephine mine, are taking out milling ore, which is crushed at the company's 5-stamp mill at the river.

Mono County.

The Pittsburg claim at Masonic, near Bodie, is being worked by Whietfle & Eastwood under lease.——Work is to be resumed at the Myrtle & Julia, near Masonic. ——Work is to be started on the Blue & Gold, near Masonic, owned by O. R. Morgan of Reno, Nev.

Nevada County.

At Cherokee a hoisting and pumping plant have been put in on the Badger Hill & Cherokee claim, under the superintendency of R. A. Thomas. The shaft is down 40 feet and will be sunk to bedrock.

The South Yuba M. & S. Co. has sold its copper property near French Corral to a company who intend to build a smelter, unless C. M. Wilson makes his proposed road to the property from Lincoln, where he expects to put up a smelter. O. Woehler of Grass Valley is general manager.

Shasta County.

It is reported that the Arps claims at Copper City, 22 miles from Redding, have been sold to T. J. Donnellan. ——Work has been started at the Wiser & Dakin mine, 5 miles northwest of Redding, under the direction of W. C. Stanley, representing F. Van Meter, who intends putting in a new hoist and continuing shaft sinking.—— A new process of reducing ores has been invented by A. B. Moody of Oakland and a plant is being built on the Advance claim, near Delta, on Dog creek, owned principally by H. P. Dalton of Oakland. It is a disintegration process by means of heat and steam.

The White Knob Copper Development Co. of New York is the owner of the Balaklala gold and copper mines, near Kennett, having paid $2,000,000 for them. Rivalry for the possession of these mines has for some time been intense between the White Knob Co. and the Bingham Con., but an amicable settlement was arrived at recently. C. J. McCormick of the White Knob Co. states that it is the intention of the new owners to push development work.

Trinity County.

(Special Correspondence).—The Maple creek hydraulic mine, Junction City mining district on Trinity river, owned in San Francisco, has been a large producer, mainly in coarse gold. It was recently decided to shift the inverted siphon and other machinery to a point at which it was believed the gold output would be increased. This occupied two months. The change was under the direction of Superintendent G. O. Laws, with J. W. Bergin in charge of the siphon work. The pipe is 14 inches in diameter; in its construction Nos. 6, 8, 10 and 12 steel was used. The grade in some instances was at an angle of 38°. Mr. Bergin superintended the riveting of the heavy pipe and shaped all the steel elbows with the hammer, having no rolls to bring to his aid. This siphon passes from the intake down the mountain on a bridge, and at an angle of 38° crosses Maple creek and ascends the opposite slope on a trestle several hundred feet in length and from 3 to 20 feet high, on an angle, to the top of China hill, an ancient gravel deposit, the total length of bridge and trestle being 634 feet. The pressure at the outlet is 426 feet.

The Valdoo M. Co. are making a drill prospect on the Huertevant property in Junction City district, with a view to dredging.

The North Mountain Power Co., with base of operations near Junction City, is sending successfully current to Eureka, Humboldt bay, about 100 miles.

John Tarpley & Co. are fitting up a new mine near the Cie Fse property (owned by the North Mountain Power Co.), opposite Junction City, and will be ready Nov. 1.

The owners of the Dick Mack mine on Summit Creek mountain, in Hay Fork valley, have good gravel in a shaft at a depth of 110 feet. It is blue, and 40 feet of the distance shows a prospect of 40 cents per yard. It is an old mountain channel, and believed to be the most extensive gravel deposit in Trinity county.

Nearly fifty years ago, what were known as the "Kellogg diggings" in upper Hay Fork valley, were among the richest yielding in Trinity county. Recently Beard Bros. opened this old claim and found that the original owner had not reached the bedrock, as supposed, but a stratum of hardpan instead. Beneath this they found a body of blue gravel yielding coarse and fine gold. In one instance a showing of $2.50 per yard was exhibited.

Junction City, Sept. 26.

William Vollmers reports that development work on the Bonanza King mine, near Trinity Center, is progressing satisfactorily. Preparations for the winter are being made. This property, owned by Vollmers, Ellery & Fillman, is under bond to Treadwell Bros. of San Francisco, Joseph Porter superintending the work for the latter. The old wagon road to the mill is being improved. There are 1400 feet of tunnel on the property and a 5-stamp mill.——The ground of the Valdor M. Co. below Junction City is being prospected with a Keystone drill to ascertain its value for dredging purposes. One drill is at work and another is on the way from Trinity Center. H. L. Lowden has charge of the operations for P. Bouery, who is managing the company.

Tuolumne County.

Good progress is reported on the tramway being built from the New Albany mine to the Grizzly mill, near Carters. It is expected the mill will be started up early in October. The old workings of the New Albany are being retimbered.——The Spring Gulch mine, near Tuolumne, owned by R. Marshall of Sonora, has been

bonded to Wm. Connally and J. Vargas, who will begin work on a newly discovered vein running parallel with the Spring Gulch vein.

COLORADO.

(Special Correspondence).—The operators are still having trouble with "high graders" in camps where the ore is high grade, and especially in Cripple Creek district. In that camp there seems to be an organized gang at work in the mines, especially in the mines producing rich ore. In the San Juan considerable high grading is carried on in the richer mines.——The preliminary survey for the drainage tunnel in Cripple Creek is being made by the engineers in order to determine the most feasible route for the tunnel. In order to receive the most benefit from the project it was deemed advisable to appoint an engineer to report after having made surveys and decided upon the best route. A larger portion of the money has already been subscribed by the operators who will receive the benefit.——The electrical men of the State held their third annual session in Glenwood Springs on the 19th. Several interesting papers were read before the meeting.——The laying of the corner stone of the Guggenheim hall will take place Monday, Oct. 2nd, at Golden, Colo., at the School of Mines. The money for this building was donated by S. Guggenheim.——There is considerable opposition being brought to bear against the completion of the Moffat road to Salt Lake. Work is progressing in Gore canyon over which there has been a legal contest between the Reclamation service of the U. S. and the Moffat interests. To date Moffat is the winner.——According to a decision rendered last week at Trinidad in the southern part of the State, the coal miner's union is not liable for damages. Suit was brought against the union by one of the coal companies. The officers, according to the decision, can be sued for damages.

Denver, Sept. 25.

Boulder County.

At Camp Albion, near Boulder, the Cashier M. & M. Co., under the management of T. L. Wood, intends to build a large concentrating mill.

Clear Creek County.

It is reported that the Waldorf M. Co. may sell the Stevens mine and mill for $300,000. Another tunnel, to be 12,000 feet in length, has been started.——Construction work on the Anglo-Saxon mill, near the base of Saxon mountain, near Georgetown, is being carried forward. The walls for the mill building proper are completed. The machinery has been delivered.——George Albertson of Denver, who is driving a tunnel into Republican mountain, near Georgetown, has all the preliminary work completed and will continue the tunnel from the 75-foot point.——A. Roberts has started work on his claims on Democrat mountain, near Georgetown. Development is being done through a crosscut tunnel which has been driven over 200 feet.——I. L. McLyman & Co. are making arrangements to start work on the Royal claims on Columbia mountain, up Beaver creek, near Georgetown. The Royal tunnel is in 400 feet.

Custer County.

Work on the Racine Boy property, near Silver Cliff, owned by Haskell & Townsend, has been resumed as the result of the returns they secured from rock sent to the Salida smelter. The ore yielded 23.8 ounces per ton. The track has been laid through the tunnel.

Gilpin County.

At the Modoc mine on Quartz hill, near Central City, operated by the United Mining & Exploration Co., Superintendent John Lyng reports that they are putting an upraise through from the 250-foot level to get under the ore body and improve the ventilation. It is reported that the company is making arrangements for leasing a mill on North Clear creek to handle their own product, and that they will have the Gilpin tramway lines extended to their mine. Frank Straub of Denver is manager. —— Lyng & Co. of Nevadaville have leased the California dump on Quartz hill and are building a road from the east side of it, and will soon commence shipping to the Hidden Treasure mill on North Clear creek. —— Sinking operations have been started at the Gibson shaft of the Esculapian G. M. Co. in lower Russell district, near Central City, at a depth of 225 feet. W. J. Blake is manager. —— Work is to be started on the Crown Point & Virginia mine at the head of Virginia canyon, near Russell Gulch. —— Sinking has been discontinued at the Pozo mine in Nevada gulch, near Central City, at a depth of 165 feet, and levels are being driven off at 150 feet. The property is being operated under a lease and bond with A. M. Rucker as manager. —— The Goldfield-Homestake M. Co. have been working the Gold Retort mine, near Central City, through the La Crosse tunnel, where an upraise is being made from the tunnel to connect with the shaft workings, which when completed will make the shaft a total depth of 210 feet. A 10x12 friction hoist and boiler are to be put in.

Manager J. R. Anderson of the Gold Dirt mine, near Rollinsville, says that he will pay all pending claims and that the Gold Dirt mill will start up again at full capacity.——The Monarch and Colorado mines mill, in Gambell gulch, near Rollinsville, will probably have five more stamps added to it within a month. This will give the mill ten stamps.

Gunnison County.

(Special Correspondence).—The Mollie Gibson mill at Pitkin is handling 200 tons of silver-lead ore from the Percy La Salle mine.——Newman, Hall & Barnes have a lease on the Little Annie mill, 6 miles from Pitkin, and are handling ore from the Little Annie mine, treating sixty tons per day.——Joe Miller and partners have opened up silver, lead and zinc ore on their property at the head of Taylor park and expect to build a mill to treat the output from the mine.——The Smuggler mine has finally gotten the fire in the mine under control, which necessitated closing down for a time. It is now shipping the usual amount.——The Mineral Farm, near Pitkin, is being worked under lease by E. D. Wright. Electric centrifugal pumps are being put in and as soon as they are ready to operate the shaft will be sunk deeper. It is down 700 feet below the tunnel level. The electric hoist is 2 miles from the mouth of the Cowenhoven tunnel, where it is located.——The hoisting engine of the Homestead is farther in the tunnel. When the pump is put in the company will start breaking ore. This property is operated by the Cowenhoven Co.—— The Bushwhacker is divided into blocks and operated by leasers, and the ore is run through the Hunter creek mill.——The Cowenhoven tunnel is nearly 3 miles in length and cuts Smuggler mountain at a depth of 1400 feet.

Aspen, Sept. 25.

The Keystone lead-silver-zinc mine, near Crested Butte, has been cleaned out and retimbered. An upraise is to be made from the lower level to the surface and a concentrating plant is contemplated.

Lake County.

(Special Correspondence).—In the down town district the Cloud City M. Co., J. A. Jones, superintendent, has secured the Home Extension property, and is sinking the shaft, now down about 600 feet. As soon as the shaft is completed connections will be made with the Cloud City mine, which will give both properties good air. All the water will be pumped from the Cloud City shaft. The distance between the two shafts is 900 feet, of which over 500 feet has already been completed by a drift. As soon as the connections are made a large force will be put on taking out ore.——The Western M. Co., which is operating the Coronado and Penrose, are installing some large pumps to handle the large volume of water which they reached while sinking the Penrose shaft. They intended to sink the shaft to a certain depth and then put in the pumps, as they expected a large flow of water. They were within a few feet of having the shaft completed when they struck a heavy flow, which has caused them much trouble. On account of the ground in the stations at the bottom of the shaft being soft, it became necessary to lay the floors in concrete and set the pumps on concrete foundations. One of the pumps is 18—28x42—10—36, built for 1200 feet, two pumps 18½x36½x10—24, built for 1000 feet. Two of the pumps are set in stations, 16x16x54 feet, and one 14x14 feet. The sump is between the two pumps. The water is now being handled by several smaller pumps, and as soon as the installation is completed the smaller pumps will be withdrawn. About 2000 gallons per minute is being handled in the Penrose shaft and considerable being pumped through the Coronado shaft. A drift connects the two shafts, and all the water will be taken out through the Penrose. It is expected the pumps will be throwing water within a month, and large mining operations will be carried on by this company.——Six boilers, giving 800 H. P., have been put in on the Penrose, and the plant is equipped with a double drum hoist. A steam winch is used in lowering the big pumps into the shaft. The Coronado is producing, through a single compartment shaft, from 180 to 200 tons of lead and copper ores per day.——In Big Evans gulch, 1½ mile from Leadville, A. V. Bohn has the management of the Citizens M. Co., operating the old Mammoth placer. The shaft is down 450 feet, and will be sunk to the 600-foot level. A. V. Bohn also has charge of the Brattleboro.——On Bruce Hill the Penn is being worked in a small way by leasers.——Most of the work done by the Ballard Con. M. & M. Co. on this hill has been in the old workings of the Ballard. C. R. Osgood, the manager, thinks that they are getting out of the caved workings, as the ground is becoming firmer. They are shipping 800 tons per month of $9 ore. Considerable bismuth was among the early shipments.—— There is some complaint here at present on the scarcity of good miners. The card system, it is reported, is being used on some of the properties, regardless of the injunction against the operators in the district from using same. The operators using the card system claim they are using it as individual concerns, and independent of the association. Judge Owers, of the District Court, has the question of a permanent injunction, which was asked for by the Federation, under advisement. Whichever way the decision goes, the question will undoubtedly go to the Supreme Court of the State.

Leadville, Sept. 25.

The Castle View shaft, belonging to the Western M. Co., Carbonate hill, Leadville, has resumed operations and is shipping 100 tons daily of a good grade of iron and sulphides. The iron carries a small percentage of lead, which makes it a desirable product for the smelter.

After being idle for fifteen years, the Grand Trunk claims in the Holy Cross district, near Leadville, has again resumed operations. J. W. Bailey of New York has put men to work.

The Twin Lake Miner says that the Ruby mine has considerable ore blocked out and shipments of high-grade will commence.——Wm. Chisholm has taken out tons of high-grade ore in sinking 12 feet on his vein in Lincoln gulch.——The cave-in in the tunnel of the Twin Lakes G. M. Co. has been caught up and retimbered, and the lessees are ready to develop.——The Echo Canyon G. M. Co. are crosscutting for a vein in the Last Dollar tunnel, and are upraising for the New Discovery vein.——Owing to the hardness of the rock, slow progress is being made in the Mt. Elbert T. & M. tunnel. The Lincoln vein is beginning to improve, but 30 feet more will have to be driven before the rich ore is reached.——Work will be resumed on the Columbine group on Lost Canyon mountain. F. G. Mitchell, the president, is making preparations for the resumption of work.

Mineral County.

Creede has shipped since the beginning of 1905 51,065 tons of ore. The largest output was in March, amounting to 8312 tons, and the lowest in June, 4241 tons. The shipments for July were 5645 tons and for August 5285 tons. There has been a decrease since last year, due to the larger tonnages milled into concentrates. The Creede United Mines Co. sends out 600 tons of concentrates a month. The Del Monte Leasing Co., operating the New York and Chance properties, is marketing from 1500 to 1600 tons per month of crude mineral and the Amethyst from 500 to 600 tons. The Humphreys mill is making two separate products—lead and zinc concentrates, of the latter about 300 tons monthly. The East Willow Creek Milling Co. is producing from 75 to 100 tons of lead concentrates and about the same amount of zinc. The manager expects to have it in running order in the latter part of November. It is of the same style, or nearly so, as the Humphreys. The Commodore is working. There are now plenty of miners to meet the needs of the operators. Men are employed upon the Emma mine at Spar, chiefly on development propositions. The Commodore electric plant has been leased to the Amethyst Co., which will extend the wires to its mine and mill.

Ouray County.

C. L. Ingram is leasing on the Great Western, near Ouray.——The Gypsy group, above the Camp Bird mill, near Ouray, and owned by A. Nelson, has been started up under lease and bond, under the management of C. W. Miller.——The last annual report of the Camp Bird mine for the year from May 1, 1904, to April 30, 1905, shows a profit of £947,252. The development of the mine gave a total of 8568 feet. The most important discovery during the year has been the development of an ore body of considerable size on a vein parallel to that on which work in the western portion of the mine had previously been carried on. Stations have been cut at the fourth and fifth levels, the latter being at a depth of 300 feet below the fourth level. Shaft No. 2 has been enlarged and retimbered, stations being cut at 175 feet and 300 feet below the collar, and sinking resumed after putting in pumping and hoisting machinery. The management, Cox & Hammond, report that after treating 74,674 tons of dry ore, the reserves were on April 30 116,535 tons broken in the stopes and 114,962 tons blocked out, making a total of £31,497 tons of dry ore in reserve. The net profit in the reserves of £993,853 is an increase of £30,738 over the previous year's estimate. From the ore treated during the year an extraction of 93.40% of the gold values has been obtained, yielding $31.18 per ton. Exclusive of depreciation of plant, the total cost of the mine was $9.12 per ton. The additional ten stamps to the mill, with the concentrating and cyaniding plant and electrical hoisting and pumping machines, have been put in.——The Ores & Metals M. Co.'s claims, 3 miles from Ouray, are under the management of J. H. Henler of Cleveland, O. A tunnel has been driven 500 feet in the Ores & Metals vein.

San Juan County.

The new Mogul mill at Gladstone is to be completed by the first of the year. Its capacity will be 200 tons of ore per day. The equipment will consist of forty stamps, Wilfley tables and tube mills for regrinding. The complex character of the ores will make a lead, copper and zinc product, the latter requiring magnetic zinc separators in addition to the regular mill equipment. The Mogul mines are about 1½ mile north of the mill and an aerial tramway will bring the mineral to the plant.

Summit County.

The Carrie mine on Wise mountain, Swan river district, near Breckenridge, is being put in condition for production by S. F. Stoughton, who has a bond and lease. A cyanide plant will probably be added to the 10-stamp mill now in use.——Work has been started on the Gold Dust mine in Illinois gulch, near Breckenridge. E. J. Hoyle is in charge of operations.——The Beaver Creek M. & M. Co. has opened up a pay streak in a drift from the Lucky shaft on Mineral hill, 4 miles east of Breckenridge.——The Carbonate and Little Tommie groups of mines on Mount Baldy is to be worked by the Buckeye G. M. Co., with G. E. Moon of Breckenridge as manager.

Teller County.

The report of J. W. Graham, Jr., secretary of the Jerry Johnson G. M. Co. of Cripple Creek, for the seventeen months ending Aug. 31, 1905, shows that 4953 tons, averaging $47.86 a ton, were shipped during that period. The gross value was $237,457.82, the cost of treatment and other expenses $50,129.27, leaving $187,928.42. The company received in royalties $55,853.41, which, with $6326.01 cash on hand March 31, 1904, $83,459.30 stock sales and other receipts, brings the gross receipts up to $147,674.51. When from this is deducted $83,459.30 for property bought, $24,932.50 for a dividend, and other sums, it left $9715.48 in the treasury Aug. 31, 1905. The main production has come from the 300, 400 and 450-foot levels, no ore of commercial value having been found up to the present time on the lowest level. The 450-foot level is producing nearly all of the ore now being shipped. The shaft on the Caley lease is 440 feet deep, and as it is 75 feet north of the ore being mined by the Gilpin Leasing Co. and on the trend of the ore shoot, it should reach the ore zones very soon.——J. E. Hewitt of Denver and G. Glenn of Cripple Creek, who have a bond and lease on the Pinnacle property, consisting of thirty-six acres on the northeast slope of Bull hill, expect to take up the bond. The shaft on the Lansing claim on this property has been sunk 500 feet.

Stratton's Independence Co., Ltd., of London, Eng., disbursed dividend 17 on Aug. 22. The amount was 12 cents per share, or $120,000. Lessees have been working the mine for some time and to their success are due the profits. The total of dividends to date is about $5,000,000. The company's suit for $6,000,000 against the Stratton estate, on account of alleged salting of the mine, has been dropped.

The Exposition M. & L. Co., in closing a 30-day run on its mill on the Los Angeles mine, on Bull hill, treated 680 tons of ore, having an average value of $6.50 per ton, by cyanide, and the cleanup was $2800. A crusher will be put in capable of handling twenty-five tons an hour. ——The number of employes at the main workings of the Elkton Con. Co. on Raven hill, Cripple Creek, has been increased to ninety. Many of these men are on the 800-foot level, where ore is being broken. Levels lying between 500 and 700 feet are receiving attention. A drift is to be started on a vein found at the 400-foot point when the shaft was being relined.——The Redbird claim of the Nighthawk Co., south of Cripple Creek, is shipping thirty tons daily from the 200-foot level.

The Treasure Vault M. Co. has been organized, with H. M. Lesher as president and general manager, to operate on Bull hill, Cripple Creek.——The Mabel M. mine of the Gold Dollar Co., on the east side of Beacon hill,

Cripple Creek, will resume shipments.——The shaft on the Colorado Boss, near Cripple Creek, has been sunk to the 500-foot level by John Sharpe, lessee, and a crosscut will be run.——C. A. Fitch is running a crosscut from the 900-foot level of the Moon Anchor shaft, near Cripple Creek.——The Index M. & M. Co. are shipping ore from the second and fifth levels of the Mint mine, on Gold hill, near Cripple Creek.

IDAHO.

According to Chas. Kirchhoff in the United States Geological Survey's report on copper production, the copper produced in Idaho during 1904 came entirely from ores shipped to distant smelters, the local works not having been in operation. The plant of the Ladd Metals Co. at Landon will, however, treat ores from the Seven Devils district during the current year.

Blaine County.

Lyttleton Price is running a drift on the 1000-foot level of the Minnie Moore mine, near Hailey.

Elmore County.

H. P. Chattin of Pine states that the Franklin cyanide plant is completed.

KANSAS.

The price of all grades of oil has advanced again. The greatest increase was in the cheaper grades. Fuel oil and oil grading 30° were each advanced 5 cents a barrel. The scale follows: Fuel oil, 35 cents a barrel; 30°, 39 cents; 30½°, 42 cents; 31°, 45 cents; 31½°, 48 cents; 32°, 51 cents. This is the first advance in the price of oil grading 32° since December, 1903.

MICHIGAN.

Houghton County.

The No. 2 or main development shaft on the Rhode Island is down 1265 feet, where the tenth level is established. The upper level at which drifting is being carried forward is the eighth, at a depth of 1000 feet, and has been extended northward 1220 feet from the shaft. The development of the new or No. 3 shaft, north of No. 2, has been begun. Since the No. 3 shaft was started momentous changes have come about in connection with the Kearsarge lode. It has been opened by two new shafts, one at the Tecumseh, 2¼ miles north, and one at the Calumet & Hecla, 3¾ miles from the Rhode Island boundary, while the Tecumseh has a diamond drill at work and will start a shaft within a short time 2 miles north of the boundary, and the Franklin Junior has one drill outfit at work 1500 feet south of the boundary, and a second about 1 mile south of the boundary.

MISSOURI.

Jasper County.

The Consolidated Jack Mines Co. of Duenweg has added a new 14-acre lease of the Crown Point land to their holdings. The shaft on this lease is said to show a 22-foot face, 16 feet high, of 8% jack, with ore in the bottom of both drift and shaft. A new mill will be built at once. Bids are being received by M. W. Hovis at the Joplin office of the company.——The King William mine at Duenweg is on its lower level and taking up stope between the two hoisting shafts. As soon as this work is completed the mill will be put on double shifts. ——The M. & B. mine at Duenweg is being operated at the 200-foot level, where good ore is being worked.

Lawrence County.

The mines at Stotts City have had trouble this summer from water which flows into the shafts at the 30-foot level, where the soft, gravelly ground rests upon hard limestone. Preparations are being made to cement the shafts for the first 30 feet, which will keep all surface water from entering the mines. There is very little water in the lower workings.

MONTANA.

Fergus County.

The members of the Fergus family owning the Fergus tract of 4500 acres adjoining the Bullard property at Kendall have transferred it to the Fergus G. M. Co. of Chicago, in which John A. Drake is the principal owner, the stated price being $2,999,750. The 1500-foot diamond drill that has been in use on the Drake properties at Gilt Edge has been removed to the Fergus tract and boring will commence this week.

The Helena Record states that in the Moccasin mountains of Fergus county the Kendall and Barnes-King companies are working the sedimentary deposits. Some one with an original conception of the ore deposits in Fergus county conceived the idea that many of them were in blanket form. To demonstrate the truth of this idea diamond drills were secured and borings commenced in the valleys in line with the dip of the known paying properties. A number of ranches were bonded for the purpose of prospecting them, and the borings have disclosed immense underlying beds that are declared to be richer than anything as yet discovered on the outcrop of the reefs. There seems to be no doubt but what the ore has been found and penetrated by the drills, and it is now only a question of time when working shafts will be sunk and new and large mills built. The ores are worked by cyaniding. The bedding plane is described as dolomite, or magnesian limestone, seamed here and there with porphyry dikes. The ore is not a quartz, but a fine-grained sediment 60 to 200 feet in width, and is enclosed between dolomite and quartz walls.

Flathead County.

The mill at the Snowshoe mine, near Libby, will begin as soon as the fall rains fill the reservoirs. The mill has been shut down on account of the shortage of water, but the mine has been running.

Granite County.

Paul and Will Scott have started their mill and cyanide plant in Douglas gulch, 1½ mile south of Sunrise, near Phillipsburg. John Huddleston of Phillipsburg is in charge of the mine.——The Gold Coin Co. has decided to erect a 10-stamp mill on their claims below the Milwaukee Gold Extraction Co.'s plant. The Gold Coin mill on Georgetown flats is running and it is reported on better ore than ever before.——The Milwaukee Gold Extraction Co., who are operating the Hannah mines, in the Red Lion district, near Phillipsburg, have started up their new 100-ton mill. The new 3380-foot tramway has been completed. There are twelve towers, set 300 feet apart. The tram buckets have a capacity of 500 pounds each and run 100 feet apart. The mill and other buildings are lighted by electricity, generated at the mill. The mine is operated by means of tunnels and the lead is said to be 60 feet wide. G. H. Savage is general manager and P. C. Waite assistant superintendent.

Madison County.

The High Up mine in Hungry hollow, near Virginia City, is owned by E. W. Merritt, N. D. Johnson and L. L. Callaway. Under the management of E. W. Merritt a tunnel has been run 300 feet to open up the vein. ——The Copperopolis mine, near the High Up, owned by Kelly & Chambers, is shipping ore to the Shafter mill.——The St. John mine, owned by John Reed of Virginia City, is under lease and bond to C. E. Damours. ——The Independence mine, near Virginia City, which is owned by L. L. Callaway and N. D. Johnson, is under lease to Richard Suydenham for two years.

Silver Bow County.

(Special Correspondence).—The North Butte Copper Co. now owns the Speculator, Edith May, Miners Union, Adirondack, Copper Dream, Jessie and Hancock claims, and others that have not yet been made public. At the present rate of production the company has ground opened for five years and is producing at the rate of 3,000,000 pounds of copper a month at a cost of 5½ to 5¾ cents a pound. The company has been operating since last April, but the fact was not given to the public until June, in which month the earnings showed $193,000 net and in July $196,000. Owing to the fact that in August the main shaft was shut down for retimbering and the ore was hoisted through a neighboring mine, by arrangement with the Anaconda Co., it was expected that the earnings would show a decrease, but instead there was an increase of $70,000 over July. When the new shaft is completed the production will be increased 50% and the expense will be lessened.——The Amalgamated Copper Co. is earning at the rate of $5,640,000 a year on its by-products of gold and silver. With an average output of 21,500,000 pounds of copper per month from the company's smelters at Anaconda and Great Falls, its output of by-products is about 800,000 ounces of silver and 300 ounces of gold per month. At the present average price of silver that by-product is worth to the Amalgamated $5,568,000 a year and the gold $72,000.——Owing to the unusually low water in the mountain streams and rivers this year the electric power companies, which have been supplying the Butte mines with power, have been compelled to cut off the supply and the mining companies have returned to the use of steam. The result has been that the big compressors and machines have been put out of commission and smaller ones put in their places. There has been fear that some of the mines would have to suspend operations for a time, but the work will be kept up, though at greater expense and more inconvenience.——The old silver mines in the Butte district contain copper, and on many of them explorations will be made.——The Standard Copper M. & R. Co. has been formed, to develop copper properties in the Fleecer mountains, 25 miles southwest of Butte.——The trouble among the owners of the Southern Cross M. Co., which resulted in a suspension of operations some months ago, is to be adjusted and work will be resumed.——The Jennie Dell M. Co. has been reorganized by the stockholders and work is to be resumed on the mine, in the northwestern part of the Butte district.

Butte, Sept. 25.

NEVADA.

The tungsten deposits in Nevada, according to a recent report of the U. S. Geological Survey, are in the foothills on the west slope of the Snake mountains, near the base of Wheeler peak, and 12 miles south of Osceola. On account, however, of the distance of these deposits from the railroad, the nearest point being Frisco, Utah, on the Oregon Short Line Railway, 100 miles distant, there has been no shipment of ores from these deposits, and most of the work has been the annual assessment work. Recently these deposits have passed into the control of the Tungsten M. & M. Co., which has worked them during the past year. The company has taken out about eighty tons of ore, but has not concentrated any of it. The tungsten mineral is hubnerite and occurs in veins of quartz, which vary from a few inches to a number of feet in width, being normally about 3 feet wide, but pinching in places to a few inches. The main vein or deposit can be traced 2100 feet by means of outcroppings and of float and is composed principally of milky white quartz and hubnerite. The vein, which cuts across the porphyritic granite, is composed of quartz, mica and hornblende, has a strike of N. 68° E., and dips 65° N. W. The hubnerite occurs in solid masses up to 16 and 12 inches in thickness, and also in disseminated particles or blade-like forms through the quartz and occasionally in groups of crystals intermingled with quartz crystals. Occasionally small apophyses of ore are found penetrating out into the country rock. It should be an easy matter to concentrate this ore, as it crushes readily, and the hubnerite could undoubtedly be easily concentrated by jigging.

Lyon County.

The Logan & Holly mine at Como has been sold to the Ohio-Tonopah M. Co., for $75,000.

Nye County.

Big strikes in the Bellhelen district, 65 miles due east of Tonopah, have been made recently. On the Tyree claims a lead was struck said to average $914 to the ton in gold. On the Aggie B claim, belonging to M. Malone, a similar body of ore, carrying surface averages of $214 a ton, was uncovered. Similar strikes were made on the Edwards claims and those of the Southwest Nevada Mines Co. The country has been staked out. Water is found near by.——Superintendent R. M. Smith, of the Bullfrog Mining Co., on Ladd mountain, near Bullfrog, says that they have a vertical depth of 200 feet on vein No. 2, and are employing twelve men.——Work on the Quartette, owned by the Montgomery Quartette Mines Co., on the southern slope of Ladd mountain, will be resumed under the superintendency of A. A. P. Garberg.——The new hoist at the Shoshone is running smoothly and work of shaft sinking is progressing.

Storey County.

The Overland mines at Gold Hill have been sold to T. E. Young of Cleveland, Ohio; P. Ely of Tonopah, manager of the Ohio-Tonopah M. Co., and J. J. McSorley of Calaveras county, Cal., for $25,000. Grading has commenced for a stamp mill and an electric hoist.

OREGON.

Baker County.

The U. S. Geological Survey's report on gypsum produced in 1904 says that beds of rock gypsum of limited extent are found in Oregon on the eastern border of the State, on a ridge dividing Burnt river and Snake river. The rock is used at the 100-ton mill on Burnt river, 4 miles below Huntington, at the station of Lime. The rock is 20 feet thick, is white and crystalline, and is worked by tunnels.

Josephine County.

A rich strike in copper ore is reported from the Queen of Bronze mine, near Takilma, being developed by C. L. Tutt. The Takilma Smelting Co., from July 1 to September 1, shipped thirty-nine cars of matte and used thirty cars of coke besides lime rock.

Owners of placer mines are getting their diggings ready for piping. It has been a long, dry summer and the surface miners have had time to shape their properties for work. Ditches have been cleared and enlarged, new pipe lines laid and flumes rebuilt. Two new hydraulic mines have been developed and equipped during the summer and will begin this winter. All of the old properties will operate again. The Galice Consolidated will have its bedrock flume finished. The Columbia will operate four giants instead of three, and the Royal group of Galice will have three giants at work. The Golden Drift Co., now operating two, will have its power dam enlarged and additional turbines placed so that four giants can be operated.

SOUTH DAKOTA.

Lawrence County.

The Homestake M. Co. of Lead reports for the fiscal year ending May 31, as follows:

	1905.	1904.
Tons of ore milled	1,398,100	1,399,057
Proceeds of bars	$5,221,089	$4,800,558
Other income	81,249	146,877
Total income	$5,302,338	$4,947,435
Operating expenses and taxes	4,235,975	4,039,753
Balance	$1,066,363	$ 907,682
Dividends	819,000	655,200
Balance	$ 247,363	$ 252,482
Interest	16,028	45,014
Surplus	$ 231,335	$ 207,468

The report says that during the past year no mishap to the property of special importance occurred. Developments in various parts of the mine progressed steadily and satisfactorily. The ore at the 1250-foot level has been reached and is being crosscutted. The plant is in fine condition and everything is running smoothly, with ore reserves for years.

The Homestake M. Co. has applied for the purchase of a large amount of timber in the Black Hills forest reservation. The company wishes to purchase and has bid 12,000,000 feet of green timber, 1200 acres of green wood, 3,000,000 feet of timber killed or infested with insects, 3000 acres of wood similarly affected and 5000 acres of dry wood.

UTAH.

The United States Geological Survey's report on copper production states that the principal producers of copper in Utah, all of whom increased their output in 1904, were the United States Mining Co., the Utah Con. and the Bingham. Besides these, the American S. & R. Co. treated a considerable quantity of Utah ores. This company has decided to build a very large copper smelting plant in Salt Lake valley, which will add to the facilities for custom smelting and will stimulate production. The Yampa S. Co. began operations during 1904. The United States M. Co. operates properties in both the Bingham and the Tintic districts, and at its smelting plant also treats custom ores. The mines of the company in the Bingham district are capable of yielding 15,000 short tons of ore per month, while the mines of the Centennial-Eureka group can readily furnish 8500 tons per month. The smelting plant, which consists of six furnaces and two stands of converters, is capable of dealing with 25,000 tons of ore per month. The company has purchased a controlling interest in the De Lamar copper refining plant at Chrome, N. J.

Grand County.

A reduction works may be built near Basin, by the MacDonald Matte Smelter Co. of Toledo, O., who proposes to put in a 60-ton mill. The plant will be a concentrator, working four tons of ore into one, then matte the concentrates on the ground preparatory for shipment. C. W. Munson, president and manager of the MacDonald Co., expects to make the necessary contracts for ore supply and also to arrange for preliminary work on the mill. The properties to be worked this winter are the Grouse Mountain, the Castle Mountain, Skylark, Laura, Tornado, Gold Hill, High Ore, Bryan, Little Dot, Aspen, Corsair and two properties in Beaver basin.

Juab County

It is reported that a concentrating plant is to be put in at the Yankee Con. mill at Park City.——The property, machinery and building of the Martha Washington mine at Silver City have been sold to G. Hanson, C. C. Griggs and J. C. Jensen of Eureka, who intend to

move the hoisting plant to the Copper Jack property in West Tintic.

Salt Lake County.

The Utah Copper Co. has four diamond drills working. Two are in the tunnels and two on the surface. Thirty-three feet in a shift is the drilling record established so far.——The Yampa smelter, at Bingham, is to build a second reverberatory furnace that will bring their capacity to 800 tons per day.

The report of the Consolidated Mercur Gold Mines Co. for the year ending June 30, 1905, shows that the earnings were $100,398.88. During the year the gross earnings were $754,676.91, of which sum $742,291.76 was derived from gold bullion, and the mill at Manning, operated on tailings, gave $13,587.90. The disbursements during the same period amounted to $654,278.03, this leaving a net profit of $100,398.88, the cash on hand and that represented in supplies at the close of the statement amounting to $122,574.75. The report by George H. Dern, treasurer and general manager of the company, shows that during the same period there were reduced 245,026 tons of ore, or an average of 20,419 tons per month. The financial statement shows $728,703.86 in gold produced at the Golden Gate mill during the year. Dividing this amount by the tonnage, as given above, it is found that the extraction averaged $2.97 per ton of ore treated. This shows an improvement of 11 cents per ton as compared with last year's report. The average value of the tailings during the year was confined to 98 cents per ton; that of the previous year to $1.03. However, the months showed fluctuations in the value of the tailings, this due to variations in the composition of the ore. Adding the loss in the tailings to the amount recovered, and the average value of all that was reduced during the year was $3.95 per ton. The mining costs for the year, including prospecting, were $370,934.56, or $1.51 per ton. The milling costs were $273,865.08, or $1.12 per ton. Accordingly, the total operating costs of the company, including all expenses, except construction items, were $644,799.64, or $2.63 per ton. This is the lowest record for expenses that the company has ever made, the best previous report being $2.88 in 1903.

Manager L. A. Jeffs has started a new 200-foot shaft on the Superior property at Alta.

Summit County.

O E. Lawrence is incorporating his lease and bond on the Jupiter claims in Thaynes canyon, near Park City, and will develop them during the coming winter. The shipments reported for the week ending September 23 are: Silver King 1,516,200 pounds, Daly West 1,250,000 pounds, Alliance (jiggings) 178,000 pounds, Clegg & Blake 52,000 pounds, Kearns-Keith 30,000 pounds. Total 3,026,200 pounds.

The Park Record says that the great old Cornish pump, which for many years has lain idle, is being broken up and sold as scrap iron. The massive parts of the pump are being raised by means of large blocks and tackles, placed on trucks and hauled outside and broken up into convenient sizes by means of an apparatus resembling a pile driver. This arrangement is inexpensive. The small pieces are loaded into cars, taken down the shaft and out through the tunnel, to be loaded for shipment to the purchasers. The old Cornish pump was up until the drain tunnel was opened, and it fell into disuse, the finest piece of machinery in the entire Western country. It was placed at the Ontario in 1882-83, to handle the water in the mine. It took more than a year of continual labor to install the pump, while it will be taken out and broken up in about three months. This Cornish pump was exceeded in capacity by Union Consolidated, on the Comstock, Nev., but not equaled in foundations, had a capacity of hoisting 2000 gallons of water per minute from a depth of 2000 feet to the 600 level, where it was run through the tunnel. The bearing shaft and flywheel weighed seventy tons; the pump rod, of Oregon pine 15 inches square, when connected weighed thirty-two tons. The foundation of this engine was excavated on the open hillside, 40 feet deep and laid in solid rock. The pump and foundations cost $300,000.

WASHINGTON.

Snohomish County.

The Imperial mine, near Silverton, is working six men in the lower level. They intend getting compressed air from the Independent concentrator and putting in a machine drill.——The Crown Imperial Co. has run 80 feet of tunnel on its free-milling property, near the head of Malady creek, near Silverton.

Stevens County.

Near Deer Trail, wolframite occurs in the properties of C. S. Palmer of Deer Trail and of the Roselle M. Co., which is mining this mineral at Roselle Camp. The deposits are 27 miles from the railroad. The ore concentrates and will give a product containing about 68% GWO_3.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District.

The E. P. U. mine, at Skylark camp, has been closed down to make necessary repairs to the machinery and tramway.——No. 6 furnace at the Granby is ready for operation.——An ore body 10 feet wide is said to have been reached in the new workings in the Emma mine, Summit camp.

The Dominion Tariff Commission from Ottawa, consisting of W. S. Fielding, Minister of Finance; L. P. Brodeur, Minister of Inland Revenue, and W. Patterson, Minister of Customs, were given a memorial by the Granby Consolidated, the British Columbia Copper Co. and the Dominion Copper Co. asking for the following: Removing the duty of 3 cents per pound on explosives; reducing the duty on structural iron from 35% to 20%; removing the duty of 5% on bar steel; reducing the 25% duty on mining candles one-half; reducing the duty on rubber hose from 35% to 20%; reducing the duty on iron pipe from 35% to 25%; removing the duty of 25% on rough and 30% on finished steel castings; removing the duty of $7 per ton on steel rails when used for mining and smelting purposes; placing on the machinery free list blast furnace slag trucks, to be hauled by mechanical power, and admitting free blast furnaces complete and converting machinery complete, also to place repair parts for machinery on the free list; opposing a duty on rough lumber. In most of these cases it was maintained that either the goods were not manufactured at all in Canada, or if they are manufactured, the product is of such poor quality that it is more economical to purchase abroad.

Rossland District.

The memorial presented by the Rossland committee to the government commission on proposed tariff changes recommended a duty on lead and lead products; removal of duty on fluorspar; reduction of duty on explosives when used for mining purposes and removal of duty on raw materials from which they are manufactured; reduction of duty on candles when used for mining purposes and removal of duty on raw materials from which they are manufactured, and the removal of duty on steel rails when used for mining purposes. Regarding the duty to be placed upon lead and the products of lead, they recommend a specific rather than an ad valorem duty, and suggest a rate of 1¼ cent per pound on pig lead and 1½ cent per pound on such products as litharge, dry red lead and orange mineral, as soon as they are manufactured in Canada. While lead is not produced in the Rossland district, the conditions surrounding the production of lead in neighboring districts have a most important bearing upon the mines there, as the dry ores can be treated more cheaply with lead ores, and should the lead mines be obliged to close down the smelters would be unable to provide the lead necessary for the treatment of dry ores, and thereby the cost of smelting the dry ores would be increased.

J. H. Mackenzie of the Le Roi has made arrangements for the shipment of Le Roi ore to Trail. Enough ore will be sent to Northport to keep two furnaces in operation until the reserve ore now on the roast heaps there is smelted. About 5000 tons are now lying in the Northport yards awaiting treatment. The custom ores contracted for by Northport will be smelted there so long as the smelter is in operation, but when it is blown out they will be shipped elsewhere.——The Canadian Smelting Works have built an electrolytic lead refinery at Trail to refine Canadian lead and supply the Canadian market with Canadian pig lead. The most important element in connection with the electrolytic refining process is electrolyte. This has been purchased in the past from manufacturers in the United States, and was formerly subject to a duty of 20%. This duty was removed by the last tariff revision, which helped the industry, but on account of the unstable character of the solution and the great losses experienced in its transportation the Canadian Smelting Works are now contemplating the manufacture of their own hydrofluosilicic acid, or electrolyte, which acid is manufactured by treating fluorspar with sulphuric acid. The sulphuric acid is obtained through Canadian chemical companies, but fluorspar will have to be imported from foreign points, as there is at present no known deposit of fluorspar in the Dominion of Canada. As the electrolyte—which is produced from fluorspar—is an important item in the cost of lead refining, amounting to between 70 cents and $1 per ton of lead, and as fluorspar is at present subject to a duty of 20%, they ask that the duty be removed from fluorspar, so that it will be possible to establish a manufacturing plant for hydrofluoric or hydrofluosilicic acids in Canada. The Rossland Board of Trade asks that the present tariff of 3 cents per pound on explosives when used for mining purposes be reduced by at least one-half, and that the raw materials used in the manufacture thereof be placed upon the free list. The reason for this is that under the present tariff the cost for explosives per ton of ore produced is at least 64 cents, which is an almost impossible burden for the low-grade ores to bear. Mines which are in process of development feel this even to a greater extent, the cost of powder in that case being one-fourth of the total expense thereof. The present duty of 25% ad valorem on the class of candles used for mining purposes adds materially to the expense of mining, inasmuch as 5 cents per ton of ore is added to the cost of mining, and the board urges that the duty on this class of candles be reduced by at least 50%, and in order that the manufacture of candles may be encouraged in Canada the board further urges that the raw materials from which mining candles are manufactured be placed on the free list. The board further urges that rails when used for mining purposes be placed upon the free list, in view of the fact that the raw material is at present receiving a government bounty.

Slocan District.

Two zinc magnetic separators are being put in the Kaslo plant of the Kootenay Ore Co., and another will be added shortly.——Owing to some delay about the vanner blankets, the Rosebery zinc plant is not yet ready for continuous operation.——At the Ottawa mine, on Springer creek near Slocan City, an air compressor is being put in. Sinking will be continued below the lower drifts.

Ontario.

The old Bruce copper mines are to be reopened. A copper smelter is to be built under the supervision of J. J. Case for custom purposes as well as for handling the ores of the Bruce property. The new company to handle the Bruce mine is a London syndicate. The mine is 40 miles east of Sault Ste. Marie, on Georgian bay, Algoma. The smelter will be capable of treating 250 tons of concentrates daily. The concentrating plant at the mine is sufficient, including rock crushers, rolls, hydraulic sizers, tables and vanners.

MEXICO.

Guanajuato.

The San Gregorio mines near Guanajuato, which are owned by the Dwight Furness Co., have been taken over under option by the Mineral Development Co., of which W. M. Wiley of Philadelphia is president. —— The 80-stamp mill of the Guanajuato Reduction & Mines Co. will be ready the first of 1906. The stamp mill is being built near the Cata mine near Guanajuato, and the cyanide plant at the old Flores reduction works. A pipe line 3 miles long will carry the crushed ore from the stamp mill to the cyanide plant.——The Guanajuato Con. M. & M. Co., operating the Sirena mine near Guanajuato, is cyaniding 100 tons of ore daily and the full capacity of the cyanide plant, which is 200 tons a day, will be reached soon. F. C. Corning is president of the company and M. E. McDonald is manager.

Sonora.

It is reported that enough work has been done at the Guadalupe mine of the Pittsburg & Sonora Co., near Bocoachic, to justify putting in a reduction plant. J. P. Casey is manager.——W. R. Holmes of Mexico City has been investigating the ores from the Picacho mine, near Bocoachic, preparatory to putting in a 50-ton reduction plant.——C. F. Hansen, manager of the Monte Vista mine, 15 miles east of Cos on the Nacozari railroad, reports a rich strike of gold ore. He plans to start shipping.

C. E. Perkins of Llano de Oro, who has charge of the engineering work at the mine, says there are 200 men employed. The excavating for the 100-stamp mill is completed. The company is building a road and pipe line 15 miles from Trinchera.——At Cerro Prieto work on the new 120-stamp mill for the Black Mountain M. Co. is under the management of Frank Cox of Nogales.

Personal.

THOS. H. LEGGETT is in New York.

R. L. HERRICK is in Westfield, Mass.

W. A. FARISH has been examining mines at Clifton, Ariz.

W. M. WILEY has left New York to visit Guanajuato, Mexico.

BEN. S. REVETT of Breckenridge, Colo., is in London, England.

ANTON EILERS has left New York for a holiday in Europe.

FRANK K. BORROW is in New York on his return from Rhodesia.

F. W. BRADLEY has returned to San Francisco, Cal., from Alaska.

W. Y. WESTERVELT of Kelvin, Ariz., has been in New York City.

ARTHUR WINSLOW is in San Francisco, Cal., en route to Goldfield, Nev.

W. B. GRAY is superintendent Kawich-Bullfrog mine, near Beatty, Nev.

E. S. WIARD is superintendent Sweeney mill of Federal M. Co. at Kellogg, Idaho.

C. L. DIGNOWITZ has returned to Salt Lake City, Utah, from a trip to Europe.

B. J. MCDONALD is manager Original Bullfrog mine at Bullfrog, Nye county, Nev.

H. H. NICHOLSON has returned to Sumpter, Or., from an extended Eastern trip.

T. A. RICKARD is on his way from New York to Mexico, where he will spend a month.

CHAS. ANDERSON is consulting engineer for the Cowenhoven properties at Aspen, Colo.

J. H. CURLE arrived in New York from London, England, Sept. 27, and will visit California.

D. H. HANKS of Eureka, Utah, has been elected president Signal Peak M. Co. at Richfield, Utah.

W. A. PRICHARD was in New York Sept. 18, on his return from Australia, and will visit California.

W. E. DEFTY, who is now making examinations in Colorado, will be in Sonora, Mexico, in October.

R. MCF. DOBLE of the Abner Doble Co., San Francisco, Cal., has returned from the west coast of Mexico.

C. J. ALLEN has resigned as manager Monumental mine, near Granite, Or., and has returned to Colorado.

D. W. BRUNTON has been selected as consulting engineer for the new drainage tunnel at Cripple Creek, Colo.

GEO. OSWELL has resigned as superintendent Highland mine, near Haines, Or., and has gone to Sumpter, Or.

G. H. CARNAHAN has been appointed superintendent Montezuma Lead Co. at Santa Barbara, Chihuahua, Mex.

F. A. BABCOCK, superintendent Southern M., M. & D. Co., has returned to Silver Plume, Colo., from an Eastern trip.

ARTHUR C. NAHL has succeeded Edgar Richard as superintendent Progreso M. Co. at La Paz, Baja California, Mex.

J. N. A. CONNOR has been appointed metallurgical engineer with Veta Colorado M. & S. Co. at Parral, Chihuahua, Mex.

DANIEL GUGGENHEIM has been elected president American Smelting & Refining Co., succeeding the late E. W. Nash.

J. W. OPP of Jacksonville, Or., has been examining his mines in the Harvey Creek district, near Phillipsburg, Mont.

BARRY HOGARTY has been made assistant superintendent Pueblo, Colo., smelter of A. S. & R. Co., vice James Heggie, resigned.

JNO. C. WAGNER has resigned the general superintendency Thunder Mt. H. Y.-Climax M. Co., Roosevelt, Idaho. J. B. Whitlock succeeds him.

JOHN GOSS has resigned as superintendent Horseshoe mill at Terry, S. D., recently burned, to open offices in the Jackson building, Denver, Colo.

EDGAR RICKARD has resigned as superintendent Progreso M. Co. at La Paz, Baja California, Mex., to engage in private practice in San Francisco, Cal.

J. W. WALKER has been made general manager Arkansas M. & M. Co., working Sound Democrat mines, near Animas Forks, San Juan county, Colo.

H. Y. HADEN, representing the De Laval Steam Turbine Co., Trenton, N. J., is making a trip in the interest of his company through Colorado, California and the Northwest.

R. H. RICHARDS, professor of mining in the Massachusetts Institute of Technology, Boston, is examining for the Dominion Government the magnetic black sand of British Columbia.

THE San Francisco Engineering Club is to be formed in San Francisco, Cal., with a membership of consulting and constructing engineers in the following lines: Chemical, civil, electrical, gas, hydraulic, mechanical, mining and steam. The club is to be formed for the education and fraternalization of its members. The committee on organization is as follows: L. E. Sperry, California Electrical Works; E. B. Parsons, Kilbourne & Clark Co.; T. E. Bibbins, General Electric Co.; C. L. Cory, Union Trust building; A. C. Roulfson, A. C. Roulfson & Co.; George P. Low, Crossley building, and C. E. Wiggin, Electrical Contractors' Association.

Trade Treatises.

Hardsocg Wonder Drill Co. of Ottumwa, Iowa, has issued a neat booklet illustrating and describing various types of the Wonder air hammer rock drills.

Circular 9 C W J of the Crane Co. of Chicago, Ill., gives description and price list of Craneweld flanged pipe joints and Circular 6 C L J Cranelap extra heavy flanged pipe joints.

A folder from Smith, Emery & Co. of 83 New Montgomery street, San Francisco, Cal., details various physical and chemical tests of construction materials, fuels, waters and processes for which they are equipped.

The National Electric Co. of Milwaukee, Wis., describe their Type M. B. generators, direct current and belt driven, in Bulletin 335. The construction and operation of Christensen air brake equipments are discussed in Bulletin 357.

Bulletin 1067, 1068 and 1070 from the Fort Wayne Electric Works of Fort Wayne, Ind., respectively describe their Type A transformers for line service, Type M induction motors for multiphase currents and Series A. C. arc lighting system.

"Charging and Manipulating Apparatus" is the title of a handsomely illustrated book from the Wellman-Seaver-Morgan Co. of Cleveland, Ohio. It contains a series of half-tones and descriptions of various installations for charging open-hearth and reheating furnaces. Its attractive typographical appearance is a favorable introduction to the machinery described.

Books Received.

Water Supply and Irrigation Paper No. 144 of the United States Geological Survey treats on "The Normal Distribution of Chlorine in the Natural Waters of New York and New England," by D. D. Jackson. This is a valuable contribution to the subject of water supply and pollution.

As extracts from "Mineral Resources of the United States for 1904," the United States Geological Survey has issued "Production of Copper," by Chas. Kirchhoff; "Production of Glass and Other Sand," by A. T. Coons; "Production of Gypsum," by G. P. Grimsley, and "Production of Asphaltum and Bituminous Rock," by E. O. Hovey.

The Missouri Bureau of Geology and Mines has issued a report on "The Geology of Moniteau County," by F. B. Van Horn and E. R. Buckley. The book first treats on the physiography, then the historical geology, and finally the economic minerals. These include lead and zinc, barite, coal and various structural materials. This report might well be used as a model by various State mining bureaus in describing their mineral resources.

Commercial Paragraphs.

THE Joshua Hendy Manufacturing Co. of San Francisco, Cal., have moved from their old-time downtown office, 38-44 Fremont street, to their fine new salesrooms directly across the street, 29-81 Fremont street, where they now occupy the entire building, with increased facilities for the transaction of business.

THE Denver Engineering Works Co., Denver, Colo., reports the sale of a complete steam turbine plant to the Denver Union Water Co., to be installed in Platte canyon, near Denver, for pumping water to the city of Denver. The plant is to be completed by Feb. 15, 1906. Same will consist of three steam turbine centrifugal pumps, one steam turbine electric generator, boilers and necessary equipment. The turbines are of the De Laval make.

Obituary.

HENRY GRANT, a pioneer mining man of Garnet, Mont., died September 20 in Deer Lodge at the age of 77 years, from a paralytic stroke.

Latest Market Reports.

SAN FRANCISCO, September 29, 1905.

METALS.

SILVER. — Per oz., Troy: London, 28½d (standard ounce, 925 fine); New York, bar silver, 61⅝c, refined (1000 fine); San Francisco, 61⅝c; Mexican dollars, 47c, San Francisco; 47c, New York.

COPPER.—New York: Standard, $16.25; Lake, $16.00 @16.25; Electrolytic, $16.37½; Casting, $15.75@16.12½. San Francisco: $16.50. Mill copper plates, $17.50; bars, 18@24c. London: £71 spot per ton.

LEAD.—New York, $4.90; St. Louis, $4.75; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6½c. London: £14 2s 6d ℔ long ton.

SPELTER.—New York, $6.00: St. Louis, $5.75; London, £27 5s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $32.00@32.15; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔ lb., 40c. London, £145 12s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 2s 6d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.25; gray forge, $14.75; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$24.00; open hearth billets, $23.00@$25.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@ 25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c; Lucol oil, boiled, bbl., 51c; cs., 56c; raw-bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 57½c; cs., 62½c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

OBTUNDING APPARATUS.—No. 799,811. Sept. 19, 1905. Crittenden Van Wyck, San Francisco, Cal. The object of this invention is to provide a simple, practical apparatus which may be placed and held in position on the patient and be and remain entirely independent of the handpiece, which shall be capable of directing a spray in any desired direction and to any part of the mouth, which will maintain the spray continuously as long as necessary or desired, whether the operator is immediately at hand or not, and also which will provide a shield for the patient's nostrils and a spreader and holder for the rubber dam. The apparatus comprises the combination of a plate shaped to rest upon the upper lip of a patient, and having a convexed portion fitting over the nose, said plate having means for the attachment of the rubber dam, an ejector and means for removably supporting the latter on the plate and on either side of the patient's mouth.

TRAVELING ATTACHMENTS FOR BUILDINGS.—No. 799,865. Sept. 19, 1905. Thomas McConnell, San Francisco, Cal. This invention relates to attachments which are especially designed for buildings and for the purpose of saving life and property in case of fires and generally to make access to any part of the building from the front. Its object is to make such access easy and rapid, to assist in the removal of persons or property from the windows at various heights in the building, and to enable the firemen to conveniently apply water at different points, and to obtain easy access to any part of the building front. The apparatus comprises a frame, a track upon which said frame may travel parallel with the upper part of the building, a car suspended from said frame, mechanism by which it may be raised or depressed with relation thereto, means for preventing the swinging of the car, said means comprising horizontally guided slidable bars adapted to project from the ends of the car and contact with the sides of the building and locks for said brace-bars.

STONE SAWS.—No. 799,870. Sept. 19, 1905. William B. Buble, Rio Vista, Cal. This invention relates to improvements in what are known as "granite" or "stone-sawing" machines. Its object is to provide an improvement in the teeth or blades which form the cutting or operating portions of such saw and a means for adjusting and interlocking such blades with the bars or carriers by which they are supported. The invention consists of independent blades having V-shaped channels in the lower edges, bars having vertical channels cut through them to receive the saw-blades, with intermediate integral spacing portions, keys driven in said channels to lock the blades edgewise, and binding-screws adapted to lock the blades transversely.

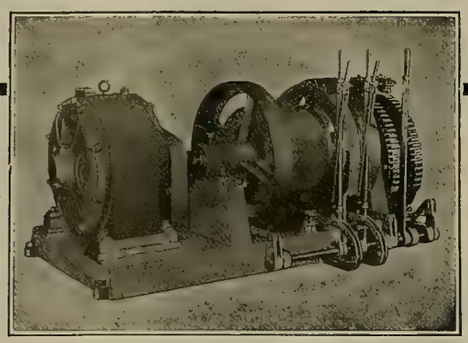
CHECKREIN ATTACHMENT.—No, 799,920. Sept. 19, 1905. Louis Moretti, Santa Cruz, Cal. The object of this invention is to provide a device which when in use holds the checkrein and the horse's head in the desired position. When it is desirable to release the horse from the tension of the checkrein, it may be done by the occupant of the carriage without leaving his seat, and when it is desired to again check up the horse's head it can be done in a similar manner. The device consists of a spring-actuated revoluble drum upon which the checkrein may be coiled, a shaft for the drum, and a means for locking the drum and holding the check in position, said means consisting of a fulcrumed spring-actuated lever having one arm adapted to engage and lock the drum-shaft and the other arm driving reins.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING SEPTEMBER 12, 1905.

799,293.—TIRES J. Baker, Pasadena, Cal.
799,294.—HARNESS—G. V. Beckman, Lodi, Cal.
799,453.—CAR STEP—G. G. Comer, Kalama, Wash.
799,460.—TOBACCO PIPE—A. C. Duncan, Tesla, Cal.
799,044.—SHOE LACING HOOK—H. J. Griswold, Eureka, Cal.
799,376.—ORE FEEDER—C. C. Hamill, Barstow, Cal.
799,335.—BERRY BOX—P. Henrich, Seattle, Wash.
799,161.—GOLD SAVING MACHINE—J. B. Holmes, Los Angeles, Cal.
799, 234.—CARPENTER'S PLANE—J. Jett, San Francisco.
799,341.—GAS GENERATOR—A. W. Jones, Alameda, Cal.
799,167.—PENCIL HOLDER—G. Jorgensen, Seattle, Wash.
799,389.—GRAINING MACHINE—H. G. Krasky, San Francisco.
799,390.—BABY CARRIAGE—M. A. Kuykendall, Portland, Or.
799,181.—SAWMILL DOG—A. B. McCulloch, Everett, Wash.
799,408.—WEEDER—L. L. Bidwell, Rivera, Cal.
799,104.—FLOWER STAND—T. S. Sprague, Alma, Wash.
799,617.—FRUIT CLIPPER—E. P. Steffa, Pomona, Cal.
799,416.—SCREEN—J Stork, San Diego, Cal.
799,426.—STILL—H. B. Williams, McMurray, Wash.



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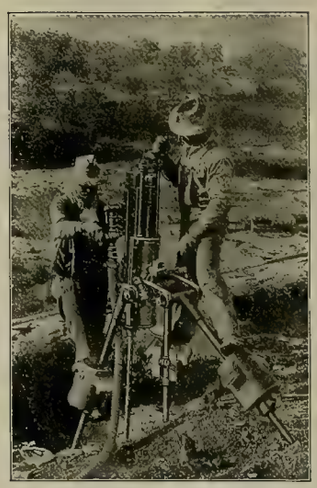

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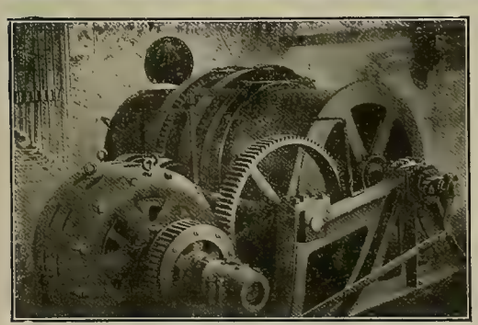

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THE CALIFORNIA DEBRIS COMMISSION having received applications to mine by hydraulic process from Bernhard Kavanaugh in Parke & Brown Mine, near Last Chance, Placer County, Cal., draining into Deep Canyon, which drains into North Fork of Middle Fork of American River; from Dougal Duncan in St. George Gravel Mine, near Yankee Jims, Placer County, Cal., draining into Devils Canyon which drains into North Fork of American River; from Klamath River Hydraulic Mining Co., in Round Butte, Round Butte Extension and Dump Placer Mines, near Sheep Ranch, Calaveras County, Cal., draining into Baptista Creek which drains into Calaveras River, gives notice that a meeting to receive any protests will be held at Room 68, Flood Building, San Francisco, Cal., Oct. 9, 1905, at 1:30 P. M.

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MINING AND SCIENTIFIC PRESS.

Whole No. 2359.— VOLUME XCI. Number 15. SAN FRANCISCO, CAL., SATURDAY, OCTOBER 7, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Fig. 1.—Pack Train, Cunningham Gulch, Near Silverton, Colorado.

Fig. 2.—Upper Terminal of Line, Showing Trestle. This is 1800 Feet Above the Mill and Lower Terminal, and is Built at an Angle of 35°.

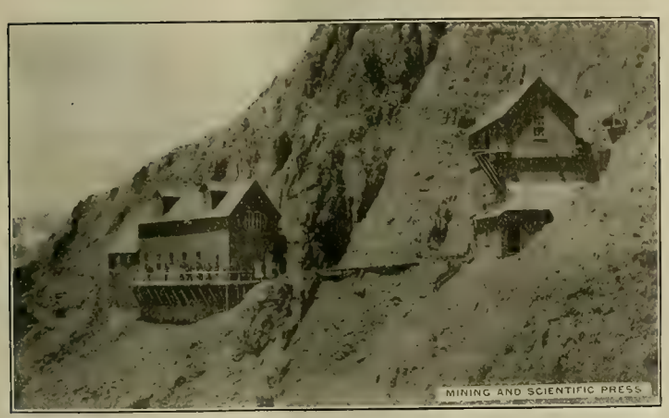

Fig. 3.—Terminal of Line and Boarding House on Side of Mountain. All Material Was Packed on Burros to Top of Mountain and Lowered by Chute 500 Feet. The Incline is 65°.

Fig. 4.—Power House, Trestle and V-shaped Wall and Lower Terminal. (See Detail of Wall and Trestle Fig. 6 Below.)

Fig. 5.—Weighing Ore—A Freight Team at the Scales About to Start for the Railroad, 80 Miles Away.

Fig. 6.—Detail of Wall and Trestle Shown in Fig 4 Above.

ORE TRANSPORTATION IN COLORADO, SHOWING AERIAL TRAMWAYS, TERMINALS, PACK TRAINS, ETC. (See Page 240.)

MINING AND SCIENTIFIC PRESS.

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SAN FRANCISCO, OCTOBER 7, 1905.

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Mine Accidents—Mine Inspection.

The most casual reader of the daily papers published in the mining towns cannot help noting the number of mine accidents that constantly occur. Whether they can indeed be all called "accidents" is questionable, as many of them are manifestly cases of cause and effect, and not "accidents" in the strict sense of the term. In the course of a recent hour's reading of local papers was observed the following: The death of Henry Jones and Thomas Ball at the Keystone mine, Sierra county, Cal. They were working in an upraise to tap the old workings. They knew that a great body of water was somewhere above or about them, but had no exact memoranda as to its precise locality. They put in a blast which tore away the ground, letting the water rush out, and were drowned in the flood. The old workings had been operated through a tunnel below the shaft on the vein. Some "thought" the shaft had been 200 feet deep, some 300, some 400; the general idea was that it was 230 feet. On this latter hypothesis the men were running the upraise to miss the old workings 150 feet. It had also been figured that the old drift was 250 feet in length; in reality it was 400 feet long. The shaft was about 400 feet deep. With wrong data the two men went to their doom. Any one can, of course, be wise after the event, but if what has been editorially advocated several times in these columns had been observed these men need not have been sacrificed, viz.: An accurate map made of the underground workings of the mine and left by the outgoing management as part of the records of the mine. This is the invariable rule in many mines — to have a map of just how the work is below, up to the day of departure and filed by the outgoing management. Then as work progresses, or is resumed, there need be no guessing as to the length or location of any underground work, and the probability of such accident as the one referred to thus reduced to the minimum. The same day Frederick Duckett was killed in the Stratton's Independence mine, Victor, Colo., by falling 100 feet in a stope at the 400-foot level. The Coroner's jury found that "the timbering of the fourth level was not put in in a workmanlike manner." It is stated that the platform upon which he was standing when he fell to his death gave way under him. This, if so, carries with it its own condemnation of such carelessness in construction. The day before these three men lost their lives as narrated, Richard Tregaskis, in the Utah Copper mine, Bingham, Utah, was killed by a blast. He with his partner had drilled and loaded six holes and were trying to shoot them. Two of the fuses ignited. Tregaskis lingered in an attempt to get the other four to light, and finally giving up the effort sprang for the ladder to go up. He was 8 feet up when the two shots went off. He fell back in the winze and was dead in an hour. This appears to have been a case of familiarity with danger making an experienced miner careless. In such instances no rules or precautions are of avail. The same day Robert White at the Banner mine, Nevada county, Cal., was starting up in the skip, just off night shift, he being warned by his brother with him that his position in the skip was a dangerous one. The skip had only gone 3 feet when his head hit a timber cap, he was forced backward and crushed between the skip and shaft timbers; he was carried to his home with a broken back. The following day, in the Gladstone mine, at French Gulch, Shasta county, Cal., three men—Jno. Healey, Darby Judge and Wm. Hayes—were at work at the bottom of a double-compartment shaft, 175 feet below the main tunnel. The engineer in charge of the hoisting machinery ran the cage up into the sheaves, the cable broke and the heavy cage crashed down onto the three men in the bottom of the shaft, crushing them into an indistinguishable mass. This would appear to be a clear case of criminal carelessness on the part of the engineer.

Here are five accidents, three of which were apparently caused by individual carelessness, the first two the result of ignorance of their surroundings. More extended perusal of the local papers would doubtless disclose a larger list of fatalities.

In such cases as those cited, inquiry always arises as to the possibility of prevention of such "accidents." To any one who ever worked in a mine, it is manifest that a great portion of such grim happenings is the result of carelessness. Men become so familiar with their dangerous surroundings that they will take chances that a stranger or one knowing nothing of mine workings would shrink from. Men will work in ground that they know is treacherous; they will leap across a shaft with 1000 feet of fearful fall to smash them if they slip; they will use an iron or steel bar in tamping holes charged with powder; they will strap timbers, lagging, etc., to the outside of a skip. They will take great personal risk and do dangerous things as a matter of course and without any display or bravado, but just as a part of the day's work, partly because, as said, they become familiarized with danger, and, sometimes, because they dislike to even appear to be afraid. A large percentage of the accidents are due to neglect and improper management or lack of safety appliances, but it must be said that an equally large per cent is because of the neglect or refusal of the men themselves to use the proffered safeguards or appliances, recognizing the danger, but ignoring the likelihood of it affecting them.

The question brings up the correlative one of mine inspection in connection with proposed prevention, but occidental statistics do not seem to favor that legislative idea, for about as many casualties are reported from Western States having mine inspectors as from those not having such officials. Still as mine inspectorship is comparatively new west of the 100th meridian, it is not wholly fair to institute present comparison in that regard.

What has been said above applies solely to metal mines west of the Missouri river. That much good has resulted from official inspection of coal and other non-metallic mines is manifest. Since 1870 there have been mine inspectors and rigid rules concerning their action in anthracite coal mines in Pennsylvania, and since 1877 in bituminous coal mines in that State. For thirty years there has been State inspection of some sort in nearly every coal district east of the Mississippi river, and its good results are evident. In 1870 the coal produced in the Pennsylvania coal region, per violent death of miner therein, was 59,969 tons; in 1900 after thirty years regime of inspection it was 114,864 tons. The number of deaths there per 1000 miners in 1870 was 5.601; in 1900, 2.71. These statistics indicate a decrease of 50% in casualties—a gratifying showing—and in connection with better machinery, improved appliances and the general advance in mining methods, must justly be credited to efficient mine inspection.

The chief objection to the appointment of a mine inspector in California, for instance, is the just dread of mine owners in the possibility of being saddled with incompetent officials possessing a political pull, and with well developed sense of "touch." An appointive office is sometimes open to these objections. California and other mining States would confessedly be better any day for the creation of mine inspectors if the incumbents were thoroughly efficient, "but," say the objectors, "a man who would make a good mine inspector can earn twice as much as a mine manager or superintendent than he could be paid by the State." So that the first requisite would be to attach sufficient salary to the office to enable the commonwealth to get honesty and ability. To properly fill the office of mine inspector would demand a high degree of talent; the incumbent would have to be an unusually able man. Wherever created, the office of the mine inspector is to enforce enacted law, and reduce number of casualties. To do this he must become an educator to a large number of mine foremen; he must also be not only an instructor, but a conveyor or transmitter of information concerning improvements. He has great opportunities, to use or abuse. He sees and notes the various appliances in use at all the mines he visits and can suggest the adoption where applicable of improvements that have been used successfully in other mines. He is called any time of the day or night anywhere in his jurisdiction where accidents occur, and assumes the responsibility for the subsequent proceedings. A man that is able to do all this, to act quickly, intelligently and impartially; to hold aloof from even the suspicion of dishonesty, is worth big money as a mine manager for some large mining company where he would be spared the contumely and annoyances inseparable from such a position.

In the Pennsylvania anthracite coal regions the mine inspectors are practical men; they have had long experience in charge of mines before being appointed. They are not politicians and are not appointed to please political friends; they are commissioned by the Governor of the State on the recommendation of a board of examiners appointed by the judges of the courts having jurisdiction. The board of examination consists of two reputable mining engineers and three reputable working miners engaged in present actual work. The Governor has no choice in the selection of the mine inspectors, but must appoint the one recommended in each case. The inspectors are commissioned for five years, have reputations to maintain, and are practically certain of reappointment so long as they efficiently discharge the duties of their office.

In any discussion of mine inspectorship the difference in the personnel of the coal and the metal miner must be borne in mind. In many of the anthracite coal mines hordes of Huns and Polacks are herded, and of necessity require a censorship that would be repelled as degrading and intolerant by the western metal miner, who does all his talking and most of his thinking in United States language.

IN another column a Colorado mine manager discourses on some of the necessary qualities that go to make up a successful mine manager. At the risk of making the list too long it is here suggested that many successful mine managers have found it well to be always ready to recognize the value of a new idea, regardless of where the idea came from. Suggestions and even criticisms from subordinates in respect to details are often of sufficient value and enlarge the horizon of view. Should the tendency be to resent criticism or advice, it might be borne in mind that it were no harm to listen, and that whether the suggestion shall bear fruit would be for himself to say. Nothing that is good need ever be discarded because of its source.

CONCENTRATES.

SILVER can be electrolytically deposited on aluminum. This discovery was made at Sheffield, England.

♣♣♣♣

THERE are mines in southeastern Arizona producing bismuth and lead, the mineral being bismuthinite.

♣♣♣♣

THE American Mining Congress will meet at El Paso, Tex., November 14, and will continue in session for one week.

♣♣♣♣

THE cost of wagon transportation over good roads is usually figured at 25 cents per ton per mile, though in some instances the cost is less than this amount, and in others much more.

♣♣♣♣

ALTHOUGH mining has been vigorously carried on in California since 1848, new discoveries continue to be announced, the most recent being in Modoc county, in the extreme northeast corner of that State.

♣♣♣♣

IN determining the value of a mine it is as important to know the length of the ore shoot as to know its width and height. An ore body may have considerable width and height, but be so short as to scarcely justify a mill or other reduction works.

♣♣♣♣

IN the early days of the Stonewall Jackson mine of southern Arizona many mules were "packed" with the native silver taken from the rich veins of that mine. Native silver and nuggets of hornsilver were also found in the neighboring gulches.

♣♣♣♣

ANY person, a citizen of the United States, may locate as many mining claims on a lode or vein, that is not already appropriated, as he cares to take. The law does not prohibit the number of claims one may take or buy, and the several claims may be on one or several veins.

♣♣♣♣

THE speed with which holes may be drilled by means of a pneumatic hammer drill depends upon the kind of drill used, hardness of the rock, air pressure, and also upon the miner himself. Some men will make better headway than others when all conditions are the same.

♣♣♣♣

ZINC FUME is an extremely fine powder of metallic zinc, obtained from condensing chambers of the zinc furnaces. It is mixed with water and is used as an emulsion in precipitating gold from cyanide solutions in some mills, this method being preferred by those who use it.

♣♣♣♣

THERE is no economy in running a stamp mill so fast that the tappets strike the cams when falling. More damage is done than is gained in increased capacity. The height of drop may be decreased somewhat with the same number of drops per minute and the interference of cam and tappet thus avoided.

♣♣♣♣

WHERE the heat from exhaust steam is found insufficient to heat feed water for the boiler, steam may be admitted from the receiver of a compound-condensing engine to the water heater direct without danger. Ordinarily, however, the exhaust steam will raise the temperature sufficiently for the desired purposes.

♣♣♣♣

THE "Concentrate," page 223, in the issue of September 30, beginning "Code Civ. Proc. 1895, section 592, etc.," referred to the Code of Civil Procedure of the State of Montana. All of the States have codes of civil procedure, but in many respects these differ from one another to a greater or less extent.

♣♣♣♣

CROSSCUT TUNNELS run from the surface to intersect veins cropping a great distance away are often continued far beyond the vein without the vein itself having been noticed by the miners, owing to contraction of the vein or to some other cause. This is probably what has occurred in the San Bernardino county, Cal., instance.

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WHERE the mine is situated at the top of a vertical cliff, the ore may be safely and cheaply delivered to a mill or ore bin at the foot of the cliff by means of an aerial ropeway. Constructions of this character are not uncommon in Colorado. On the front page of this issue and on page 240 appears illustrated reference to the subject.

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A REGION wholly destitute of payable quartz mines may produce a rich placer field. In such places the gold usually occurs in small seams of ochre, clay or quartz and too far separated to make it possible to mine the mineral zone as a whole, but the erosion of such a region often results in a concentration of the gold in the gulches and depressions, forming payable diggings.

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IT is not uncommon to find hoisting plants at mines equipped with some automatic device which warns the engineer of the approach of the skip or cage to the surface. These devices are usually either bells, shaking indicators, or flashing red lights. Such arrangements are no doubt of value, but the engineer should know exactly where the skip is at any moment, and not depend upon extraordinary alarms and devices to tell him of the danger of overwinding, for the reason that placing entire dependence upon such mechanical arrangements may result in a serious accident in the event of failure of the mechanism to operate.

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THE diameter of a Pelton wheel has little bearing on the amount of power developed, as it merely determines the speed at which the wheel should run under high head. To develop 250 H. P. with a Pelton wheel, water would be required in the following quantities: Head, 300 feet, 347 miner's inches; 400-foot head, 260 miner's inches; 500-foot head, 208 miner's inches. A miner's inch is legally 1.5 cubic foot per minute.

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THE tourmaline bearing dikes of pegmatite near Mesa Grande in San Diego county, Cal., were discovered in 1896 by a field assistant of the State Mining Bureau, and attention was called to the occurrence of black, green and red tourmalines found in these dikes in the thirteenth report of the State Mineralogist of California issued in 1897. These deposits are now being worked for the pink tourmalines occurring in the granite dikes.

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AS THE ore is delivered to the mill by aerial tram, it may be that the "grease which is interfering with amalgamation" may be caused by oil dipping from the wheels supporting the buckets on the wire way. It must be this, or the oil comes from some place in the mill—dripping shafting, cams, etc. If neither of these, it may be some mineral substance in the ore that is giving trouble and not oil at all. Plumbago, arsenic, antimony, molybdenite, talc and other minerals disturb amalgamation, often seriously.

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IN the case of the claims A and B in Oregon, while claim A may lie higher than claim B, work on A if of actual value to B may be charged in part to B. A mill built on the creek to treat ore from both claims may be applied as assessment on both claims. A tunnel run on the vein on A might not be construed as work tending to develop B, while a shaft on A might be so construed. It is merely a matter of fact. The authority under which assessment work is done on one claim for the benefit of several claims of a group is the United States Revised Statutes, Sec. 2324.

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ON PAGE 169 of the issue of September 9, in the "Concentrate": "A dynamo can usually without material alteration, or without any at all, be employed as a motor. Motors were introduced for convenience and for particular purposes. A single dynamo may run any number of motors within the range of its electro-motive force": "Electro-motive force" might have read horse power. In electrical engineering 746 watts are figured as equivalent to 1 H. P. The watt is the term employed to express electrical power, and is obtained by multiplying the voltage (electro-motive force) by the amperes or current.

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IN the case of clarifying slimes referred to by the correspondent from Anaconda, Mont., the material was not acid, but consisted largely of fine silica and impalpable hematite dust. It is not essential that the slimy material be acid to make it possible to clarify it with lime. If no acid be present it is, of course, necessary to avoid excessive alkalinity. The addition of lime to material to be treated by cyanide process must be made with caution. The same methods are not always applicable nor successful. At some plants the milk of lime is employed, while at others this method is unsatisfactory. Some crush the lime with the ore in the battery, others crush it separately. At the Homestake plant in Lead, South Dakota, the lime is crushed in a mortar by a single stamp and it has been found that the size of the crushed particles is an important factor in the success of the operation.

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THE cost of pumping water per ton of ore treated for milling or other metallurgical purposes must be determined by the situation, the factors being the distance and height to which the water must be pumped, the amount required, and cost of power for pumping and of labor. Where it is possible to pump the water to a sufficient height to a tank on some elevation near the pumping station it is better to do this, allowing the water to flow by gravity to the mine, if the distance be great. This overcomes the friction head, which in long pipe lines is considerable. Generally the cost of pumping water does not exceed 50 cents per ton of ore treated, if the pumping installation is commensurate with the magnitude of metallurgical operations. It is not economy to have a plant capable of supplying a larger amount of water than the works require. It is generally better to pump less water than the maximum amount required, and to settle the tailings and pump back a part of the water from the settling dam.

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THERE are many mines where iron has been found to contain an increasingly greater amount of copper with depth up to certain limitations. Copper has appeared in many of the mines of Leadville, Colo., with depth. The depth at which this change takes place varies greatly. In some mines it is comparatively near the surface, in others the change comes several hundred feet below the surface. No arbitrary line can be drawn. In mines where no copper appears in the superficial portions of the vein or deposit, and it does begin to appear with increasing depth, the "signs" should be followed. It may be that the amount of copper present will never become an important factor in the value of the mine, but if the copper contents add any value to the mine at all it should be welcomed. The normal zone in a copper producing mine is usually found to be low grade, sometimes less than 1%, and yet this class of ore may have produced a zone of great enrichment at higher levels, while at the surface no copper is found in the ore at all.

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THE object sought in adapting briquetting to the smelting of fine ores is to obviate the loss ensuing from the escape of flue dusts, concentrates and granulated mineral fines during the smelting process, and to put the fine mineral ores, tailings, and similar fine materials into such a form as will admit of their being treated in the smelter without loss. Considerable has been expended in experiments along many lines; many smelting concerns are operating briquetting plants for the treatment of fine dusts, and materials which for many years have been running down the canyons or into the settling basins, are carried back to the smelters and, after being solidified in the form of mineral briquettes, are resmelted with profit. Through the treatment of these mineral fines and the flue dusts and slimes from the concentrators, it has been found possible to increase the smelter output 10%, old ore dumps, flue dust, etc., containing as low as 6% of mineral value being treated by the briquetting process with profit. Briquetting as applied to fine minerals eliminates other disadvantages arising from the use in the smelter of concentrates and fine ores in their natural state.

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THE chief thing to look out for in setting up a gravity battery for telephone work is to prevent any mixing of the solutions, and care and dexterity will be required. The solution of copper sulphate is a thoroughly saturated solution, and several pounds of copper sulphate crystals are placed in the jar to maintain the solution at the saturation point as long as possible. The copper solution should about half fill the jar; the weak solution of zinc sulphate is poured carefully in on top until a layer of zinc solution is obtained deep enough to cover the zinc element when it is in place. The battery must, of course, be set up in the place where it is to be used and left undisturbed as any movement of the cell would cause the solutions to mix. To replenish the copper solution the zinc solution should first be drawn off, which can be done with a battery syringe or syphon; the practice of dropping crystals of copper sulphate through the zinc solution is a bad one, as it causes a mixing of the solutions. When the solutions become mixed and the zinc becomes discolored, which will occur if the cells are moved or shaken, or if they are left long on open circuit, the solutions should be drawn off, the plates thoroughly scraped and cleaned, the zinc re-amalgamated, and the battery should be set up again with fresh solutions. Speaking generally, the gravity battery is not a good type of cell for telephone work, as it deteriorates so quickly on open circuit; its use is practically confined to situations where a continuous current is required, and for such purposes the motor generator and storage battery are better.

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IT is sometimes said that a banker to whom a customer has paid in moneys for his current account is a trustee of such moneys, but this is a mistake. The true relation between a banker and his customer is that of debtor and creditor only, with an obligation on the part of the banker to discharge the debt in a particular manner. So clearly is this the case that if, after paying money into the hands of a cashier to the credit of his account, which is not overdrawn, the customer should suddenly suspect the solvency of the bank, he cannot withdraw it except by check. In the same way, the moment a bank clerk in cashing a check has placed notes or money in the control of the person presenting the check there is actual delivery and possession, and he cannot take them back. Should a customer overdraw his account the bank is not bound to offer the sum really due him, but can rightly refuse to honor the check. When a check is indorsed the indorsee can bring an action against the drawer, just as the indorsee of a bill can sue the acceptor. A check is not an assignment of any portion of a debt due from a banker to his customer, but simply a request with which the banker has promised to comply. Should the latter fail to meet his engagement to pay, all things being in order, the customer can bring an action against him and, although no actual loss has been sustained, will be entitled to nominal damages, as the obligation of a banker to honor his customers' checks rests upon a clear and distinct promise or agreement to that effect, which arises from the course of business and the nature of the transaction. There can be an indorsement in blank or a special indorsement of a check. The post-dating of a check drawn to bearer, or order, in no wise affects its validity, and a person taking it bona fide and for value has a perfectly good title. Every banker who honestly pays a check drawn upon himself is entitled to charge the sum he so pays to the account of his customer, although the signature of the payee or indorser has been forged. A banker is bound to know the signature of his customer, and therefore, if he pays a check bearing the latter's forged signature, he cannot charge the customers' account with the sum so paid. And if the amount payable on a check has been fraudulently altered, the banker who pays it can only recover from his customer the sum for which it was originally drawn. But when there is evidence that the gross negligence of the drawer clearly afforded opportunity for the alteration of the check, the customer may have to bear the loss himself if there has been no want of care on the part of the banker in cashing the check.

Mine Manager's Requirements.

TO THE EDITOR:—Even in the present advanced stage of progress in mining, one sees many cases of extravagance in operating mines. Notwithstanding the excellent work of the periodicals devoted to the mining industry, more than one mining venture, involving perhaps the total capital of some man or company, is allowed to proceed as if it had no management whatever. Perhaps that important function is vested in the person of some influential friend or relative, who must be provided for, or some antiquated hobbyist may have here a chance to air his pet ideas, or a dreamer, whose principal feature is the profundity of his appearance, may prove the stumbling block.

The management factor is of primary importance. On it depends the mutual relations of owner and miner. The capitalist and promoter by their very nature have little in common with the man who does the work. The theorist being on his own intellectual plane appeals more directly to him, and the miner has an inherent contempt for the methods of the scientist, meeting him with the trite observation that one man can see no farther into the ground than another, or gold is where you find it, etc.

It is the province of the manager to demolish this barrier between mining brain and brawn, and not have arbitrary orders issued without an understanding of conditions and executed in a contemptuous and half-hearted manner.

There are many kinds of managers, who manage with varying degrees of success. Prominent among these are the specialists in some branch of science which may or may not pertain directly to the working of a mine. Here there is perhaps a civil engineer or a master mechanic, or perhaps one who has attained distinction in metallurgy. Sometimes a butcher or even a dry goods merchant or other tradesman will be observed among the ranks of mine superintendents. Now any of these may meet success for a brief period, but there comes a time when the strictest economy is needed and even trifling extravagance of the past will be felt.

It is here that good management becomes imperative, and where the specialist is apt to fail. Lines apart from the one with which he is thoroughly conversant will not be in condition to meet the new requirements, nor will they assume due prominence in his eyes.

One who is pre-eminently a business man will naturally see the numerous opportunities for saving in the purchase and transportation of supplies. He will not leave necessary material until the last moment and then have it hurried through at much expense, when the slower freight would have answered the purpose. Nor will he neglect to watch the market reports when buying. Thus it is with specialists in any line, while applying their efforts to their own particular branch; others equally important are overlooked.

There are numerous ways in which economy may be practiced: Buying and selling, keeping in mind not only what is needed but what may be needed, always having on hand a supply of necessary material, for in waiting and doing without and hurry-up orders much money is wasted. In transportation local conditions must be studied; roads kept in good shape for bringing in men and supplies will always pay for themselves, not only cheapening supplies, but also bringing in a class of men who are not compelled through incompetency to expose themselves to the worst conditions. For the same reasons accommodations and working conditions should be kept up to the best possible standard.

It is unnecessary to revert to possibilities in sampling, mining, milling and handling of ore, the placing or handling of machinery, simply treating of the man who must superintend these various lines of business. It has been exemplified many times that the student fresh from college and without practical training is not able to handle a problem so various and intricate. No more is the miner, who has spent a lifetime under the ground studying how to rend the rocks, capable of dealing with such abstruse problems. Yet we must admit the knowledge which the miner gains is an invaluable acquisition to the fund which the manager should possess.

There is a capacity which neither experience nor study can be said to produce entirely. It is an inherent quality which experience alone will discover; that is the power of handling men. Such a power should belong in an eminent degree to a superintendent of mines. The large amount of machinery needed to work a mine makes it incumbent on him also to understand the installation and operation of the same. Surveying, too, is an important feature in mining operations. The mine superintendent who can survey knows where he "is at," and where a map of the workings is kept at hand he can direct operations to the best advantage. A good general knowledge of various metallurgical processes also is imperative. The reasons are as obvious as that an engineer should know the location of the throttle of his engine. Yet how many "supes" are there who could not start the mill or run down an assay. As the great industry grows the importance of geology, mineralogy and kindred sciences in the practical field become more and more evident. So our manager must be versed in these lines. He must also be a bookkeeper, a draughtsman and electrician, in order that he may more thoroughly oversee the workings of those under him There are emergencies arising every day with which the guiding hand must be able to cope, or money and time are wasted in searching for a master to overcome them.

One of the most serious troubles he can have is a lack of funds for carrying out plans known to be essential. Directors are crying to cut down expenses and output is growing sensibly less as the more favorable ore bodies are becoming exhausted and there is no development of workings or plant to meet new requirements.

Here is a juncture that emphasizes the utility of figures and plans for guidance, with of course a liberal allowance for possible deviations, and margins varying with the knowledge of conditions.

With such plans it is known what will be necessary in the shape of plant, etc. There need be then no costly delays caused by some essential factor being thought of just when needed. Nor will there be the extra expense of substitution in some part of the plant which has been found inadequate for development of the mine, and the lack of harmony often seen in the various parts will be avoided. One piece of machinery will not be using power out of proportion to the amount of work to be done. Allowance can be made for growth within close limits. Second-hand machinery is not a very desirable asset.

Of course it is easy to say what the manager shall know and do. But no doubt many have found it a serious problem to secure the man who has these multifarious branches of knowledge blended in the right proportions. One sees advertised in your columns that a man of experience is wanted. What this experience has been, under what conditions or with what result, does not seem to cut much figure. Again a man finds favor who can produce an array of recommendations, no weight being given to the fact that the writer of such documents has less at stake than the reader.

On looking about one can see here a field that has not been sufficiently supplied to have brought about any considerable amount of selection. The requirements are so diverse that only recently has it been possible to encompass their acquirement in one lifetime. The occasional college man who is not afraid to labor with his hands for a time has an advantage not to be despised. No less is that of the student miner or mechanic. Though previous experience is essential, where delays and expense liable to experiment would be fatal, it is a poor criterion except in so far as conditions are similar. Of course failure is liable, but progress is based on failures.

Telluride, Colo. MINE FOREMAN.

A Homely Suggestion.

TO THE EDITOR:—In Sierra county, Cal., Canyon creek, above Devils gate, was evidently once a large lake. Into this lake flowed many small streams, from the gulches cut deeply into the sides of the surrounding high mountains. Mt. Filmore is the third highest mountain in California; its peak is over 3000 feet above Poker Flat, which is situated at the bottom of the ancient lake site, where Canyon creek now runs. High up on the sides of the mountains are many abandoned placer mines, in channels of ancient river beds, formerly profitably worked by hydraulic methods.

About 1000 feet above the bed of Canyon creek are the deep cuts made as parts of the work on a large canal, designed to bring water to the hydraulic miners from Gold lake, 20 miles distant. On all sides are the evidences of past extensive hydraulic mining done here. Over $3,000,000 in gold was taken from the mines around Poker Flat, which is but an index of what remains. As a result of the restraints on hydraulic mining, this fact is worthy of consideration, as a typical case, and the question arises, Cannot something be done to enable the miners to take out the gold that remains in these mines?

On looking over the ground with this object in view, there is presented an apparently very simple solution of the problem. The boundaries of the ancient lake site are high mountains, on all sides except the outlet, where the waters of Canyon creek pass through a narrow slit in a narrow wall of rock. This opening is over 100 feet in height, and part of it is less than 40 feet in width. Far above the gate, on the mountain side, are crags, on the up stream side; a few well placed shots would throw down enough rock to close the gate, and thus, with the necessary chinking, a debris dam could be formed that would restrain all of the objectionable material brought down from the hydraulic mines on Canyon creek and its tributaries, from Devils gate to Gibraltar, a distance of 7 miles.

Farther down the creek, other places where high rocky points, on each side, are not far apart, might be utilized in the same way. It is not necessary that, in all cases, the full height of these dams be made at once. When sufficient height to produce the desired result is reached, the mining can go on, and the dam be raised as may be required, the object being to provide a barrier against boulders and gravel, and a check pool to make slack water in which the heavier material will settle; the lighter portion that remains in suspension in the slack water will not be deposited by the running water of the lower streams. Canyon creek is a tributary of the Yuba river.

With this proposed dam at Devils gate, 1 mile down stream from Poker Flat, as a type, other hydraulic mining regions might locate similar suitable dam sites, and thus aid many abandoned mines on ancient river channels to yield abundance of gold by the cheap, simple method of hydraulic mining.

Downieville, Cal. JOSEPH VOYLE.

A Tough Experience.

TO THE EDITOR:—Frequently I read accounts of mining and milling methods that show success. Just by way of variety I send you a truthful narrative of what may be considered a failure. You said some time ago that "failures were but stepping stones to success." I believe it, and have a few good-sized boulders to start on. I represent one class of your subscribers, the class that is trying to do a little mining in a small way on a small capital, the class who get a few dollars ahead and are then willing to risk them in trying to do better for themselves and a few others, for it is not possible to work a mine to any extent without furnishing employment to others. My mine is a ledge of free milling ore 2 feet in width, carrying a good percentage of sulphurets. It had been worked in the seventies and abandoned on account of the ore being low grade, and also a rush of water, which stopped the work. Five years ago a friend of mine tried to open up the mine with a whim, and while he took out enough ore to pay him for the outlay, he could not get below the 80-foot level without putting in a steam plant, which he was unable to do, so he gave it up, leaving about 100 tons of ore on the dump that assayed $5 per ton and more. As it was a long, hard haul to the nearest mill, it would not pay for the hauling and milling.

Having known of the mine for a number of years, and having had a long experience with a "poor man's mill"—i. e., an arrastra—I tackled it, putting in a steam hoist, pump and arrastra, the latter at the mouth of the shaft, to run the whole with one boiler and engine, having everything arranged conveniently, so that one man could do all the top work.

Just as I was ready to fire up to test the machinery, after over a year's hard work, the shaft caved, coming together for over 40 feet, so I had to retimber the shaft from the top to the water, the latter making as high as twelve buckets of water to one of waste. But, as I wanted lots of water, of course, that suited me. I finally got started and everything ran smoothly. I ground out a ton of the dump every six hours, making two tons per day of twelve hours, and the way it took the "quick" was certainly encouraging. "Stocks" went out of sight, and I knew I "had it" at last.

But pride preceded my fall—the "knock" was there all right and I got it. I had a tank alongside the shaft that I pumped into from the sump. I used to fill it every night after shutting down the "mill," as it not only saved time by doing so, but it also ran down the head of steam. On the fifth night after starting to grind something went wrong with the pump. I went down the shaft in the morning and found only 6 inches of water in the sump. The water had quit in the mine. I tried to run the dump through, but I had to wait a whole week to get enough water to grind a batch of ore. The deeper I got into the ore dump the more talc and clay showed up, which took three times the amount of water the clean quartz had required. So I concluded I was surely "up against it." Now, tell me, was this a case of bad judgment, or is there such a thing as bad luck?

Piute, Cal. MINER.

Steam Shovels in the Atlin District, B. C.

One of the companies operating in the Atlin district, in British Columbia, the Northern Mines, Ltd., recently completed the installation of a steam shovel plant, for placer mining purposes, says the Canadian Mining Review. The plant includes a shovel, with a capacity of 1000 yards in ten hours; an auxiliary hoisting plant; 2000 feet of flume, and 200 feet of sluices. The shovel has been placed on a stratum of clay cement in a pit excavated for the purpose. The dirt is deposited by the shovel into skips holding 1¼ yard, which are hoisted by the auxiliary plant on a cableway conveyor some 40 feet to the dump box. At the end of the dump box there is a grizzly which cuts out all rock over 3 inches, from there the gravel travels over 60 feet of block riffles, at the end of this sluice there is another grizzly which cuts out all material over ⅜ of an inch, and the remaining gravel then passes over another 40 feet of sluice to the dump. From the height of the sluices, some 40 feet, there has been provided an ample dump, and the possibility of a block by tailings has been greatly minimized. During subsequent tests for a three-hour run some ninety-five buckets were handled and it is estimated that 800 yards per day can be handled with ease.

Transportation in Colorado.*

Written for the MINING AND SCIENTIFIC PRESS.

Transportation facilities in Colorado are being improved upon each year. It is not uncommon to see large pack trains consisting of burros or mules carrying ore from the mine or mill to the station and returning with supplies for the mine. In the San Juan country, especially, a large amount of the ore is carried in this manner, as many of the mines are inaccessible for railroads or wagons, and in some instances, where there is a fairly good road, the operators seem to think it the cheapest and most economical to pack the material in preference to hauling by wagon. At the Tomboy mine, near Telluride, they have a good wagon road to the mine and mill—about 6 miles—but most of the material is packed on mules or burros for this mine. Several of the other mines, such as the Smuggler-Union and Liberty Bell, have their mills in the valley, on the railroad, and the ore is brought from the mine to the mill by aerial tramway. The aerial tramway is undoubtedly a great benefit to this section of the State, as the mountains are extremely high and the mines are in out-of-the-way places, where it requires several miles to reach by wagon road or trail, while the tramway is built over the most precipitous moun-

Fig. 7.—Man Crossing the Chasm on Aerial Tramway.

tains and across gulches. As an illustration of tramway building, the Old Hundred mine, on Galena mountain, about 5 miles north of Silverton, in Cunningham gulch, is an example of what can be accomplished. This tramway is built in three sections. Beginning at the foot of the hill, in Cunningham gulch, the first section extends up the side of the mountain for a distance of 1800 feet, and is known as the Bleichert system. Of the three sections in the line this is the lightest grade, being only 35°. On the front page (Fig. 4) is illustrated the lower terminal of this section of the tramway and a high trestle over the road in the gulch. This trestle is used for hauling out the waste for the mill foundation, which is being erected at this point. At the foot of this trestle a high stone wall, built of solid masonry, has been erected in a V shape to protect the power house and terminal from snowslides. This wall is built in this manner so that the snowslide will be split and the force of the same stopped before any damage can be done. Snowslides must be guarded against in these high altitudes, and especially where the mountains are so steep as in the San Juan country.

In Fig. 2 is illustrated the loading terminal and trestle of the Bleichert tramway at station No. 1. Fig. 7 illustrates the jigback tramway, with a man on board, between No. 1 and No. 2 stations. This line is 760 feet long and the steepest point is about 50° angle. The second jigback, between No. 2 and No. 7, is 2200 feet in length and has an angle of 63°. To appreciate the difficulties in erecting such a line, it is necessary to take a trip over it. There are several lines in the district much higher from the ground, but none quite as steep. To one not accustomed to riding the tramway lines, it looks as if the bucket was going straight up. The sensation cannot be described. The total length of the three lines is 4750 feet, with a fall of 2200 feet.

Fig. 3 shows the boarding house and upper terminal of the upper jigback. This boarding house is built on the side of the mountain, and in order to get room enough it was necessary to blast out of the solid rock. From the porch to the bottom of the next stopping place it is several hundred feet, almost perpendicular. The material for this boarding house and terminal was packed on burros from the railroad at Howardsville, 4 miles north of Silverton and 1 mile from the lower terminal of the tramway, up Cunningham gulch, where a trail was struck and followed to the top of the mountain, making about 5 miles by trail and less than 1 mile straight up the hill, where it was lowered down in an improvised chute a distance of 500 feet. A steel range for the boarding house was also handled in this manner. This work was done in the dead of winter, and anyone familiar with the San Juan country during winter months will understand the trials and tribulations of a tramway builder at that season of the year.

The pack train in some sections is almost a necessity, as to build wagon roads would mean large amounts of money, and until the country is more thickly settled and more mines opened up the pack train must of necessity take the place of the railroad and tramway. The pack train shown herewith consists of seventeen mules carrying 3400 feet of 1⅛-inch wire cable in one piece for use on an aerial tramway.

In Leadville some of the ore is loaded from the ore bin at the mine direct to the railroad cars for shipment to the smelters, and in many instances it is hauled by four, six and eight-horse teams to the railroad.

In Gilpin county, at Central City, the majority of the mines are located on the line of the Gilpin County Tramway, which traverses the hills as far as Russell Gulch and down to Black Hawk, to the mills, where it connects with the railroad.

In Cripple Creek it is interesting to see the number of railroad tracks circling here and there around the hills to the different mines in the district, and to watch the trains as they are loading with ore for shipment to the mills and smelters. In this district, which cannot be said of any of the other districts in the State, the men are enabled to live at home and catch an electric or steam train at a certain hour in the morning or at night for their work, and which takes them within a few minutes' walk of any of the mines.

It is believed that in time a majority of the mining camps will be equally as well supplied with transportation facilities. One thing in favor of Cripple Creek, the hills are not so hard to get around as in the southern part of the State and in other localities, although the grade on some of the railroads entering the camp is very steep.

There is now considerable talk of an electric road being built to the different mines in Leadville district, which, if constructed, will be the means of handling much lower grade ore than at present.

*See illustrations front page.

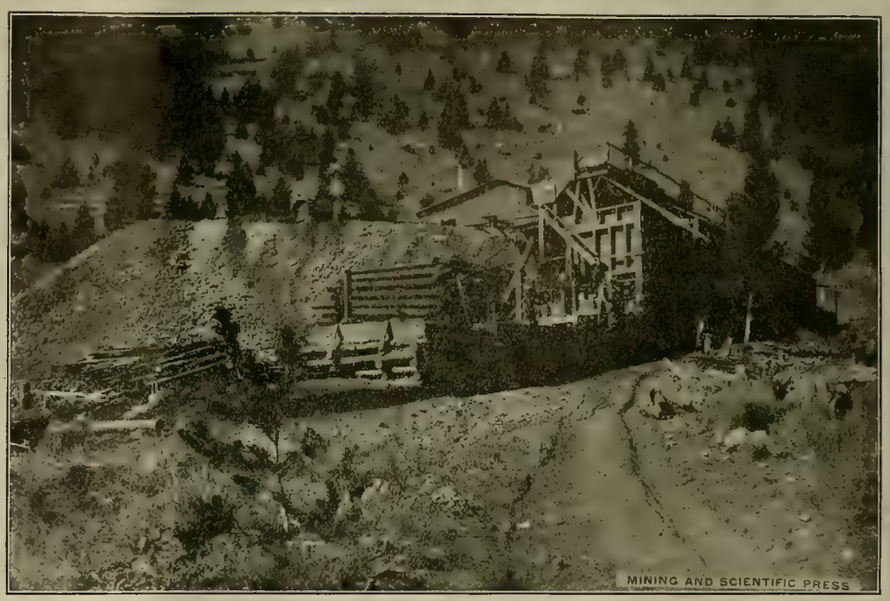

Fig. 8.—The Ore Bins and Jigs at the Mine.

Fig. 9.—Seventeen-Mule Pack Train, 3400 Feet 1⅛-Inch Cable, Southern Colorado.

Southern Rhodesian Gold Mining.*

Written by C. E. PARSONS.

The conditions existing to-day in southern Rhodesia are widely different to those of a few years ago, the general welfare of the community being more dependent upon the existence and prosperity of small individuals than it has been in the past. The growth of tributers and small local syndicates operating mines of their own or properties originally developed and leased to them is one of the most noticeable features.

The value of the gold for the year ending March 31st, 1905, was £1,120,528, or 31.8%. The return for June, 1905, was valued at £127,812, which constitutes a record. This amount was contributed by seventy-two producers, of which about fifty-six were individuals and local syndicates who have embarked their own capital and labor in the various enterprises.

Of the total value of gold produced for the month of June, over £38,000, or 30%, emanated from small owners. From this it will be seen what an important factor they represent. In June 774 stamps or their equivalent were operating, and at the present moment over 200 further stamps or their equivalent are under order.

A large number of properties which have not yet reached the milling stage should be producing in the near future. Of these the following may be mentioned: The El Dorado, Sabiwa, Giant, Jumbo, Battlefield, Clifton, Yankee Doodle and Etna. All these mines have considerable ore reserves. Milling has just commenced on Qaika and Beatrice mines, neither of which figures in the June output. In two other cases milling plants are being increased. Allowing for the exhaustion of several of the existing prop-

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erties, a progressive output should be maintained.

Rhodesia has advantages over the Transvaal in that it is better timbered and watered. Against that, railway rates are high and materials in consequence more expensive. It has cost the inhabitants £9 10s to £16 a ton for goods imported by them. Railway rates, however, are shortly to be reduced about 25%. The configuration of the country in a few instances, together with water power, is in its favor. This applies principally to the Umtali district. The ore deposits do not possess the permanency and stability that obtain in the Rand conglomerate series, but compare favorably with those on most of the other gold fields scattered over the globe, both from a geological and mineralogical standpoint.

It is not too much to say that Rhodesia offers a very wide field for small mining propositions. At the same time low-grade reefs and bodies of ore exist that cannot be well handled by individuals owing to the heavy outlays demanded. Most of the gold is derived from quartz veins and reefs, but a large percentage is also extracted from diorite, schist, and a small amount from alluvial deposits.

In the Lomagundi district a deposit of auriferous conglomerate on the El Dorado mine is attracting a great deal of attention, and excellent results are being obtained. Small owners may now work to a profit under arrangement with the Chartered Co. Should they make more than £100 profit a month, a royalty of 2½% is payable on the gold won. If, therefore, profits do not reach £100, no royalty is demanded.

The auriferous area is extensive, large and small gold mines being scattered throughout the territory and exist at wide intervals apart, often many miles from a railway. Mines treating varying tonnages, from 14,000 tons to a few tons of specimen stone, or even less, are the order of the day.

Working costs are difficult to get at, conditions varying to such an extent that we find every case stands by itself. The president of the Chamber of Mines in his last annual report selects seven representative mines. Two large low-grade mines working under exceptional conditions are not included. The following are his approximate figures:

	£	s.	d.
Mining	0	10	2
Milling	0	4	10
Hauling, crushing, sorting and headgear	0	2	9
General	0	3	0
Cyaniding	0	3	2
Total	1	3	11

This does not include redemption, depreciation, etc. With these additions the amount would work out to about 30s.

Tributers working on a smaller scale, having fewer expenses and not including their own time, would probably work for from 12s to 20s per ton. This figure can only be estimated from experience. Altogether about 1200 whites and 1500 natives are employed in the mining industry.

Apart from gold, silver valued at £902 and lead at £548 were obtained in June, 1905, while deposits of copper, zinc and wolfram occur. From the Wankie collieries about 7000 tons of coal is being supplied to the railways, mines, and in other directions. Near Gwelo a water-worn deposit of diamondiferous gravel is being prospected and stones of good quality have been found.

Unlike many Australian "fields," the country under irrigation or during the wet season is capable of producing all kinds of crops, while vegetables grow well. It is an excellent stock raising country. About 1100 whites live by farming, scattered over 950 farms. These factors will assist the gold industry. The total population consists of 12,000 white people and 565,000 natives living in the country.

In most cases outcrops and the upper portions of reefs of any value have already been removed from the surface to 30 and over 100 feet by the "ancients," consequently modern mining often commences below the first level.

The general practice in Rhodesia is that adopted in other parts of the world, with modifications. The stamp battery (heavy type) finds most favor. A large number of other mills are used by themselves and as auxiliaries. One large dry crushing roller mill is treating upwards of 14,000 tons a month, and another smaller plant is being erected. Over twenty Tremain steam stamps are in operation, also ten Huntington mills. Several tube mills will shortly be at work.

Wolframite and the Prospector.

In recent years a great deal of interest has attached to the tungsten minerals, of which the most important are wolfram, hubnerite and scheelite. Wolfram is the most abundant so far as known. Considerable quantities have been mined in the southern Black Hills of South Dakota in granite dikes, and in the northern Hills in Cambrian quartzites. In Arizona and in other States it occurs in veins. The following description of wolframite, by a writer in the London Mining Journal, is of interest and value to prospectors:

Wolfram is of a black or deep brownish black color, and has a luster resembling black glass, but with a metallic or submetallic tinge. In breaking, it usually cleaves along flat, shining faces, very much like antimony, and in this respect is very different from the conchoidal fracture of broken glass. Where exposed on the surface this cleavage is not always present. On handling the mineral one is impressed with its specific gravity; it is heavier than iron, not quite so heavy as lead—about the weight of metallic copper. The following list shows the specific gravity of wolfram compared to that of other substances: Wolfram 7.8, magnetite 5, hematite 5, hornblende 3, titanic iron 5, tinstone 7, rutile and metallic iron 7, metallic copper 8, lead 11 and water (the standard).

The streak is the mark left when the mineral is scratched by a substance harder than itself, and corresponds with the powder when the mineral is finely crushed. Minerals agreeing with one another in color very rarely have the same colored streak or powder, and this fact is useful in distinguishing wolfram from those minerals which otherwise it closely resembles. Magnetite, hematite, titanic iron, manganese dioxide, tourmaline, tinstone, hornblende, zincblende, black volcanic glass, etc., are all black, or most of their varieties are, but vary considerably in the color of their streak.

The streak of magnetite, coal, manganese is black, that of tourmaline, tinstone, rutile, hornblende and volcanic glass is of various shades, but all light colored, while hematite, zincblende, chromite and titanic iron resemble that of wolfram in leaving a dark-colored streak tinged with brown or red.

The hardness of a mineral is also a very useful test. Titanic iron, chromite, wolfram, hornblende are about as hard as a common knife blade; while hematite, tourmaline, magnetite, tinstone, rutile and franklinite are all harder.

As an example of the working out of the various tests how to know wolfram, say I have a blackish mineral. Its weight at once impresses the observer. It would, therefore, not be hornblende, chromite, zincblende, tourmaline nor rutile, but might be either wolfram, magnetite, hematite, titanic iron or tinstone (specific gravity test).

A piece now very finely crushed gives a powder or streak which is neither black nor light colored. Taking those among which the mineral might be found in the previous tests, it will be seen that it cannot be tinstone (light colored) or magnetite (black), but being reddish or brownish may be wolfram, hematite or titanic iron (streak test).

If one now takes a small piece of the mineral and tests it in a blowpipe flame and the mineral fuses or melts on the edge or corners, it is therefore not hematite nor titanic iron, but probably wolfram (fusible test).

Now break from that piece a flake, and the clean, bright submetallic luster of a cleavage face is shown. The presence of the mineral is confirmed (cleavage and luster test).

I thought the above may be some guide to the wolfram prospector, but to those more advanced I append a chemical test.

CHEMICAL TEST.—As a tungstate of iron and manganese gives a gray, infusible mass on charcoal, with borax, and lead gives colorless beading in the oxidizing flame; in reducing flame gives a yellow bead while hot, which changes to yellowish brown when cold. With microscosmic salt it gives a colorless bead in the oxidizing flame, while in the reducing flame it is dirty green when hot and becomes blue on cooling; on the addition of iron it is blood red.

Wolfram when present in small quantities may be detected as follows: The sample is fused with about five times its weight of sodium carbonate, the mass extracted with water, and the tungstic acid precipitated in the form of a white powder by means of hydrochloric acid. The precipitate becomes yellow on boiling, and is insoluble in excess of the acid, but dissolves in ammonia. The solution after acidification gives a deep brown coloration with potassium ferrocyanide, and after some time a precipitate of the same color separates out. The solution, after adding the ammonia, gives a white precipitate with silver nitrate and yellow stannous chloride. On acidification with hydrochloric acid, and warming, the precipitate becomes a beautiful blue color, which is very characteristic. If wolfram is treated with strong sulphuric acid and some zinc added to the solution, the solution will have a deep blue color. Wolfram is usually associated with tinstone, and for a long time the separation of the minerals was a matter of considerable difficulty. It is now effected by roasting the crushed minerals with carbonate of soda, by which means tungstate of soda is formed and the tin ore can be separated. The tungstate of soda thus formed is used with starch for rendering light fabrics such as muslin uninflammable. It is also employed as a mordant by dyers; it is also used for hardening plaster of Paris, and it is the chief source from which tungstic acid is derived.

For the estimation of the quantity of the wolfram present, the best method is as follows: Take ten grains of the substance and boil for about an hour with twenty-five cubic centimeters of pure hydrochloric acid, then add five cubic centimeters of pure nitric acid; boil for about half an hour and then allow to stand about twelve hours. Dilute with an equal volume of water, and filter. The iron and manganese are obtained in solution, while the silica and tungstic acid compose the residue (with, perhaps, tin). Collect the undissolved residue, filter and wash with dilute hydrochlorine, dissolve in warm ammonia, filter off the undissolved residue—silica and possible tin. Dilute the solution and evaporate to dryness in a weighted porcelain dish; when dry, ignite carefully till it assumes a uniform yellow color, cool and weigh. The iron and manganese, etc., are then to be estimated.

Black Sand Investigation.

During the last session of Congress, says U. S. Geological Survey Bulletin No. 199, an appropriation was made to enable the U. S. Geological Survey to investigate the black sands of placer mines. Under the supervision of Dr. David T. Day, chief of the division of mining and mineral resources, samples of black sands have been collected from placer mines of the United States, British Columbia, Central America and Mexico, and concentration experiments have been carried on all summer at the Lewis and Clark Centennial Exposition at Portland, Or., in connection with the exhibits of mining machinery. A preliminary report on the progress of the investigation has recently been submitted by Dr. Day to the Director of the Survey.

A circular letter requesting samples of black sand was sent last March to the 8000 placer miners of the United States and 828 samples of sand have been received for investigation from all parts of the United States. Of these, 195 specimens have been assayed for their contents of gold and platinum, with the results shown in the accompanying table:

AMOUNT OF GOLD AND PLATINUM CONTAINED IN BLACK SAND CONCENTRATES FROM VARIOUS PLACER MINING DISTRICTS.

[OUNCES PER TON.]

LOCALITY.	County.	Gold.	Platinum
ARIZONA.			
Columbia	Yavapai	.79	.06
Granite Creek	Yavapai	trace	trace
Walnut Grove	Yavapai	trace	trace
CALIFORNIA.			
Oroville	Butte	19.94	27.45
Alvarado placer mine, Butte Creek	Butte	5.22	.17
Buchanan Hill	Butte	1 09	.08
Peavine Creek	Butte	7.03	.83
Empire	Butte	.08	trace
Wild Goose mine	Calaveras	39.08	.35
Orleans	Humboldt	19.00	4.00
T. 16 N., R. 12 W., Sec. 7	Mendocino	trace	trace
Rough and Ready Township	Nevada	5 60	.52
Taylor mine, North Fork American river, Colfax	Placer	29.26	1.27
Southwest of Auburn	Placer	24.14	1.48
Gold Run	Placer	37.61	8.78
Gold Blossom mine, Butcher Ranch mining district	Placer	191.60	3.36
American River	Placer	126.90	9.67
Nelson Creek	Plumas	1 45	.12
Boulder Nest mine on Grizzly Creek, Genesee district	Plumas	1.44	.66
Rock Island Hill mine	Plumas	10.80	.16
Little Grizzly mine	Plumas	trace	trace
La Porte	Plumas	2.98	.21
Van Dusen canyon, Holcomb	San Bernardino	.12	.06
Gem mine, Sacramento river, north of Redding	Shasta	64	.28
Gypsy mine, Shasta district	Shasta	8.29	.25
Fox Creek	Siskiyou	.72	trace
Grouse Creek	Siskiyou	10 31	.18
Happy Camp district	Siskiyou	nour	.82
Junction City mining district	Trinity	28 43	25.80
South Fork and Trinity river	Trinity	9.02	1.28
T. 5 N., R. 7 E.	Trinity	4.90	4.61
COLORADO.			
Buena Vista	Chaffee	1.99	.43
San Luis Valley	Costilla	none	trace
Junction of Gunnison, Chaffee and Pitkin counties	Pitkin	.05	.05
Pole Creek, Cretone	Saguache	.34	.06
West of Telluride	San Miguel	.37	09
Saw Pit	San Miguel	trace	trace
IDAHO.			
West of Blackfoot	Bingham	19.62	.18
West bank Snake river	Bingham	1.60	.70
Ox Bow tunnel, Payette river	Boise	.52	.28
Gold Fork, North Payette river	Boise	2.02	.08
Bear Creek mining district, Rocky Bar	Elmore	1.10	.11
Baker Gulch, Crooked river	Elmore	trace	trace
Gem placer mine, Menan	Fremont	trace	trace
Elk City district	Idaho	1.06	.05
Pierce City	Shoshone	.16	.04
Big Island, North Fork Clearwater river	Shoshone	.16	.08
Beaver Butte mining district, Trail creek	Shoshone	6.40	trace
MONTANA.			
Princeton	Granite	1.67	.05
NEW MEXICO.			
Los Cerrillos	Santa Fe	trace	trace
Tecolote mountains	Lincoln	trace	trace
OREGON.			
South of Durkee	Baker	9.90	.22
Old Ocean Beach, Randolph mining district, No. 1	Coos	1.8	2.10
Old Ocean Beach, Randolph mining district, No. 2	Coos	none	.91
Old Ocean Beach, Randolph mining district, No. 3	Coos	.02	.10
Ocean Beach, Whiskey river	Coos	none	.20
Ocean Beach	Coos	1.25	6.23
East of Riddle	Douglas	4.71	8.59
Cow Creek mining district, Glendale	Douglas	50	2.25
Riddle	Douglas	19.27	128.73
North Fork Steamboat river	Douglas	.18	.02
No. 2 Bohemian mining district	Douglas	trace	trace
Fry Gulch mine	Josephine	1.88	4.53
Galice Creek	Josephine	none	.26
Sucker Creek	Josephine	6.53	.67
Allen Gulch mine, Waldo	Josephine	37 30	.58
Coyote Creek	Josephine	none	trace
South Santiam river	Linn	2.60	3.52
Camp Carson district, Grande Ronde river	Union	2.40	.12
SOUTH DAKOTA.			
French Creek	Custer	trace	trace
UTAH.			
Colorado river	Garfield	6.36	.15
North of Morgan	Morgan	trace	trace

Adequate machinery and appliances have been secured and placed in the Lewis and Clark Exposition,

Portland, Or., in charge of competent metallurgists, to treat one carload in eight hours. The manner of treatment varies with the kind of sand to be treated. The sands are grouped in two classes—(1) sea sands, low-grade gravels and tailings from a number of dredgers and their middlings from placer workings, and (2) heavy tailings from concentration, containing the residue from the cleanup from placer mines, etc. The method of treatment so far developed for beach sands and tailings from placer mines has been to deliver the sand, after appropriate sampling, to the automatic feeder. It is then elevated to the roof of the building, passing over the screen, and delivered to an automatic distributor, from which it is evenly fed by a current of water through four iron pipes to the several concentrating machines. These machines separate the sands into three portions—concentrates, middlings and tailings. The entire concentrates and middlings are collected and samples of the tailings are taken out every five minutes. Samples of these concentrates, middlings and tailings are dried and then treated by the process devised by Henry E. Wood of Denver, Colo., by which the sands are first separated by the magnetic separator into six portions by five successively increasing currents, representing the chief minerals contained in the sands. These are finally separated by a hand batea. The end products thus separated and obtained are magnetite, chromite, garnet, olivine, monazite, zircon, quartz, gold and platinum. The amounts of these minerals are then weighed and the portions representing precious minerals are assayed.

The following results are stated to have been obtained by concentrating the black sand: Forty pounds of black sand received from Placer, Josephine county, Or., yielded oversize on 10-mesh screen 18 pounds 9 ounces, which yielded 13.754 grams of gold nuggets. The undersize through a 10-mesh screen, weighing 21 pounds 5 ounces, yielded 11.6 grams of nugget gold. Its total weight being 25.354 grams, the gold would be worth, if pure, $16.84, giving a value per ton of $842.

Another run of the black sands was from the residue from a cleanup of dredging operations from Rock Point, Or., weighing 468.6 pounds, containing quicksilver, amalgam and gold. The oversize through 10-mesh screen was 223½ pounds and yielded 3.992 grams of gold; the undersize was 243 pounds and gave 15.270 grams of gold, making a total yield of nugget gold of 19.262 grams. This, if pure, would be worth $12.71, or the residues were worth $54.20 per ton.

The Mercur Gold Mines of Utah.

The annual report of the Consolidated Gold Mines Co. of Utah, for the year ending June 30, 1905, is of interest to mining men of the western United States. During the fiscal year the daily average tonnage was 671 tons, the total for the year being 245,026 tons, of which about one-third was base ore. From all this ore an average of $2.97 was extracted, being 11 cents per ton more than the previous year.

The tailings values during the year showed a remarkable fluctuation in value. Concerning this the report makes the following statement:

TAILINGS.—The tailings, by months, were as follows:

July, 1904	$0 91	January, 1905	$1 18
August, 1904	86	February, 1905	1 04
September, 1904	85	March, 1905	1 02
October, 1904	94	April, 1905	92
November, 1904	96	May, 1905	95
December, 1904	1 21	June, 1905	92
Average			$0 98

On last year's report, the tailings averaged $1.03 per ton, hence we have gained 5 cents per ton on the extraction.

It will be observed that the tailings do not always remain uniformly low, the fluctuations being chiefly due to variations in the character of the ore. However, the general average shows a material improvement over the work of the two preceding years. It is true that we do not extract all the soluble gold, and it was for this reason that we undertook our disastrous experiment with the slime plant, two years ago. However, we aim to operate along the lines of greatest profit, and, while it might be possible to get a greater extraction of values by some other method, the increased saving might be more than offset by added expenses. The Mercur ore is a rather complex one, and many suprising things happen, from time to time, in the course of its treatment. I do not feel as if we had reached the best possible results, and even now we are experimenting along some new lines, in the hope of finding a cheap, practicable method of getting our tailings as low in practice as they can be got in impracticable laboratory tests.

ORE VALUES.—Adding the amount lost in the tailings to the amount extracted, we find that the average value of the ore treated during the year was $3.95 per ton. This most important item, too, shows an improvement over last year's results, the average value of the ore having increased 6 cents per ton. On such a large tonnage as we handle, an increase of a few cents per ton soon runs into money.

EXPENSES.—The mining costs for the year, including prospecting, were $370,934.56, or $1.51 per ton. The milling costs were $273,865.08, or $1.12 per ton. Accordingly, the total operating costs of the company, including all expenses, except construction items, were $644,799.64, or $2.63 per ton.

This is the lowest record for expenses that the company has ever made, the best previous report being $2.88 in 1903. It is obvious that this economy of operation was the greatest factor in bringing the company such a prosperous year as compared with the preceding twelve months.

The mining cost per ton shows an increase of eleven cents over last year's figures. This is not surprising when it is considered that the past year has been devoted largely to reopening the mine. Driving into caved stopes has been expensive, both for labor and timbers, and ore from such places naturally costs more to get out than from virgin bodies. There have also been some extraordinary expenses for repairs, that were charged to operating, mention of which is made under Mine Report.

The milling costs, on the other hand, have shown a most gratifying decrease, being forty-eight cents per ton less than last year. Economies have been effected in many departments, and especial attention has been paid to regulating the work, according to the principle of intensified production.

DIVIDENDS.—One dividend was paid by the company during the year, viz.: Dividend No. 20, June 6, 1905, 2½ cents per share, or $25,000.

The previous disbursements of the company were $1,030,000, hence the total dividends to date are $1,055,000.

Adding to the above the amounts paid by the old Mercur and De La Mar companies, prior to their consolidation, we find that the total of the dividends paid by the properties of the Consolidated Mercur Gold Mines Company is $3,235,312.97.

MANNING MILL.—Last summer, after making the necessary repairs, the Manning mill was leased on a royalty basis. The lessees operated the mill for a short time, but their results were so disappointing that they were obliged to throw up the lease, and the company received no revenue from their operations.

Upon the relinquishment of this lease, the mill was operated by the company until the end of the season. This run lasted from September 25th to December 5th, during which period 21,040 tons of old tailings were re-treated. The gross production was $13,587.90, or 64 cents per ton, and the total expenses were $11-452.43, or 54 cents per ton. Hence, the net profits on the company's operations were $2,135.47, or 10 cents per ton.

This spring the mill was again leased, and up to the close of the fiscal year the company had received royalties amounting to $4038.15, covering the months of April, May and June.

MILL REPORT.—The year ends with the mill generally in good condition, so far as machinery and general equipment are concerned. The building, however, needs painting, and some of the iron roofing will have to be renewed. These matters will be attended to before winter.

CRUSHING.—In the crushing department no material change has been made, except to regulate the operations of the machinery so as to handle the ore most economically. Some alterations have been made in the size to which the ore is crushed, as well as in the screening arrangement, with a view toward bettering the extraction. This department is giving good results, and is being cheaply operated.

ROASTING.—In the roasting department five furnaces are at present in operation, although during portions of the past year only four were running. The furnaces now handle a larger tonnage than ever before, with far lower operating expenses, and with only a fraction of the repairs of former years.

LEACHING.—The leaching department has been operating very smoothly during the past year. Particular care has been exercised in the method of charging the ore into the leaching tanks, as well as in applying the solutions. The consumption of chemicals has been comparatively low, that of cyanide being .82 pound per ton of ore.

The tailings tracks were changed, and new cars provided, to admit of the use of horses in tramming out the tailings, which are now being discharged by contract, at a considerable saving to the company over former day's pay work.

MINE REPORT.—The past year has been an interesting and important one in the mine. Broadly speaking, the work has largely consisted of reopening the older workings. Early in 1904 the property was in a precarious condition. A considerable portion of the mine was caved, and had been abandoned as worked out. This seemed surprising, in view of the fact that the various blocks of ground had never yielded anything like the quantity of ore indicated by the original development. Our more recent operations have made it clear that the caving of the various stopes was not due to exhaustion of the ore, but to faulty mining. The mining was nearly all done with stulls. This system is very good under certain conditions, but the Mercur ore bodies range from 20 to 80 feet in thickness, and to attempt to mine such an ore body by means of stulls, even though the vein be taken in slices, or "subs," is wholly impracticable, and it is not surprising that in some of our best stopes not over one-third of the ore was got out before the country caved. The mine was in the first place quite intelligently prospected and developed; but the same good judgment was not displayed in the selection of mining methods.

We have done a great deal of prospecting in virgin territory, during the past year, and have opened up much new ore; but a large share of our work has been in going back into the old stopes, driving through caved ground with tunnel sets, preparatory to mining by the caving system. To persons inexperienced in this sort of work, this often seems dangerous; but, as a matter of fact, when done by men accustomed to it, it is as safe as running untimbered tunnels in new ground. Hence, there has been no apprehension on the score of safety, the principal thing to look out for being to keep solid bottom for all drifts, and not to drive over any open caves, which might let the floor of a drift through. We have been very successful in this respect, the single exception being due to disobedience of orders on the part of contractors who were breaking ore by the car. But, of course, this sort of work takes great quantities of timbers, which run up the cost of the ore while we are blocking out. Furthermore, the drifts are not made very large, so they do not produce much tonnage as they progress. Again, while in some stopes the cave drifts are all in ore just as if it were a virgin ore body, in some other places the material contains a great deal of waste rock, the waste often exceeding the ore. The ore from such places, naturally, is pretty expensive.

Taking the foregoing points into consideration, it is not hard to understand why our mining costs increased a little during the year.

ORE RESERVES.—I wish it were possible to make a close estimate of the tonnage of ore in sight in the mines, but it must be apparent to anyone reading what I have said about the workings in caved ground that this is out of the question. The best I could hope to do would be to make a guess. I said last year that I thought the ore then developed ought to admit of profitable operation for at least two or three years, and that there was no reason to doubt that during such a period many new developments would be made. The year's results have shown that that estimate was certainly conservative. I feel just as confident to-day that we have at least twice as much ore in sight as we had a year ago.

IMPROVEMENTS AND REPAIRS.—Owing to the great difficulty we have had with hand sampling, we decided last year to build a small sampling mill at the Mercur mine. The mill went into commission in December and has been of great advantage, because instead of having to rely upon samples of a few pounds, we can now run through a ton at a time, if desired, thereby getting much more reliable results. In building the plant, we used a good deal of material and machinery we already had on hand. The financial statement shows the cost of the plant to be $1514.76. As a matter of fact, it cost about $500 more than this amount, but the difference was charged to operating expenses.

Our large electric hoist got into bad condition during the year, owing to the wear and tear of seven years' operations. We are obliged to provide an entire new main driving gear, which costs about $2000, all of which was charged to operating expenses.

The timbering in the Tramway tunnel at the Mercur pockets, under the tailings dump, got into such wretched condition that it became necessary to give the place a general overhauling. Since the condition of the mine had so greatly improved as to justify the expenditure, we retimbered the entire wide part of the tunnel with 12x12 inch Oregon fir timbers, the sets being 8 feet high in the clear. This makes a commodious, safe and convenient tunnel, that will last for years. The cost of the work was several thousand dollars, and was included in the operating expenses.

These extraordinary expenditures run up the cost of mining. Unfortunately, they are not all over yet. Among the prospective jobs for the ensuing year is retimbering the main shaft, which is in bad condition, and which is a constant source of expense for repairs.

A RECENT Reuter dispatch from Madagascar contains the following: "The draft of the decree for the regulation of mining in Madagascar is still at the Ministry of Finance, where it is being examined by the Minister of Justice. As soon as the document is returned to the Ministry of the Colonies, M. Clementel will submit it to the Council of Ministers, and will publish it as soon as possible in the Gazette. The decree divides the mines of Madagascar into two categories, alluvial mines and reef mines. In the case of alluvial mines a tax of 5% ad valorem on the gross output and an annual tax of 2 francs per hectare of land will be imposed. As regards reef mines, the system to be adopted will be similar to that in force in the Transvaal. There will be a tax of 200 francs per hectare and an ad valorem tax of 10% or 15%. The amount of the ad valorem charge has not yet been finally determined, but it is very probable that it will be fixed at 10%."

THE Council of the American Institute of Mining Engineers has accepted the invitation from the Council of the Iron & Steel Institute of England to hold a joint meeting in London in August or September, 1906, the exact date to be subsequently decided. The ninetieth meeting of the Institute, for the reading and discussion of papers, will be held at Lehigh University, South Bethlehem, Pa., beginning Feb. 21, 1906.

Mining and Metallurgical Patents.

PATENTS ISSUED SEPTEMBER 19, 1905.

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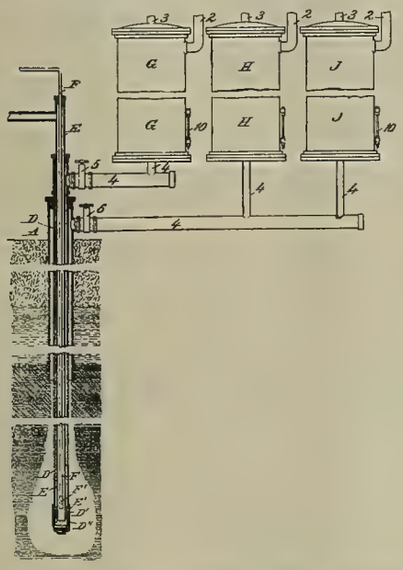
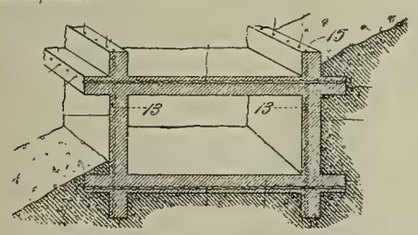
PROCESS OF MINING SULPHUR. — No. 799,642; H. Frasch, Cleveland, Ohio.



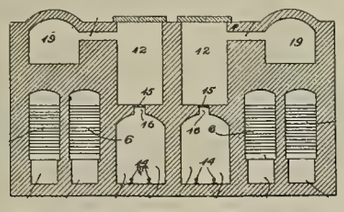
In sulphur mining in porous rock, improvement consisting in forcing hot water into underground deposit and out through walls of mine cavity, so that it flows away through surrounding rock, allowing melted sulphur which separates itself by gravity from water in mine to collect until it seals end of sulphur pipe, and introducing air or other aeriform fluid into column of melted sulphur so as to reduce its density and allow it to be raised by pressure in mine cavity.

CONCRETE FLUME.—No. 799,827; W. L. Church, Boston, Mass.



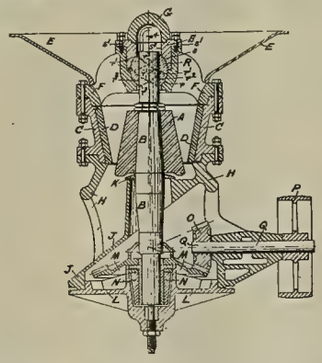
Flume comprising opposite walls having outwardly projecting flanges, and connecting wall, all of concrete and integral with each other, and series of independent transverse tie rods connecting side walls, tie rods formed with means interlocking with concrete and having ends embedded in flanges.

METALLURGICAL FURNACE.—No. 799,745; P. A. Mackay, Newcastle, New South Wales, Australia.



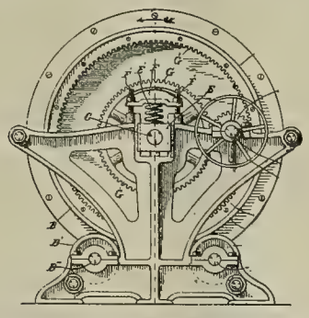
In metallurgical furnace comprised in unitary structure, combination with parallel passages or chambers extending longitudinally along center of furnace, regenerative furnaces extending longitudinally along sides of furnace, passage ways connecting regenerative furnaces with parallel chambers, partitions between chambers, each partition being hollow to form left and right reduction chamber having thin walls, oxidizing chambers extending longitudinally over regenerative furnaces, one at each side of structure, passage ways connecting left reduction chambers with left oxidizing chamber, passage ways connecting right reduction chamber with right oxidizing chamber, opening in top of each reduction chamber for receiving products to be treated, passage way below each row of reduction chambers, and trap door 15, at bottom of each reduction chamber by means of which products of each of reduction chambers may be conveyed to each of passage ways below reduction chambers.

ORE CRUSHER.—No. 799,647; P. Hart, Johannesburg, Transvaal.



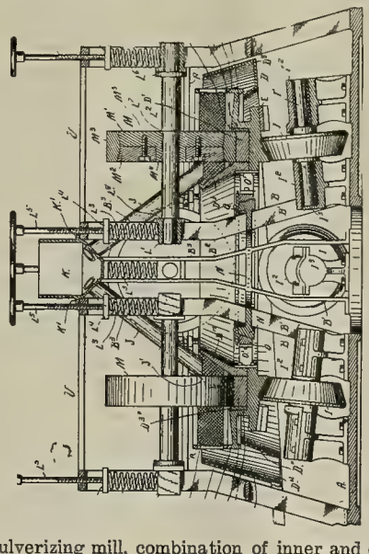
In crusher of nature indicated in combination, cone spindle and crushing cone secured thereon, means for imparting gyratory and eccentric motion to spindle, ball slidably fitted on upper extremity of cone-spindle above cone, spider forming bearing for upper end of cone spindle, spider having semispherical internal recess which is adapted to receive portion of ball and adjustable gland fitted in top of spider and having internal semispherical recess to fit upper portion of ball, gland being fitted to spider in such manner that spherical socket is formed for ball in which ball is confined vertically and permits it to rotate, gland also having hole above top of cone spindle, and a cap which serves for closing hole in gland, cap having internal recess forming with hole in gland, grease or lubricant holding box communicating with spherical socket and from which grease or lubricant can pass between sphere and socket and ball and spindle.

PULVERIZER. — No. 799,990; G. S. Knapp, Grand Rapids, Mich.



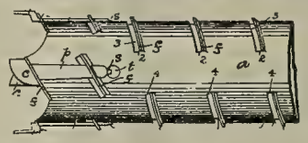
Combination of rotative case, means for passing material longitudinally through case, large roll near axis of case and movable vertically, and series of smaller rolls surrounding large roll and radially movable relative thereto, all of rolls being supported by lower side of case.

PULVERIZING MILL —No. 800,089; J. H. Elspass, Denver, Colo.



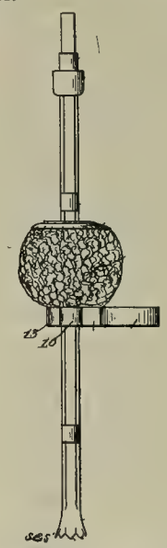
In pulverizing mill, combination of inner and outer series of posts, each series of posts having inclined lower parts whose lower extremities are outermost, upper portions of both series of posts being vertical and bifurcated, annular rotary mortar located between two series of posts, rollers supporting mortar from below, pulverizing rolls provided with axles journaled in boxes mounted in bifurcated vertical portions of inner and outer posts, tension springs also located in bifurcated portions of posts and engaging springs from above, pulverizing rolls co-operating with mortar to perform pulverizing function.

DRILL FOR MINING PURPOSES. — No. 799,880; J. Tonge, Jr., Westhoughton, near Bolton, England.



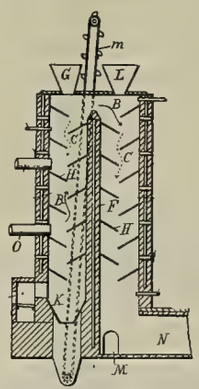
Drill comprising tubular body provided with volute flanges, plurality of flanges being slotted, and cutters provided with stems adapted to project through slotted flanges, tubular body being provided with holes or openings into which ends of stems are bent.

HOLLOW PERCUSSION DRILL.—No. 800,004; J. Murphy, Leadville, Colo.



Percussion drill having mounted thereon adjustable dust catcher consisting of body of water-absorbing material having portion thereof surrounding and engaging drill, sleeve mounted upon drill, extending partly through body and provided with integral flange abutting against one end of body, and attaching means secured to flange to which body is secured for connecting latter to sleeve.

TREATMENT OF SULPHIDE AND COMPLEX ORES.—No. 799,696; C. H. Ward, Sydney, New South Wales, Australia.



Process of treating ores containing sulphur, which consists of following steps: First, in raising temperature of crushed ore to degree sufficient to cause decomposition of sulphides by means of current of hot gases moving in direction opposite to movement of ore; secondly, adding sodium chloride to ore so treated; thirdly, subjecting mixture of ore and sodium chloride to hot gases produced during first step of process and causing such gases and ore to move together in same direction; and, fourthly, reducing temperature of commingled ore and gases while they are moving together by introduction of cooling medium.

PROCESS OF TREATING ZINC ORES. — No. 799,743; P. A. Mackay, Wenona, Ill.

Process of treating zinc ores containing cadmium sulphide and zinc sulphide, which consists in subjecting ore to dead roast, whereby zinc sulphide is oxidized and cadmium sulphide converted into cadmium sulphate, thereafter dissolving out deleterious sulphate and grinding and distilling remaining zinc oxide to obtain therefrom pure refined zinc.

Structure and Genesis of the Comstock Lode.*

The formation of the Virginia City bonanzas is peculiar, and has never yet been concisely presented. The present developments in mining work have thrown much light upon this question of genesis. In the Virginia City portion of the lode the ore occurs not in the main fissure, but in openings or veins in the hanging wall, which occupy nearly vertical positions. These veins are more nearly allied to gash veins than to what are usually called fissure veins. The secondary vein, now so productive in the Ophir ground, has brought to light some valuable and interesting facts: (1) It has been found only in the lower mine levels, either as a mere fault zone or a productive deposit. (2) From the lines of motion preserved finely in the clay gouge, the relative movement of the walls is seen to have been nearly horizontal, whether north or south the writer is not able to state definitely. From the parts of the vein observed, however, chiefly on the 2050 level, it seemed probable that the motion was to the south for the east wall, dipping downward about 4° in the same direction This corresponds to the view that the vein itself is due to a pulling apart of the rock mass, causing the greatest openings to the north, in the concavity caused by the bending of the vein to the east at the north end.

* * * * * * * *

The ores are doubly interesting from the fact that their deposition still continues, due to faulting opening up new fissures and fractures, and from the fact that the mine waters are, for such waters, rich solutions yielding very positive results to fire assay methods. The ores are moving in two ways—upward and downward.

That the ores have moved upward at more than one time has been noted best by Becker. He writes: "In the great California & Virginia bonanza several streaks or veins of very rich black silver ores, said to be largely stephanite, occurred These were separated from the surrounding quartz very sharply, as if of later origin." Again he writes: "What I have seen * * * leads to the belief that these rich concentrations were of later origin than the rest of the ore. The quartz in the C. & C. was almost everywhere a crushed powdery mass, while the thin and persistent veins of black ore running through it were very solid. A somewhat similar relation seems to have existed near the croppings, and it is not impossible that these ores were formed at the expense of others of the more usual kind at a later date, and that they occupy spaces opened in the ore masses by a faulting action."

The writer had hoped to present even more conclusive evidence of successive deposition and its recency, but owing to the fact that the lowest mine workings are not open to outsiders, this became impossible. However, such evidence as already possessed is as follows:

In the ore bodies opened within the last year on the secondary vein now worked, some pertinent facts presented themselves. The finest specimens of ore show often very perfect crystals of stephanite and argentite coating, or wedged between, quartz crystals. Coating one side, the downward side, of all the minerals, is a thin layer of calcareo-siliceous material. Below the surface crystals of ore and quartz is a layer of quartz, resting in turn upon a second layer of calcareo-siliceous matter. This shows below it a second layer of ore, resting upon quartz crystals, and so on, the series often repeating itself several times more or less perfectly. In that portion of the ore occurring in the lower depths, from which the water has been drained but a short time, the surface layers of ore, quartz and calcareo-siliceous matter showed clear and fresh, while, on standing in the open or in the higher portions of the vein, the same minerals appeared dusty and old. In some of the vugs in the lower portion of the ore body, quite a number of small but perfect rhombohedra of calcite were found; also, as noted by Becker, old fractures in the ore, caused by faulting movements, are cemented with quartz and ore. In the ores now worked, however, the motion appears to have been a pulling apart, for brecciation, though present, is rare, and the two sides of a cemented break are usually fully complementary. This process of successive deposition is not limited to the Virginia City portion of the lode, but is found quite well developed in the Gold Hill mines, and in the calcite gangue of the Justice ore body.

Further uncemented fractures present themselves as indicators of motion up to the present time, since the withdrawal of the waters by the mine pumps. The great volume of water still entering the lower workings also contributes abundant proof of fissures kept open by late motion, for the lode proper, where cut by the shaft, is reported to have been completely filled with quartz.

* * * * * * * *

The ores are moving downward by the leaching action of the acid surface waters. In this way they are extracted from their containing rocks and redeposited below. This process in the past has produced the striking nodular ores of the Andes mine, noted by King as occurring just below the level of ground water. These ores are now in their turn being attacked and again being carried below. A striking example of the ore deposited by the vadose waters was exposed on one of the levels of the Andes mine. The presence of east-west slips has already been noted as occurring here, and one of these, dipping south 60°, had opened sufficiently to allow the free circulation of water. The slip had cut across all other rocks, vein and country, and was filled with about 2 inches of solid coarse black sulphides of lead and silver. This small sheet of ore pinched out toward the bottom of the drift, and broadened above. The grain of the ore, and general characteristics of ratio of lead to silver, etc., were all different from the ore which occurs below, deposited from the deep circulation. The nodular ores consist typically of nodules ranging in size from that of a pea up to a foot in diameter, and composed of rich black sulphide ore in a matrix of fine crystals of quartz. Each nodule is completely surrounded by barren quartz, which at times may penetrate the nodule along later cracks. These quartz crystals are built upon the nodules as centers, giving them a radial arrangement.

All the facts relating to these peculiar ores tend to confirm the view of their deposition resulting from the intermingling of oxidized surface waters with deep alkaline unoxidized solutions. They are known to occur nowhere else on the lode in any mine workings, although the exploration within the croppings is very little in amount.

The acid surface waters which are now doing so much work have covered the walls and crosscuts of the Andes mine with 6 inches to 1 foot of sulphates, containing traces of gold and silver. The chief salt is the magnesian aluminum sulphate, with also large admixtures of iron and copper, which results in a remarkable variety of colors. The workings of the Central tunnel likewise show these sulphates, but in general the circulation of air is too rapid to allow of their great formation except in some favorable localities. The composition of these salts is shown as an average in the water analysis following. In the Central tunnel in one particular spot, where the surface waters are not fully oxidized, ferrous sulphate and pyrite are being deposited at the present time. Some sulphates are being formed here in delicate needle-like crystals containing a large amount of the ferrous salt. Bright, well-formed cubes of pyrite and some few dark sulphides, too small in amount to admit of testing, occur below and within the sulphates. Not infrequently a little crystal of pyrite tips a needle of sulphate where the solution is plentiful. Also, almost solid masses of the sulphide are found within the wall in the partly decomposed country rock. The water is descending along an east-west slip which dips to the south. The clay, or clayey rock, upward along this slip is full of pyrite, but this mineral is heaviest near the wall of the drift where the solution is able to cover more ground. The clays of the upper portion of the lode are all found to contain well formed but small crystals of pyrite containing some value. There is probably but one process responsible for all this, and a possible reaction of the surface waters to produce such a result may be expressed as follows:

$$FeSO_4 + 2H_2SO_4 + 7H_2SO_3 = FeS_2 + 8H_2SO_4 + H_2O.$$

This reaction is, of course, possible only when there is an insufficient supply of oxygen, as occurs locally in this part of the Central tunnel.

The water surrounding the sulphates and pyrites being deposited is strongly acid, the most so where the pyrite is heaviest. As the wall is worked into the acidity becomes perceptibly less. The ferrous sulphate appears to exercise the necessary protecting influence over the pyrite to save it from attack by the free acid or further attack by the small amount of free oxygen present.

* * * * * * *

The Comstock lode is divisible on structural grounds into two main portions: (1) The Virginia City portion and (2) the Gold Hill portion. The Silver City fault or lode (or branch, as now called) is a distinct unit, probably of a later age. The grounds for this belief are, as seen, the facts of it being a distinct fault and that the vein filling is different from that of the Comstock lode proper. The only grounds for a belief in a later age are those of structure; it is well shown that much faulting took place after the first formation of the main lode, and to combine all the facts presented it is necessary to assume a period of faulting not coincident with that which formed the bonanza gashes, but later than the first faulting. In this country of great and long-continued faulting such an assumption is not without a good basis.

The Virginia City portion of the lode is bounded on both north and south by a series of east-west faults. Also, to the north, some forking of the lode occurs, with one strong branch bending to the east in the Sierra Nevada ground. The faults or slips to the south are those approximately in and east of Bullion ravine. But few of these east-west fractures contain much secondary mineral. The few which do become veins are largely calcite bearing, and probably of different age from the others. Between these two lines of east-west motion is located the Virginia City portion, differing from the other part in having a greater relative movement of the foot and hanging walls. This motion has been so great that an unequal movement of the hanging wall block was produced, the bottom moving farther than the top, with consequent rupture. These ruptures produced the secondary vertical gashes, or veins of rifting. This motion causing rupture, however, was distinctly later in age than the first vein forming movements. Hence, when the secondary openings were formed they were filled with concentrations from the previous deposits as well as with original supplies from great depths. And there is no good reason for assuming that either the movements or the ore deposition have ceased, but rather all facts tend to confirm the idea that ore is yet being moved from place to place in the greater depths, as well as fresh supplies from below being brought up by the hot waters.

In the Gold Hill portion the relative movement of the walls of the lode has been less; there have been no rift veins formed, and the ore bodies are within the lode walls, near the hanging. The same two periods of deposition of vein filling were present here, the bonanzas occupying later fissures near the hanging wall of the earlier vein. No doubt deposition is still progressing in depth here, though not enough mining work has been done to allow a definite statement in this regard. The one exception to form in this portion of the lode, in the Yellow Jacket mine, was due to the fact that the vein, in its proper plane, did not reach the surface, so that the relative movement of the hanging wall block downward was taken up near the surface by a gash or rift.

On account of the importance of the subject, a reiterated statement is not out of place regarding the two periods of ore deposition. Had the second of these periods not existed, there would be practically no ore on the Comstock, hence the relations of these two must be of vital concern. The first period of vein filling was due to the primary faulting, and low-grade materials were placed in the open fissure. The second and later period opened new fissures, rift veins in Virginia City, and openings within the vein in Gold Hill, in which the rich concentrated ores of the bonanzas were deposited. This second period probably continues in the depths, as it would surely do above were the lode still intact from man's hand. The details of this ore deposition have not yet been thoroughly studied out, nor can they be until our knowledge of the physical chemistry of the subject is more complete.

The deep ore bodies of Virginia City have been, and will be, found within the hanging wall, in more or less vertical fissures, of which the surface east vein, the Great Bonanza and the vein now being worked are examples. More such bodies should be found by properly driven crosscuts and drifts lower down and to the eastward. There is also a large stretch of the lode above the 2150-foot level which has not been thoroughly explored. The probable reason for the peculiar rifting of the hanging wall block is that the cementing of the first fracture by quartz, and the concomitant weakening of the hanging wall by the leaching action of the ground waters, enabled the later stresses to fracture the hanging wall block as it is found. The reason for believing in the existence of still deeper similar rifts filled with ore is that the surface for 2 miles eastward from the lode shows the hanging wall block to be greatly altered by the action of hot waters, and therefore weakened. The Sutro tunnel section corroborates this, and the mine workings also show the rocks east of the lode not to be solid nor unaltered.

Also, there is considerable concentration of ore taking place from above from the surface, or vadose, waters. These ores will occur on or near the foot walls of the numerous branches of the lode which outcrop on the surface, within a few hundred feet of the outcrops. Such material is low grade, however, and, in the main, not yet available because of the high cost of mining and milling. A body of future reserves is thus assured. The low grade of these ores has been proved by numerous assays. Further, the west wall of the lode has never been thoroughly investigated, and such work might prove very profitable.

*John A. Reid, University of California, an abstract.

Automatic Plumb Bob.

J. S. J. Lallie of Denver, Colo, inventor of instruments and attachments for use of civil, hydraulic and mining engineers, has recently invented an automatic plumb bob, designed to furnish instantaneous action in elevating or depressing the bob to any desired position, without the use of screws or other devices. With it, it is stated the engineer can make the adjustment of the bob as readily while wearing gloves as without them and, when the survey is complete, the cord may be instantly coiled within the bob. The matter of proportion has been taken into consideration in shaping this new plumb bob, and it is provided with a case-hardened steel point, steel bushing in the head, rounded to preserve the cord.

Application of Electric Power to Gold Dredging.*

As the modern gold dredger is primarily a western institution, it might possibly be well to briefly describe the object of it and the method of operating it before taking up the subject of power.

The object of the gold dredger is to collect the gold from the deposits of sand and gravel which have been deposited there by the action of some river or glacier which, in its course, has broken up and carried along the rock that originally formed the boundary of its channel. When gold bearing veins exist in the rock, the gold in the course of time becomes freed from its surrounding ore and is together with the gravel deposited at some point, where the velocity of the stream ceases to be high enough to keep the gravel in motion.

Many schemes have been devised to regain the gold from these deposits, the simplest being to feed the gravel into an inclined sluice box through which a stream of water flows. The gold, owing to its greater specific gravity, is deposited in the riffles in the bottom and the gravel is carried through. To use this process on a large scale, there must be a sufficient grade to the deposit of gravel and underlying bedrock to prevent the tailings from interfering with the excavating operations which feed the gravel into the sluice. Ordinarily, a pit was sunk to bedrock and the gravel elevated by means of a conveyor to the sluice above at a height sufficient to carry the tailings away from the workings.

In many localities the prohibitive cost of water has made it impossible to work these deposits by this means. The perfection of the gold dredger within the past ten years has made it possible to work many of these low-grade deposits and many properties that have heretofore been considered worthless are now paying good interest on the investments.

The dredger, in brief, consists of a floating platform provided with an endless chain of buckets working on a ladder; one end of this ladder is fixed and the other can be raised or lowered, thus regulating the depth of the cut. The gravel, sand and boulders are scooped up by the buckets elevated and dumped into a revolving screen. Jets of water play on the gravel and thoroughly wash it. The gold, gravel and smaller stones fall through the openings in the revolving screen to a shaking table, while the larger boulders that might damage the tables and riffles pass through the end of the revolving screen and are carried through chutes to the side of the dredger and deposited. The coarser gravel is separated from the finer on the shaking table and falls on a belt conveyor which carries it to a considerable distance in the rear and deposits it, thus filling up the cut. The finer gravel containing the gold passes over a system of riffles containing mercury, where the gold is collected; the gravel and sand are washed over the riffles and fall overboard in the rear. The dredger is held in position by an anchor in the rear, and side lines from the bow permit the buckets to be fed across the face of the cut.

The first dredger that was a commercial success as a placer mining machine in the United States was installed at Bannock, Mont., in 1895. The first season it was operated by steam power, but the high price of fuel (wood was $4.50 per cord and coal $12 a ton) made the operating expenses extremely heavy and the steam equipment was replaced by a direct current electric system, a hydraulic generating plant furnishing the power.

From its nature, the dredger is not adapted to the receiving or carrying of fuel, often being operated at points very difficult of access, and by its great flexibility, electric power is the ideal motive power for this class of service and has become universally used, making it possible to reduce the working force one-half.

There are at present two of these dredgers being operated near Golden, Colo., power being furnished from Denver, one owned by the Clear Creek Dredging Co., about 12 miles from Denver, and the other by the National Gold Dredging Co., about 11 miles. It is reported that two more will be installed within the next year, but this cannot at present be verified.

The electrical equipment of one of these dredgers is as follows: One 20 H. P. three-phase induction motor for operating the revolving screen; one 20 H. P. induction motor for operating the shaking screen; one 20 H. P. induction motor for operating the stacker or conveyor that deposits the gravel in the rear; one 30 H. P. induction motor for operating the sand pump; one 50 H. P. induction motor direct connected to a 10-inch and 6-inch centrifugal pump for furnishing water to the revolving and shaking screen; two 45 H. P. direct-current motors with series-parallel-reverse control for operating the buckets; one 20 H. P. direct-current motor used to operate winches and in moving the boat and raising and lowering the anchor; one 10 H. P. induction motor for driving a centrifugal pump in the hold used in priming the other pumps and for clearing the hold of leakage water.

The direct current motors are supplied by a 100 K.W. rotary converter and a 5 K.W. transformer of 370 to 110 volts supplies current for the lights when operating at night.

The entire electrical equipment was supplied by the General Electric Co. The induction motors are of the Type "K," starting with a separate compensator and all operating at 370 volts, e phase. The direct current motors operate at 600 volts.

As to the nature of the loads on the various motors, that on the motors that drive the buckets is a peculiar one; it may be described as a combination of an elevator and a street car load with not quite as many stops and no particular need for very rapid acceleration. When beginning a cut at the surface, the incline up which the buckets travel may be only 20° from the horizontal; the soil is, as a rule, very loose and the starting torque is, comparatively speaking, nominal. The motor has only to overcome the inertia due to the mass and weight of the buckets—that is, from 400 to 600 pounds per foot of length. As the buckets become loaded with gravel the load increases. The speed of the buckets at the top of the cut may be as high as 50 feet per minute. This load is similar to an elevator load and is steady, the only fluctuations being caused by a bucket as it revolves around the lower tumbler, taking an extra large bite out of the gravel or else missing the gravel entirely. As the depth of the cut increases the load becomes heavier, because of the greater angle up which the buckets travel, the gravel being packed harder and the occurrence of large boulders.

Most of the gold is found in the gravel immediately over bedrock, and it is desirable to get all of this gravel possible. The most severe condition on the motors occurs when they are stalled, caused by the buckets striking an extra large boulder, a stump, or by the bank caving and completely burying the buckets. In such a case the motors are reversed till a little slack is gotten into the chain; the motors are again started and this reversing continued till the buckets are worked loose; whatever the nature of the obstruction is it must be overcome, because the boulders, if not dug out, will form an effective barrier between the buckets and bedrock, and upon bedrock lies the bigger per cent of the gold. On some of the newer dredgers variable speed induction motors are used for the buckets and winch drive, thus dispensing with the rotary converter.

Rotary converters, especially when operated on 60 cycles, are not entirely satisfactory, and more or less trouble is encountered in their operation when handled by inexperienced men, and the experience of dredging engineers is that the reliability of the induction motor drive more than offsets the higher efficiency of the series parallel control of the direct-current set. Actual tests on the bucket motors show them to operate at from 1.4% to 25% overload.

The induction motors driving the centrifugal pumps, shaking screen, revolving screen and conveyor are, after once started, subject to constant load, or very nearly so. Actual tests show them to be loaded as follows:

50 H. P. for centrifugal pumps	60% full load
20 H. P. on conveyor	35% " "
20 H. P. revolving screen	29% " "
20 H. P. shaking screen	34% " "
10 H. P. for hold pump	30% overload

The motor that drives the winches is not subject to any unusual load. The power required to move the boat is not great and the winches are fitted with two speed gearing and friction clutches. A good part of the time this motor is running light. Test shows this motor to operate at from ½% to 50% overload.

While the total connected load is about 200 K.W. for each dredger, the power required varies from 75 K.W. to 150 K.W., the average being about 100 K.W. Most of the induction motors are much larger than really needed, and, since they are very light loaded, the power factor is bad.

Had the power company been consulted in the selection of these motors, smaller motors would have been chosen, which would have resulted in a smaller motor investment and a better power factor on the system.

The load, from the central station standpoint, is a very desirable one. They operate the entire twenty-four hours for nine months of the year in this climate, and for the remaining three winter months it is a day load—just exactly the load the central station is looking for to improve its load factor.

As a matter of fact, the machinery is so heavy and the service so severe that they are shut down possibly 20% of the time for repairs. As a matter of general interest, I may say that the bucket train consists of forty buckets of 5½ cubic feet capacity, weighing 1500 pounds each, and capable of handling about 3000 cubic yards of gravel per twenty-four hours.

The consumption for a dredger of this size is very nearly 1 K.W. H. per cubic yard of gravel handled. Current is delivered on the grounds of the dredging company at approximately 11,000 volts, three phase and 60 cycles; it is stepped down to 370 volts and delivered on board at this pressure.

The step-down transformer station is quite unique, inasmuch as it is portable in form. The transformer house, containing three 50 K.W. oil-cooled transformer choke coils, lightning arresters and switches, is built as compact as possible and mounted on skids, so that it may be moved from place to place as the operation of the dredger progresses. The dredger is connected to the transformer house by 600 feet of 3/0 three-conductor cable. This allows the dredger to operate over quite a large area and necessitates the moving of the transformer house only once in every four months.

Since the direct-current motors can not be operated at potentials greater than 600 volts, this requires that the alternating current shall not be at a greater pressure than 370 volts, and, as the induction motors must be built for this voltage, they must all be special machines. This departing from the line of standard operation necessitates the motors all being special makes and the installation more expensive and difficult to replace in case of accident. This is a strong point in favor of the induction motor drive on the buckets.

In conclusion, I will say that the rate to be charged for this class of service can only be determined by the costs of generation and the costs of construction, each case requiring a separate analysis, the construction costs in most cases being so large that the business might be found unprofitable on a straight meter rate, unless it contained a heavy minimum to assure the central station of continuity of operation, and I would advise the use of a rate similar to the Doherty, or else a sliding scale.

*A paper presented to the 1905 meeting of the Colorado Electric Light, Power & Railway Association by J. F. DOSTAL.

The Ventilation of Mines.

NUMBER VII.

GASES DUE TO EXPLOSIVES.—Mr. Mann's special report deals very fully with the nature of the gases produced by firing of explosives, and the accidents recorded show that the vitiation of the mine air from this source is liable to be very serious, and that there have been more than a few deplorable fatalities from it, though the total number is, after all, surprisingly small when compared with the immense amount of explosives used, as pointed out by Mr. Mann. The most distressing cases are those in which the oxides of nitrogen appear to be the active agent, the sufferers experiencing little inconvenience at the time except a good deal of coughing, and having no warning at all from the way the candles burn that the air is bad. The circumstances under which part of the explosives burns instead of exploding are not completely determined and are not easy to find out. Out of the hundreds of charges fired daily, it is only very rarely that one burns, probably many thousand plugs exploding completely for one that takes fire. When the percentage is so small as this, it is clearly very difficult to determine what are the causes of failure to explode. The experiments carried out by Mr. Mann showed that complete explosion could be obtained over and over again with overloaded holes and weak detonators, so that neither overcharging nor undercapping can be relied on to produce incomplete explosions, as has been commonly held. Nevertheless, it has been shown that there are often causes at work which would tend to reduce the strength of detonators, as, for example, leaving them exposed in moist workings; and we would therefore recommend that all detonators should have the full strength prescribed for their particular number, as laid down in Mr. Mann's report. It seems possible that in a very minute percentage of cases the explosives may be bad, but these are so rare that the chances are enormously against the bad plugs being pitched upon for testing. In continuous work, however, every one of them must be used some time. The same may be said of detonators and fuse; one bad cap or piece in 10,000 would almost certainly escape testing, but would be found sooner or later in working through the stock. One such bad piece may cause an accident, while other plugs from the same package, or caps from the same box, or pieces of fuse from the same coil, may be tested time after time and proved to be perfect. Absolute uniformity of manufacture cannot be guaranteed, and it seems just as likely that inexplicable explosions and burning of charges may be due to the very rare occurrence of bad materials, as that it is brought about by any of the causes popularly assigned to it. Nevertheless, our inquiries have led us to the conclusion that the general quality of the explosives used in this State is good; and it does not seem possible in practice to greatly improve on the methods of testing now employed. Age of the explosive and the manner in which it has been stored, may have a good deal to do with deterioration of quality. It has been pointed out in Mr. Mann's report that the merchants' magazines are frequently inspected; but it appears essential, also, that stocks should not be kept in the mine magazines for too long a time without similar supervision. Several witnesses, who were practical miners, told us of their having met with instances of charges burning instead of exploding—some having actually seen the bright glare of the burning stuff, others judging by the characteristic smell and by the state of the holes afterwards. It seems possible that the cause of this burning may be that an earlier shot has blown off the top of the charge and the detonator with it, and ignited the remainder without exploding it, as it is well known that such "cut-outs" occur not infre-

quently; and it seems also possible that a cut-out charge might be ignited by sparks from showers of stones thrown out by the other shots. Another cause is probably the practice followed by some miners of burying the detonator deeply in the charge; for if the fuse "spits," as it is liable to do occasionally, it might ignite the explosive before the detonator is reached. The rate of burning of the explosive is extremely rapid, and a considerable amount may therefore be burned before the fuse ignites the buried detonator, and thereby explodes the remainder of the charge. In Mr. Mann's tests it was only when the detonator was buried that a strong reaction was obtained for nitrous fumes in the gases resulting from the explosion. The result of burning of explosives is always the production of quantities of very poisonous fumes of carbon monoxide and nitrogen peroxide, as explained in Mr. Mann's report. The disastrous accident at the Mount Charlotte mine, at Kalgoorlie, by which six men lost their lives, shows how deadly these gases may be. Similar accidents are on record elsewhere, and the moral to be drawn from them is that all places in which shots have been fired must be thoroughly cleared out by a current of air before they are fit for men to resume work.

It is worth noting that, according to our knowledge of the decomposition of nitroglycerine explosives, the formation of peroxide of nitrogen is accompanied by that of carbon monoxide; so that when the one gas is present the other should be also. It is commonly stated that a certain amount of carbon monoxide is found even in complete explosions of nitroglycerine compounds, while no mention is made of the peroxide of nitrogen; but the equations given by authorities on the subject all involve the simultaneous presence of both gases, the oxide of nitrogen in greater volume than the carbon monoxide. Yet in analysis quoted in the Transvaal Commission's report, and also by Haldane, Martin and Thomas, carbon monoxide is often reported without any corresponding peroxide of nitrogen. In the tests carried out by Mr. Mann, both gases were uniformly absent, so far as any measurable quantity was concerned, except when some blasting gelatine had been deliberately burned, though traces of nitrogen peroxide could be detected qualitatively in several cases by the very delicate iodide-of-starch test. In wet workings it may be that the very soluble fumes of nitrogen oxides are rapidly absorbed by the moisture present, while the slightly soluble carbon monoxide remains in the air. This may be the explanation of the accident to Owen Hughes, at the Turn of the Tide mine, who appears, according to the medical evidence, to have been poisoned by oxides of carbon without being affected by the oxides of nitrogen. We cannot, however, feel at all certain of the diagnoses that have been made in cases of fumes poisoning, as our inquiries rendered it very evident that hardly any of the medical men examined had given special attention to the nature of the gases causing accidents, or had been at pains to ascertain whether nitrogen oxides or those of carbon, or both, were responsible for them.

(TO BE CONTINUED.)

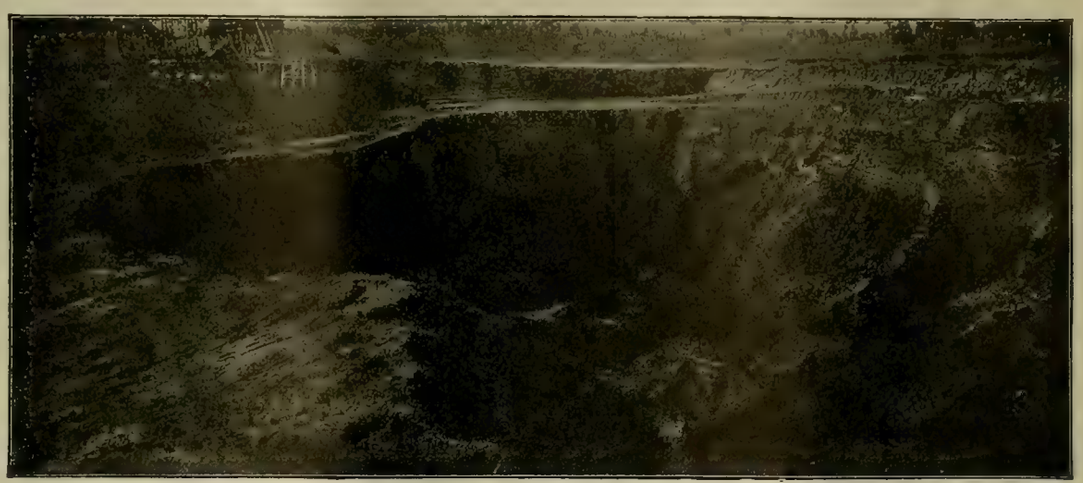
Quarrying Iron Ore.

Written for the MINING AND SCIENTIFIC PRESS.

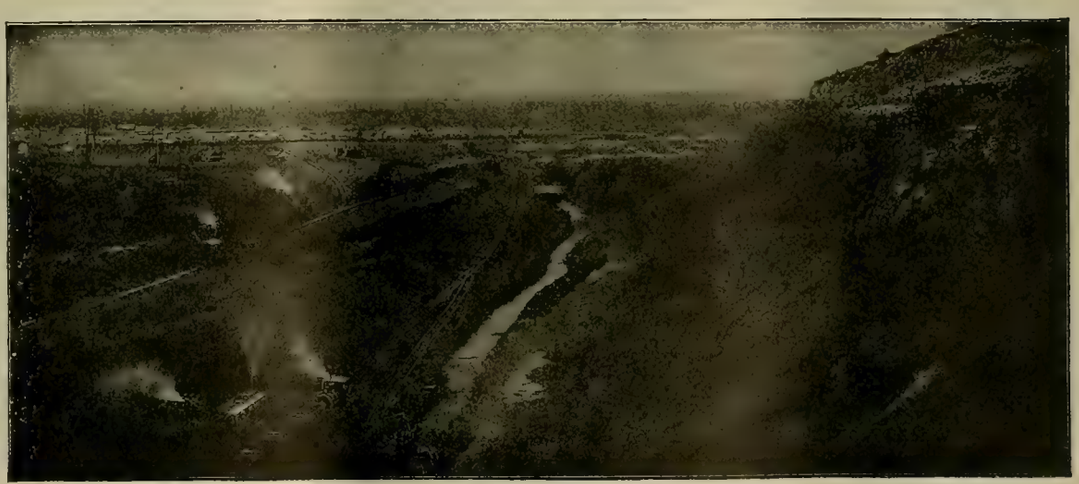
Vastly different in appearance from the drift mines of California, the quartz mines of Colorado, or the copper mines of Montana, are the iron mines of Minnesota. Of the latter, there are several kinds and modes. In the surface pit a steam shovel is the main factor in results, it being an open cut like ordinary railroad work. In the underground iron mines is the nearest approach to gold or copper workings; the expense of securing the ore is considerably more, but as it requires extended admixture of different iron ores to make the required quality of iron, and as some of the requisite ore can only be secured from lower strata, the extra expense becomes necessary. Another form of iron ore mining is the milling, or deep, open pit. Manifestly the cheapest mine to operate is the surface pit, of which the Missabe Mountain mine, Mesaba range, Minnesota, furnishes a good illustration. As shown, the ore is simply loosened up, lifted on cars by steam shovels and started for the smelter, there to be converted into steel. In an open pit mine the surface is first stripped of its soil, which may be 2 or 50 feet in depth. The accompanying illustration of an open pit at the Auburn mine, on the Mesaba range, gives a better idea of the appearance of such a mine than any written description. This style of mining is mostly in vogue where the ore is in gigantic pockets. It sometimes occurs that a costly pumping plant must be provided. Where depth is attained and the ore vein is followed, such a mine as that depicted develops into an underground mine, with its customary shafts and levels.

Mining and scientific progress is grandly exemplified in the case of the Lake Superior iron mines. Not only is this shown in the system of mining, but to even a greater extent in the handling of the ore. A recent achievement in that line was the loading of a steamer—the Augustus B. Wolvin—at the Great Northern docks, Allouez bay, with 10,245 tons of ore in eighty-nine minutes. That ore was carried in that steamer to Conneaut, Ohio, at a cost of less than 75 cents per ton.

From the Lake Superior iron ore region, of which the Mesaba range is so prominent a part, there have been shipped over 250,000,000 tons of ore. About 80% of America's iron ores come from this region, and about that percentage of the country's iron and steel is made from those ores. This represents a growth of fifty-two years. In 1853 seventy tons of Lake Superior iron ore were used in a Pennsylvania blast furnace. Fourteen years after the Bessemer process (to which the Lake superior ore is particularly adapted) caused the Lake Superior iron ore mining industry to begin to assume its present gigantic proportions. There are now a score of mines there, each of which annually produces more than 500,000 tons of ore.



Milling Pit, Auburn Mine, Mesaba Range, Minn.



Missabe Mountain Mine, Mesaba Range, Minn.

THE PROSPECTOR.

The green-stained rock from Pine Nut range, Lyon county, Nevada, is feldspar porphyry, with incrusting stains of malachite (copper carbonate) and chrysocolla (copper silicate). Very low grade. The white rock is sericite schist.

Three packages of rocks received from Burnt Ranch, Cal., are determined as follows: No. 13, felsite, with finely disseminated pyrite. No. 14, a feldspathic rock containing several per cent of copper sulphide (chalcopyrite). One side is incrusted with calcium sulphate (gypsum). No. 15 is similar to No. 14, but also contains epidote (a greenish yellow mineral). No. 16 is from the croppings of a vein or deposit of iron and copper ore. The green mineral is malachite (copper carbonate). No. 17 is a much altered greenstone, probably diorite. No. 18 is probably the same kind of rock, occurring nearer the surface. This may prospect in gold. No. 22 is diorite. No. 23 is feldspar porphyry. No. 24 is diorite. No. 25 is also greenstone, probably diorite.

The samples from Hailey, Idaho, are: No. 1, a sulphide ore containing lead, iron, zinc, arsenic, a little copper, probably gold and silver. It is a very complex ore, requiring smelting, or concentration of the various minerals by means of magnetic separator. The gangue is quartz. No. 2 is gray limestone, one piece of which shows iron oxide.

The rocks from Goldfield, Nev., are as follows: No. 25, a type of diabase. No. 26 is chiefly calcium carbonate. No. 27 is rhyolite, with porphyritic feldspars and quartz blebs. No. 28, rhyolite. No. 29, porphyrite. No. 30, quartzite. No. 31 is basaltic rock. No. 32, rhyolite of fine and even texture. No. 33, diorite containing some iron sulphide. This rock is older than the volcanic rocks previously described, and probably occurs in the underlying formation or is from another district. No. 34, tuff. No. 35, similar to No. 32, but somewhat stained with iron oxide.

The rock from Unuk River, B. C., is diorite and contains disseminated copper sulphide and pyrite.

The slaty mineral from Corning, Tehama county, Cal., is hematite, with some earthy impurities. It is an ore of iron and should be tested as to its value by those engaged in the industry of iron making. At present no iron mines are being worked in California, although there are large deposits of the ore in various localities.

The rock sample from Lamb Creek, Idaho, is amphibole rock—consisting largely of hornblende. It also contains iron and copper sulphide.

The rock from Harrington, Ariz., is quartz, with bright, glistening specular iron (variety of hematite). This was probably mistaken for galena. The sample contains no lead, but should be carefully tried for gold.

The Prospecting department of this paper makes no analyses nor assays of rocks or ores—simply classifies rocks and determines minerals.

Placer Mining in Alaska.*

NUMBER VIII.

HOISTING.—For hoisting and conveying, say to a distance not exceeding 200 feet, the Dawson self-dumping carrier, with accompanying bucket, cables, etc., and steam hoist, must be used in order that the most economical work per man employed can be done. This device, which is shown in Fig. 16, is without doubt the best system of handling gravel from a shaft of shallow depth now in use in the Northwest. It is strong and compact, and is simple in operation. Those parts which by their position receive the most strain and jar can be made sufficiently durable to withstand hard usage.

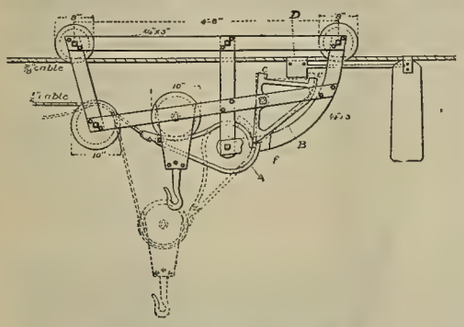


Fig. 16.—Self-Dumping Carrier.

No springs are used in the construction for the reason that at low temperature, say 40° F. below zero, metals are very brittle, and the constant jar, a necessary accompaniment of the work of this apparatus, renders springs and any light metallic member unsafe.

As Fig. 16 shows clearly the construction of the carrier, only a few words need be said of its operations.

It may be stated that three distinct operations are accomplished, two of which are performed by the carrier, the third being effected by an auxiliary rope used in dumping the bucket. The first consists in engaging the bucket as it arrives from the shaft and carrying it to the dump box, the second in returning the bucket to the head of the shaft and there dropping it to the bottom. As the carrier returns down the ⅞-inch cable, the hook to which is attached the bucket occupies the position indicated by the solid line. The cam A lies horizontally and is held firmly in this position by the dog B, the weight of the bucket pressing the notch of the cam against the point of the dog f. When the carrier reaches the head of the shaft the end c of the dog strikes the block D and frees the point of the dog from the notch of the cam. The front of the cam now occupies the position indicated by the dotted line, and, as the bucket sinks into the shaft, is pressed against the block, since the carrier tends to move backward. Thus as the bucket sinks with the hook on the ½-inch cable the carrier is held firm.

As the bucket rises from the shaft or pit the strain is toward the engine, and the lower en of the dog e still prevents the apparatus from movi .

When, however, the cam A by the up ard movement of the bucket reaches the horizontal position indicated by the solid lines, the point of the dog f jumps into the notch, lowering at the same time the point e which allows the carrier to move up the ⅞-inch conveying cable, and also once more secures the cam in its horizontal position.

The block attached to the cable is held in a vertical position by a suspended log or block, which insures its engaging with the dog.

By this system of working, if the self-dumping rig handles 250 of the 30-pan buckets in ten hours or, roughly, 60 cubic yards, the plant will necessitate the employment of twelve men, namely, two firemen, one hoist man, one point man and seven men shoveling and wheeling, beside the foreman. The boiler used for generating the steam for points at night is used for running the hoist in the daytime. In running from fifteen to twenty points a night it will burn from one-half to one cord more. The total daily twenty-four hour expense can not be brought below $130 and will probably amount to $150. It is evident that with such a plant the tenor of the gravel must amount to at least $2.60 to the cubic yard to pay any profit at all, exclusive of washing in the spring, and should be 4 cents to the pan, or $5.20 to the yard, to pay a profit which compensates for operating in so remote and expensive a country. The cost of washing in the spring is in general from 50 cents to $1 per cubic yard.

The winter dumps are piled in a conical heap around the gin pole, to which the trolley cable of the self-dumper has been attached while the dumping is in progress. In laying out the space for the dump, the string of boxes in which the gravel is to be washed during the following spring is so laid that it will bisect the proposed cone, having its proper grade and length. When the spring opens the dump is easily shoveled into the boxes, from both sides, beginning at the lowest point and working upward. Boards are generally laid over the top of the boxes, and a portion of the gravel rests on these. The boards are taken off as the work of shoveling in progresses.

The expenses of winter work are much greater than those in summer, and the tenor of the gravel must in consequence be much higher. In the first place it is to be remembered that the gravel dumped in winter must be all rehandled in the spring. In thawing, also, the amount of steam used in winter is greater than in summer, and all pipes and hose conveying steam both above and underground must be coated with asbestos or other nonconducting material. On the other hand, labor is generally cheaper in winter than in summer, and the possibility of striking thawed streaks of ground is much less.

(TO BE CONTINUED.)

*Bulletin 263 U. S. Geological Survey.

SURFACE WATER may sometimes be kept out of the pit at the commencement of sinking a shaft through soil, decayed rock, or other loose material, by driving sheet piling, either of metal or wood, entirely around the excavation to bedrock or far enough into the ground to cut off the water percolating through it, thus forming a sort of coffer dam, from which the water may be removed. If the depth to bedrock is too great, then another means may be employed, but it will prove less effective—that of forepoling in the shaft—that is, driving lagging ahead of the work of excavation. This lagging must be of sawed plank and set as closely together as possible. It is not calculated to hold back the water, but to keep the soft ground back in place so that the miners may rapidly remove that from the bottom of the excavation. The water must in this case be removed by a pump or otherwise. Some difficult sinking has been accomplished by means of two shafts sunk close together.

The Nissen Stamp.

The Nissen stamp is an individual mortar stamp with circular screen surface. In South Africa coarse stamp mill crushing is deemed desirable because of the increased capacity per stamp and consequent saving of power and interest on the investment. There it is followed by regrinding in mills. Elspass mills, tube mills and Chilian mills are used for regrinding. The circular screen of the Nissen stamp, among other features, is intended to increase the capacity of the stamp. The splash in a Nissen stamp, striking the screen at right angles because of its being circular, is with the intent of allowing more ore to go through the screen each splash than ordinarily.

Fewer slimes is another essential. Where the splash of the water carrying the ore with it always strikes the screen at right angles, and thus gives the particles of ore crushed small enough to pass the screen better opportunity to do so, and the ore thus being able to escape from the mortar more easily, fewer slimes are made. This is especially a desirable feature where an ore is to be stamped to pass a certain sized screen for amalgamation purposes, and to be followed by concentration or cyaniding, or both, in either case the slimes being undesirable and increasing the cost of operation. Many mills in the western part of the United States have found this to be the case.

FIG. 1.

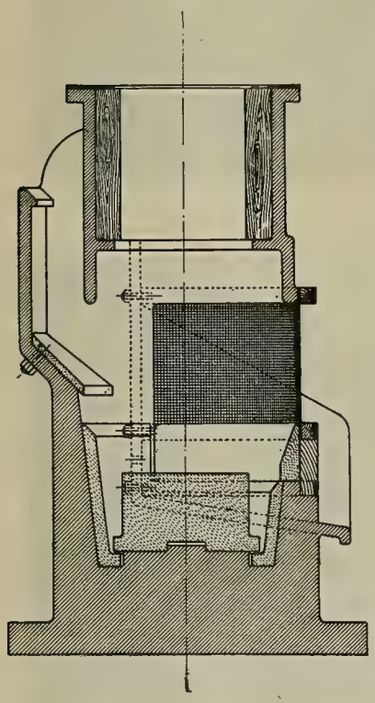


FIG. 2.

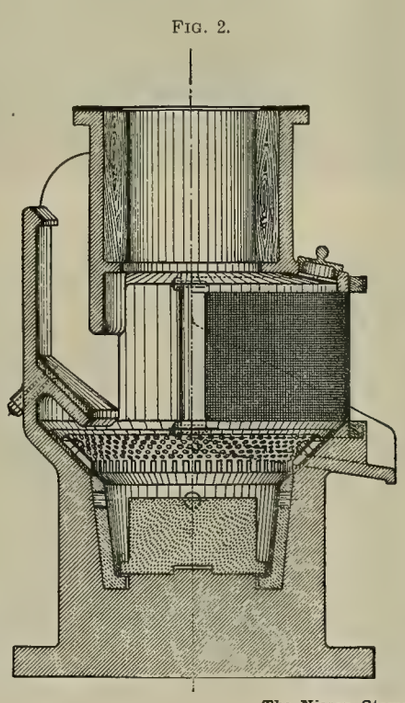


FIG. 3.

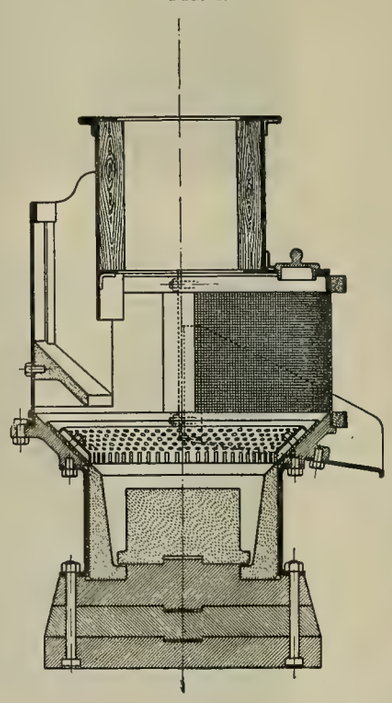
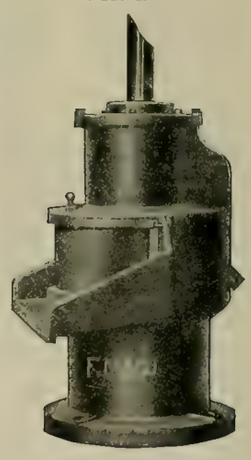


FIG. 4.



The Nissen Stamp.

The Nissen stamp is manufactured by Fairbanks, Morse & Co. in several styles of mortars to suit the particular requirements—as to discharge, size of the mortar and location of the amalgamation plates—that each individual mine has found best suited to their ores. It is primarily a circular mortar having a gravity stamp operated by the usual cam and tappet method, one stamp in each mortar.

Each Nissen stamp is intended to be a separate and complete stamp mill in itself. The mortar weighs one-third of that of an ordinary 5-stamp mortar. Each stamp can be hung up and the mortar cleaned separately.

The Nissen stamp chuck block mortar is shown in Fig. 1. General arrangement, height of discharge and other details are made in each case to suit the requirements of the mine. The Nissen mortar arranged for inside amalgamation is shown in Fig. 2. In many cases a sectionalized mortar for muleback transportation is necessary. The ease with which this can be arranged in the Nissen mortar is shown in Fig. 3. The general view of the Nissen individual mortar stamp in Fig. 4 shows the arrangement used in the Nissen stamp.

Fairbanks, Morse & Co. are the sole manufacturers of this stamp and assert that they have their plants running overtime supplying the demand that exists for this stamp and other of their mining and milling machinery.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ARIZONA.

Cochise County.

The new mill of the Vanita M. Co., which is working the Pearce property below Benson, was stopped after running a few days, by the breaking of essential parts, and instead of repairing them it is said that the company will build a larger mill. The new mill is to be built at once, and will have double the capacity of the old one. Pumping machinery supplies water from the mine to run the entire plant.

Gila County.

(Special Correspondence).—Shipping is to be resumed from the Starlight mine of the Tri-Bullion Smelting & Development Co., in the Stanley Butte region, 8 miles south of San Carlos. Mining work was begun in January, 1903.

San Carlos, Oct. 2.

The Arizona Commercial Copper Co. is putting in a Sullivan diamond drill on the 300-foot level of the Copper Hill mine, near Globe. A strike of rich ore was recently reported to have been made on this level. On the Black Hawk mine crosscutting on the 200-foot level is in progress.——Superintendent F. M. White of the Warrior Copper Co. is shipping fourteen tons daily to the Old Dominion smelter.——Work is to be resumed on the Arizona-Colorado M. Co.'s property near Globe by Superintendent J. W. Banhauer. The shaft, now down 300 feet, is to be sunk to a depth of 500 feet and then a crosscut made to the main lead.——The Globe & Arizona Dev. Co. have driven the tunnel on the Black Oxide claim 480 feet and is in mineralized rock. The company is also sinking a shaft on its Limestone claim.

Graham County.

(Special Correspondence).—Rich silver ore is being shipped from the Commerce mine, 14 miles from Duncan. It is under the management of Arthur Murphy. The new strike was made at the bottom of a 200-foot shaft.

Work has been started on the Fraction claim, near Metcalf, by P. F. Crowley.——It is expected that the new converting plant of the Shannon Copper Co. will be in operation about the first of the year.

Mohave County.

W. B. Ridenour, of Hackberry, has relocated the Hackberry mine and intends to reopen it to the north of the deep shaft. The mine was opened to a depth of nearly 600 feet when owned by the Indian Queen Co.—— R. P. Wheeler, of Milwaukee, is at the Sun Cloud mine, where he will give a contract to sink 100 feet, a whim having been sent to the mine from Congress. The mine is on the Big Sandy, 4 miles south of Signal.

CALIFORNIA.

According to the report on mineral products of this State for 1904, prepared by L. E. Aubury, State Mineralogist, the total value of mineral substances produced in the State in 1904 was $43,778,348; that of 1903 was $37,759,040, an increase of $6,019,308. This is a greater increase than has been shown for many years past, the usual amount for the past ten years being about $2,000,000 a year. The largest increase for the year is in the gold output, which amounted to $3,000,000 above the yield of 1903. The total value of the metallic substances (including precious metals) for 1904 was $25,114,699, which includes gold, silver, pyrites, quicksilver, copper, lead, manganese, platinum and chrome. The silver is given in commercial value, or the amount received for it by producers. The total value of non-metallic substances was $2,131,369. These substances include borax, coal, mineral waters, salt, infusorial earth, gypsum magnesite, mineral paint, lithia-mica, fullers earth, mica, soda, tourmaline and other gems. The total value of the hydrocarbons and gases was $9,257,434, an increase of $1,312,161. The hydrocarbons and gases include asphalt, bituminous rock, natural gas and petroleum. The petroleum price is the average free on board at wells or stations in each county. The number of barrels of oil produced was 29,736,003, valued at $8,317,809, as against 24,340,839 barrels in 1903, valued at $7,313,271. The increase in asphalt is also very large for the year, it now being made in the refining of California heavy oils. The total value of structural material was $7,274,846, an increase of $366,383 over the previous year. These materials include brick and pottery clays, Portland cement, lime and limestone, macadam, rubble and concrete, paving blocks, marble, granite, sandstone, serpentine, slate, glass sand and soapstone. The relative value of the principal minerals of the State is as follows: Gold, petroleum, copper, clays and their products, cement, rubble, quicksilver. The amount and value of each of the mineral substances is tabulated by the State Mineralogist as follows:

Asbestos, tons	10	$162
Asphalt, tons	56,187	672,910
Bismuth, tons	20	2,400
Bituminous rock, tons	45,280	175,680
Borax (crude), tons	45,647	698,310
Cement, bbls	969,538	1,539,807
Chrome, tons	123	1,845
Clays (brick), M	281,750	1,994,740
Clays (pottery), tons	84,149	81,952
Coal, tons	79,062	376,494
Copper, pounds	29,974,154	3,969,995
Fuller's earth, tons	500	9,500
Glass sand, tons	10,004	12,276
Gold	.....	19,109,600
Granite, cubic feet	520,687	467,472
Infusorial earth, tons	6,950	112,282
Gypsum, tons	8,350	56,562
Lead, pounds	124,000	5,270
Lithia-mica, tons	641	25,000
Lime, bbls	579,451	571,749
Limestone, tons	40,207	87,207
Macadam, tons	532,690	414,668
Manganese, tons	60	900
Magnesite (crude) tons	2,850	9,298
Marble, cubic feet	56,401	94,208
Mica, tons	50	3,000
Mineral paint, tons	270	1,985
Mineral water, gallons	2,430,320	406,916
Natural gas, M cubic feet	144,437	91,035
Paving blocks, M	3,977	161,752
Petroleum, bbls	29,736,003	8,317,809
Platinum	.....	1,849
Pyrites, tons	15,043	62,992
Quicksilver, flasks	28,876	1,086,323
Rubble, tons	1,764,208	1,227,209
Salt, tons	95,968	187,300
Sandstone, cubic feet	363,487	567,181
Serpentine, cubic feet	200	2,310
Soda, tons	12,000	18,000
Silver (com. value)	.....	873,525
Slate, squares	6,000	50,000
Soapstone, tons	228	2,316
Tourmaline	.....	65,000
Other gems	.....	71,000
Total valuation		$43,778,348

Amador County.

Electric is being substituted for water power at the Argonaut mine, near Jackson. The mine, mill and rock breaker are to be run by electricity.——The Climax new 10-stamp mill, near Jackson, is to be ready within a month. A 4000-foot pipe line and 2 miles of ditches have been put in.

Butte County.

The Boston & California Dredging Co., now operating three dredgers; the Boston & Oroville M. Co., now operating three dredgers and constructing another; the Bear River M. Co., now constructing one dredger, and the Oroville Gold Dredging & Exploration Co., now operating two dredgers, are included in the new Oroville Dredging Co., Ltd., with W. P. Hammon as manager. The properties include 3000 acres of proven ground, of which 300 acres have been mined. Of the 3000 acres, 2000 are on Feather river and the remainder on Bear river, between Yuba and Placer counties. These properties include eight dredgers in operation and two being built. The properties of the Yuba Con. Gold Fields Co. are not included in the new company.

Calaveras County.

The Angels quartz mine has started their quartz mill at Angels.——Superintendent Alex. Chalmers, of the Lightner mine at Angels, has struck on the 700-foot level a 30-foot vein, which shows the main ore body worked on the upper levels has been reached on the lowest workings.——Sinking is being continued at the Cordelia mine at Murphys.

El Dorado County.

The Sunrise mine, near Kelsey, is to be reopened and worked by Colorado capitalists. G. C. Ranney is arranging for lumber with which to rebuild the mill.

Inyo County.

Coso camp is 33 miles from Keeler, the terminus of the Carson & Colorado Railroad. In this district G. D. James of Reno, Nev., recently examined the Green Bay, Calumet, Chicago, Delaney No. 1, Delaney No. 2, Delaney No. 3 and the Wisconsin properties and found a mineral zone 150 feet in width showing values of $3 to $10 gold per ton. The belt appears to be valuable for cyaniding. In the Modoc district, along the eastern foothills of the Argus range and 20 miles east of Coso, the veins appear to be narrower and encased in granite and porphyry walls, the granite predominating. Among the properties examined were the Clementina, Isabella, New Year, New Britain, Willie, Lost Hope and Bordel. The veins are about 2½ feet wide, as shown by a 12-foot shaft on the Isabella, a 30-foot crosscut tunnel on the New Year, with drifts each way, and on the Clementina a drift 60 feet in length. The values are much higher. Modoc camp is across the Panamint valley and 18 miles from the old Ballarat camp.

Kern County.

At a meeting of representatives of all the companies in the Independent Oil Producers' Agency of Kern county at Bakersfield, Oct. 4, preliminary plans were laid for uniting all the independent companies into one large company, to which all the oil land now in the possession of the independent producers will be deeded. Preliminary plans were also laid for the construction of two 1,000,000-barrel reservoirs for the storing of oil. The object of the independents is to compete with the Associated, to which company the agency is now bound under contract to deliver oil at the wells at 18 cents a barrel. The contract will be completed in a few months, and the evident intention of the independents is to be prepared at the fulfillment of the contract to market the independent oil at a satisfactory figure. Under present conditions the greater portion of the independent oil is being delivered to the large companies at a price that means little if any profit to the producers, and the preliminary action of to-day means the beginning of a last determined effort on the part of the independents to throw off the burden of the big corporations. This is but a continuation of the first united move on the part of the independent producers a year ago, and has for its object the formation of a company organized much on the plan of the Associated, and which it is intended shall embrace all the independent companies in the Kern River, the McKittrick, the Sunset and the Coalinga fields. If the plans of the producers are carried out, the properties of the independent companies will be deeded to the proposed company, and will be paid for in stock issued by the company. By this means the new company will hold in fee simple all the oil properties in the San Joaquin valley, with the exception of the holdings of the railroads, the Associated Oil Company and the Union Oil Company, and will be in a position to take steps toward transporting independent oil by means of an independent pipe line to tidewater and the market.

The Big Four M. Co. has driven its development and drainage tunnel, near Havilah, 800 feet.

Modoc County.

(Special Correspondence). — Considerable excitement has been caused by reports of gold discoveries west of Fort Bidwell. The camp is 12 miles from Fort Bidwell, in Surprise valley, and 6 miles from New Pine creek, in Goose Lake valley. The mails go up from Reno by rail to Madeline, 144 miles, and thence by stage to Alturas, the county seat of Modoc county, 35 miles. From Alturas there are two stage lines—one through Surprise valley to Fort Bidwell, the other through Goose Lake valley to New Pine Creek, which is on the Oregon-California line, half the town being in one State and half in the other. The distance either way from Alturas is 45 miles, making the total distance from Reno 230 miles. It may also be reached via Redding. The discoveries have all been made in the Warner Range, which runs north and south between Goose Lake on the west and Surprise valley on the east. They prove that the country is mineralized and worth prospecting. The rocks are eruptive and no sedimentaries have been found. The camp is 86 miles from the Nevada-California-Oregon narrow gauge railroad at Nevadaline, and it will cost $20 a ton to haul the ore by wagon to the railroad.

The Plummer-Reid-Wade mine, near the summit, has been bonded by B. Levison of Elizabeth, N. J., who intends to develop it. It is said to be a large low-grade proposition. Ore has been taken out of the Syphreth and Kafeder claims. No reliable assay reports have been made as yet, and, while the country is undoubtedly mineralized, yet the extravagant reports of bonanzas should not form the basis for investment without investigation. Modoc county consists of a succession of valleys, formerly inland lakes, following one another through the country from north to south. Goose lake, Tule lake and lakes in Surprise valley are remnants of these former lakes. These valleys are connected by narrow rocky canyons, or are separated merely by low volcanic ridges, and are bordered by bluffs of volcanic rock, marking the limits of former lava flows. Prospecting has been difficult on account of the lava coverings. Warner's Range is in several places over 8000 feet in height and snow prevents winter access. Water is plenty in the range, though scarce in some of the surrounding country.

Alturas, Oct. 2.

Nevada County.

R. J. Simmons is opening up the Eclipse mine on Gold Flat, near Nevada City. The old shaft, which is 150 feet deep, will be cleaned out and retimbered. —— The new hoisting plant on the Badger Hill drift mine, near Nevada City, has been completed and sinking is now under way. The vertical shaft will be sunk to a depth of 150 feet. —— The Junction mine at North San Juan has been bonded to R. W. Correll of San Francisco for $60,000.

Placer County.

The Black Canyon mine, near Westville, has closed down.—— The Polar Star at Dutch Flat is to be reopened.

The drill used in boring the air shaft in the Hidden Treasure mine, at Bullion, has broken through and the air can now go through the shaft, but there is still 70 feet to finish, as the hole from the drill is only a small one.——The Reed and White placer mines and ditches have been leased to F. G. Albinos and M. Toy of Michigan Bluff by J. D. Meredith.——J. S. Mills is sinking the main shaft of the Dairy Farm Extension mine, near Lincoln.

Siskiyou County.

The C. A. Patterson Co., operating the Eliza mine, near Yreka, and putting up a 12-stamp mill, has secured the Judge Spencer mine, adjoining.

Sonoma County.

Arrangements are being made at the Socrates quicksilver mine at Pine Flat to operate all of the machinery by electricity, as well as to light the shafts and tunnels. A dam, 35 feet high, has been made across Sulphur creek, opposite Dewey's mill. At present steam is being used as power. The company has built a 50-ton ore furnace, which will be fired about October 15. November 15 the first charge of ore will be placed in the furnace.

Tuolumne County.

E. C. Loftus, superintendent of the Santa Ysabel mine, near Stent, is putting in concentrators. All is in readiness to start twenty of the mill's forty stamps dropping as soon as power comes on. Ore has been blocked out in Nos. 2, 4 and 6 levels of the main 3-compartment shaft, while sinking in this, which has been temporarily suspended at the 800-foot mark, will be resumed and continued to a depth of 1500 feet.——Retimbering the shaft and other improvement work is being done on the Goldwin mine, near Tuolumne.——The old pipe line at the App mine, near Quartz, is being replaced by a new one. ——Superintendent A. W. Bryant of the Prudhomme, near Carters, says that work on the property will be resumed in the spring.——A new tunnel will be started on the Sunnyside mine, near Tuolumne, that will tap the vein 200 feet deeper than the old working adit.—— The incline shaft on the Confidence mine, at Confidence, is down 900 feet. Drifting is being done from the bottom in an endeavor to pick up the pay shoot found in the upper levels. The mill and cyanide plant are running steadily.

COLORADO.

(Special Correspondence).—The corner stone of the new hall at the State School of Mines was laid October 2. The money for the erection of this building was presented to the school by S. Guggenheim of the smelter trust. The school is at Golden.——The State Supreme Court handed down a decision in the flat tax question which means that the flat tax law must stand and that corporations will be assessed accordingly. It is believed that the case will be appealed to the U. S. Supreme Court for final decision, as it will make considerable difference with the firms doing business in the State.——It is encouraging to note the difference between now and this time last year. In several camps visited during the past few months the report is to the effect that there is a scarcity of good miners. There are plenty of men running around the towns saying "there is nothing doing," but according to the operators in the various districts there is plenty of work for good men. A few days ago in Leadville one of the operators stated that he had been for several days trying to get five miners and had not been able to secure them. This seems to be the report generally over the State. The summer months have seen a good trade among the machinery and supply houses of this city and for some time to come the

trade should be A1, as in many camps they are now taking in supplies for the winter, especially in the more rugged and colder districts.

Denver, Oct. 2.

Boulder County.

After an inactivity of several years the Wano mine and mill at Jamestown are being renovated. The Monarch Consolidated Co. will begin operations. W. H. Davis, the company's chemist, reported that roasting and cyanide treatment are applicable to the ores of the Jamestown region. The capacity of the mill will be increased to meet the demands of the Wano mine. Rolls will be put in for crushing. No outside custom ore will be treated by the company. A six-pound solution of cyanide will be used and a direct oxidizing roast, such as was recently put in at Magnolia, will be employed.——The plans for the new mill are being drawn by Franz Cazin, of Denver. The mill is to be operated by a 500 H. P. water plant and a 100 H. P. steam plant.

There are said to be 400 men working in tungsten producing mines, near Nederland. A recent shipment of 41,100 pounds of crude ore from Miller & Co. yielded 7475 pounds of tungsten, carrying 66.07% tungstic acid. The shaft is 30 feet deep.——The 15-stamp mill of the Boulder County mine is running continually.——Superintendent T. P. Oliver, of the Colorado Tungsten Co., is opening up good ore and shipping to the Boyd mill at Boulder.——F. Karstrom is shipping to the Boyd mill. ——The Nederland Tungsten Leasing Corporation is working the Illinois property of the Wolf Tongue M. Co. and have a tunnel in 80 feet. Several loads of fair tungsten ores were taken out of the surface workings of this lease.

Chaffee County.

(Special Correspondence).—F. G. Mitchell, manager of the Lost Canon Con. Deep Tunnel G. M. Co., is operating in Boswell gulch, 20 miles south from Leadville. The tunnel is now in 1100 feet and considerable drifting done on the vein. According to reports, the ore averages $20 per ton. The tunnel cuts the vein 600 feet under the surface. A mill will be built next spring.

Leadville, Oct. 2.

Clear Creek County.

The Gem Mines Co. has completed the new electric air compressor at the collar of the Gem shaft, near Idaho Springs. It will be driven by a 150 H. P. electric motor and will furnish air for ten drills. The plant will furnish power for twenty-five sets of leasers in the Gem and Freighters' Friend mines, besides furnishing power for the operations of the company in their lower levels.—— Wright, Lilly and associates of Colorado Springs intend to organize a new company on the Dubuque claims up Fall river from Idaho Springs and opposite the Lucania tunnel in which they are now interested. The property has been developed by an adit tunnel which is in 400 feet. A main tunnel will be driven to cut the different lodes.——I. N. Rogers and H. C. McCreery have sold the Refugee mine at the head of Hukill gulch to G. A. Starbird and E. S. Lewis of Denver.

At the Santiago mine, in East Argentine district, near Georgetown, after running the crosscut No. 5 over 600 feet the main vein was reached and drifting started. The width is 4 feet between walls, the pay streak carrying 18 inches of fine smelting ore. This point is 150 feet below No. 4 tunnel and 1100 feet below the crest of the hill. No. 4 tunnel is being driven on a 3-foot streak of ore. Manager Wm. Rogers is cutting an upraise above No. 3 and another above No. 2 tunnel. The mill at Georgetown, after being overhauled and adjusted, is handling forty tons every twenty hours, there being an interval of four hours each day when the electric power from the Georgetown plant, being otherwise engaged, is insufficient. The rock concentrates from three to seven tons into one after the smelting product has been sorted out, and contains in the crude from $8 to $20 per ton. The process employed is crushers, rolls, Huntington grinders, jigs and tables. It is probable that the finer products, slimes, etc., will be cyanided later on. The mill is shipping from one to two cars of concentrates per week and three cars of selected ore per month. The entire output of the mine is hauled in wagons 7½ miles to the ore bins of the mill at a cost of $1.80 per ton, each wagon carrying from four and a half to five tons at a load.

The Consolidated Park M. Co. has been formed to work the Park claims on Seaton mountain, near Idaho Springs, under the direction of J. J. May. An electric motor to run an air compressor is to be put in as soon as machine drills can be used to advantage.——Reports come from Empire of two important strikes in the Dailey district, one in the tunnel being driven by the Red Mountain & Mad Creek M. Co., of which J. D. Williamson of Denver is president. The other strike is in Horseshoe basin.

Superintendent F. M. Tucker, of the Krupps M. Co., operating claims on Columbia mountain, near Empire, reports breaking into a 3-foot vein of high-grade silver-lead ore, running high in lead and carrying good values in gold and silver.

Gilpin County.

The stone foundation, being built on the Evergreen property in Apex, is completed and work will be commenced on the 60x100-foot shaft house which is to be built near the mouth of the 500-foot tunnel the company has been driving. Work on the tunnel is to be abandoned as soon as sinking is commenced.——Work has been resumed on the Ætna property in Nevadaville. New machinery has been put in. Work will be pushed in the 600 crosscut north at the 200 level. John Simmons has charge.

F. H. Owen of Central City has resumed operations on the Review mine, on Winnebago hill, and is stoping on the 200-foot east level. The property is owned by N. D. Owen of Denver. The main shaft is down 460 feet.—— Superintendent Frank Paxton, of the Russell M. Co., reports that they have completed retimbering the No. 4 shaft on the West Pewabic property from top to bottom, a depth of 180 feet. Leasers are at work in the lower levels.——J. J. Elliott of Denver intends starting the Springdale or Gold Rock property in Russell district, under a lease and bond. The main shaft is down 600 feet.

Gunnison County.

C. Skinner is superintending work on the Volunteer mine, near Pitkin. The winze is being unwatered preparatory to starting development work.——The Ben Franklin group, near Pitkin, has been leased to A. B. Clark, who intends working it.

Hinsdale County.

It is expected that the Hanna mill, at Capitol City, will be completed by Nov. 1.

Lake County.

A good body of ore has been opened at the 900-foot level of the Evelyn, Graham park, near Leadville. The shaft on the property is 1200 feet deep.——Machinery is being placed on the Little Nell claim on the crest of Carbonate hill by Lomeister and associates, of Leadville, and when in running order work will be carried on at the bottom levels. At present prospect work is being done at the 500-foot level to try to locate a shoot of ore. ——The Long & Derry property, near Leadville, will again be worked. C. Taylor, of Leadville, is interested.

After being idle for several months the Adelaide, one of the oldest mines near Leadville, has started hoisting. The plant is being operated for N. West of Denver by John McAlister. The water has been pumped out. Work is to be done at the bottom level, 380 feet below the surface, where drifting is being carried on.——The Hub mine, near the Adelaide, is idle.——A little sulphide is being taken out of the No. 1 shaft of the Ohio & Leadville Co.'s Ollie Reed mines. They are prospecting at the fourth level. A diamond drill has been at work for some time in the No. 2 shaft. It has gone down at the rate of 12 feet a day, and is now 250 feet below the bottom of the 350-foot shaft.——The Mastiff M. Co., which has a lease on the Humboldt mine at Adelaide Park, is taking out fifteen tons a day of low-grade ore. Stoping is being carried on at the 375-foot level.

San Juan County.

The Sultan Mountain M. Co., operating claims on Sultan mountain, near Silverton, have begun a winter's campaign. They are running a crosscut tunnel on the Junior Warden vein to cut the Molas lead, and a contract of 400 feet has just been completed by Jesse Herr & Co. of Silverton. An additional 100 feet is to be run under contract by Olsen Bros., and when this contract is completed the breast of the tunnel will have been carried to within 300 feet of the objective point, at a depth of 150 feet below the old workings of the mine and 250 feet below the surface.

Summit County.

The stockholders of the Senator Gold M. Co. have voted to raise $30,000 for further development work by issuing gold bonds on the property. The property is on North Star mountain, 10 miles south from Breckenridge, and is developed by a crosscut tunnel which has cut veins carrying iron and copper sulphide ore with values in gold and silver. The property is equipped with a compressor, drill plant and buildings.

The Old Union M. & M. Co. of Breckenridge is running mine and mill to utmost capacity. Mill Superintendent C. Gilbert is shipping zinc products, which have found a market in Kansas. It can be safely stated at present that the Old Union is past the experimental stage, and from now on will be listed among the steady producing and dividend paying enterprises of the district.——Work has been resumed by the Rothschild Tunnel Co. on its bore at Argentine. Driving another 2000 feet is in charge of Thomas Webb.

In experimenting with the black sand in the Banner placer hydraulic works with wooden riffles, the value of the sand saved is 8.39 ounces in gold, and with steel riffles after passing the wooden riffles the value is $17. This shows a great value in black sand, of which there are large quantities, and all has heretofore gone to waste in placer mining.——J. H. Myers states that the King Solomon Mining Syndicate has been able to interest capital in the mineral fields near Montezuma, and they will soon have a mill running at the mouth of the Lenaway tunnel.

Teller County.

The mill of the Little Giant M. & M. Co. in Pony gulch, near Cripple Creek, is finished. It is calculated that the mill will be capable of handling 150 tons of low-grade ore daily, ore from surrounding properties as well as that of the company being desired for treatment.—— Operations have been resumed at the Homestake mill, on Ironclad hill, with S. M. Downs of Cripple Creek in charge.

The United States Reduction & Refining Co., operating the Standard plant at Colorado City, will shortly build a tailing cyanide plant.——Ore has been struck by the Equity M. Co. in its exploration on the second level of the New Discovery property, on the summit of Mineral hill, 1 mile north of Cripple Creek.——The Laura Lee on Mineral hill has been leased by an Eastern company and it is proposed to sink a shaft to the 1000-foot level and cut the cap rock which is believed to cover the hill. The shaft is down 400 feet.——In the Ruby mine on Bull hill, near Victor, prospecting is under the direction of the Merger M. Co.

The total output and value of Cripple Creek ore for September were:

	Tons.	Average Value.	Total Value.
Sioux Falls	1,200	$ 2 50	$ 3,000
Anaconda	2,550	7 00	17,850
Los Angeles	640	4 50	2,800
Wild Horse	1,200	6 50	7,800
Santa Rita	450	8 00	3,600
Smelters	9,500	60 00	570,000
U. S. R. and R.	25,000	30 00	750,000
Dorcas	3,300	32 50	107,250
Portland	7,500	28 00	210,000
Economic	6,000	28 00	174,000
Totals	57,340	.....	$1,846,300

Ore is being broken in the Midway mine, between Ironclad and Bull hills, Cripple Creek, at a depth of 186 feet. Exploration at a depth of 1000 feet in the Anaconda mine of Gold hill has shown ore. In reaching the 1000-foot point, a winze was started from the tunnel level, which has a depth of 600 feet and continued for 400 feet.

The Huntington mill, on the Mohawk Belle and Twin Sisters claims, between Raven and Bull hills, near Cripple Creek, is handling ten tons of ore a day. The plant is being operated by Carrington & Epy.——Ore running $40 per ton is being shipped from the Gregory mine at Cripple Creek.

A strike has been made in the Black Diamond on Tenderfoot hill, near Cripple Creek. Prospecting began in a 120-foot shaft.

IDAHO.

Owyhee County.

W. F. Sommercamp has organized the Potosi M. Co., which has taken over the Home and Potosi mines at Silver City. A hoist is to be put on the Potosi, on which a shaft was sunk several years ago, to a depth of 240 feet. The Home mine is on the same vein, adjoining the north end line of the Potosi.——The mill of the Addie M. & M. Co., at Silver City, has been started under the direction of Arthur Knapp. Amalgamating pans have been put in and amalgamating is done in the batteries, the pulp being elevated back and run through the battery twice before going through the pans.

Shoshone County.

The Snowstorm mine, near Mullan, is shipping 300 tons of ore daily. This is said to be the only copper mine in the Cœur d'Alenes that is producing at the present time.——John Newbury & Son are driving a crosscut on the Fanny Gremm, a property east and adjoining the You Like and the Midnight, near Mullan.

Washington County.

Work with the Landore smelter, owned by the Ladd Metals Co., has been steady since blowing in the reverberatory furnace. The plant is giving satisfaction. It has a capacity of fifty tons daily. Coke has been hauled regularly, so that the management has a good supply of fuel on hand.

MICHIGAN.

Houghton County.

Superintendent Edwards of the Tecumseh states that the drill at the second location has cut the Kearsarge lode at a depth of 185 feet and that drilling has been continued until both walls of the lode have been determined, together with their copper contents. The core that was extracted from the lode shows the same state of mineralization as that discovered in the other hole. Machinery is being moved to the location. Work will be started on the shaft as soon as possible, as sufficient development work has been done to assure the management that the lode exists on the location in the same state of mineralization as that of the first.

MONTANA.

Granite County.

D. T. Conkling and M. L. Bashor have leased from Gannon & Neu the Oro y Plata placer mines near the mouth of Henderson gulch, near Philipsburg. Associated with them is John Brasslin. While good weather lasts the lessees will prospect and make ready for work in the spring.

Silver Bow County.

(Special Correspondence).—Another section of the Butte copper district likely to rival both the old portions and the new country in north Butte lies south of the Pennsylvania mine. A scheme is on foot for the consolidation under one big company of a number of the best of these producing mines.——The Mountain View mine of the Boston & Montana Co. is in continuous operation and yielding 20,000 tons of ore each month. The Mountain View has been equipped with a new hoisting engine capable of working to a depth of 500 feet. A new hoisting engine has been ordered for the new four-compartment shaft that is now down 500 feet on the Leonard mine of the Boston & Montana Co. From the 1200-level of the mine another force is raising to connect with the opening from the surface. A new surface plant is being built, and will include a steel gallows frame 140 feet high and new ore bins 150 feet long. The shaft will be equipped with shaft dumping skips.——The Columbia mine in the Lowland district, 18 miles northeast of Butte, is being worked by leasers who are shipping to the Butte smelters.

Butte, Oct. 2.

The Butte Miner reports that the big concrete stack of the Butte reduction works, 352 feet and 7 inches high, has been finished after four months' work. In its building were used 60 tons of "T" steel, 1500 barrels of Portland cement, 1400 tons of sand. The weight of the chimney, inclusive of its concrete base and slag foundation, is 15,275 tons. The stack has a diameter of 18 feet, and rests on a concrete base of 1806 feet. This base stands on a slag foundation designed by James Doull, of the Butte reduction works, and is put into place under his supervision. This foundation was originally intended for a brick stack of the same internal dimensions as the present concrete stack. The outside diameter of the base of the chimney is 21 feet. For the foundation the ground was excavated to a depth of 7 feet, the formation of ground being a natural washed sand deposit. Into this excavation a box was made of cast iron plates 100 feet square and 3 feet deep. Into this box was poured molten slag. The foundation was built up by a series of these slag blocks 3 feet high, each block being stepped in from the outer edges of the one below 3⅓ feet, there being six of these blocks, making the slag foundation 18 feet in depth and 66⅔ feet square on its top surface. While the molten slag was being poured into the boxes, layers of steel wire rope, chain and T rail were sewed horizontally through each block, and standing vertically through these blocks of slag and projecting out of top of slag foundation and into the stack foundation base were 70 tons of scrap iron and steel. On top of this foundation was built the foundation of the chimney. This foundation consisted of a solid block of concrete 42½ feet square and 5 feet high at its sides and 8½ feet high in the center, the top of this block being shaped like the frustum of a pyramid. Horizontally through this block of concrete was laid four layers of 1¼x1¼-inch T iron, two layers being laid parallel with the sides of block and two layers diagonal. Into this network was placed vertically and in a circle corresponding to the size of the chimney

500 bars of 1¼x1¼-inch T steel, these bars being all bent outwardly at their lower ends. From the base to the top rings of 1x1-inch T iron were laid horizontally. For the first 21 feet of height of the chimney the walls are 18 inches in thickness and in these walls are the two inlets to the chimney, one on each side, each opening 8x17 feet. On top of the 18-inch wall the double shell of the chimney is placed, the outer shell being 9 inches thick, the inner shell 5 inches thick, these shells being separated by a 4-inch space, the air space at the bottom being connected to the atmosphere through the outer shell by portholes. The inside shell extends up to 101½ feet above the base, and the outer shell is offset over the inner shell, the air space being left entirely open on the inner side of the chimney and the inner shell free from the outer shell at the top. The outer shell is then carried 7 inches thick to the top of the chimney. The building of the stack has been rapid, 30 feet of height being attained per week. Main dust chambers to connect with the stack will be 360 feet long, 225 feet being 60 feet in width, while the remaining 105 feet will be 80 feet wide. They will be 30 feet in height. The chambers are being built of structural steel, with sheet steel roof and brick walls. Every consideration is given the welfare of the men employed in connection with the flues, the chambers being built on slag piers with transverse ducts permitting free circulation of air. Auxiliary dust chambers connecting with the calcine chambers will communicate with the main dust chamber. A steel converter building, which will accommodate two converter stands, is being built. This plant will be large enough for three converter stands if necessary. Two new matte furnaces, 20x60 feet, are being installed with 600 H. P. boilers, the waste gases of which will be utilized in the matte reduction.

NEVADA.

Esmeralda County.

The Goldfield News reports that for the week ending Sept. 28, 2340 tons of ore, having a value of $320,132, were consigned to the local mills or were shipped out over the railroad to the smelters. No returns were received from the Goldfield R. Co., as the Frank mill is closed down temporarily pending the arrival of an automatic sampler.——The plant of the American R. & M. Co., which was started up the first time a few days since, has as yet handled but a small amount of ore.——During the period 200 tons of ore, having an average value of $40 per ton, were treated at the Combination Co.'s mill; 693 tons of an average value of $104 per ton were treated at the plant of the Columbia Sampling & Ore Co., 50 tons—experimental—having an average value of $50 per ton at the plant of the American R. Co.; 290 tons of milling ore, having an average value of $40 per ton, and 152 tons of shipping ore, having an average value of $230 per ton at the plant of the New Western R. Co. At the latter plant there is now awaiting treatment 400 tons of milling ore and 500 tons of shipping ore. Aside from this there went out via the railway 28 cars containing 955 tons of ore of a gross value of $191,000. In connection with the railroad it can be stated that a flat rate of $17 per ton has been established on ore shipments, and that on first-class merchandise a rate of $3.80 per 100 pounds has been established; on other grades of merchandise a graduating scale has been adopted, these rates applying to goods en transit to and from San Francisco. The Wells Fargo Express Co. has also made a reduction since the advent of the railroad of $1.50 on the 100 pounds to all Pacific coast points.

Lincoln County.

The Old Colony M. Co. has ordered a 5-stamp mill and cyanide plant for the Yellowstone mine at Juniper Camp, near Searchlight. A 15 H. P. hoist has also been ordered. A new working shaft is to be started to go to the 500-foot station for the first stage. Levels will be run from this at every 100 feet. At the same time working shafts of similar depth are to be put down on the Bird and Golden Rod by the same company. Leonard Tobin is manager.——Work is to be resumed on the Old Roman mine near the Empire camp at Newberry mountain, near Searchlight. C. F. De Puy is manager. ——Superintendent A. A. Ross has resumed work in the Good Hope mine, near Searchlight.

Lyon County.

The Overland mine, in Silver City, has been sold for $25,000. It is understood that a shaft will be sunk on the property to a depth of 500 feet and a modern mill and cyanide plant put in.——At the Hayward mine, in Silver City, an electric hoist, mill and cyanide plant will be put in.——The Silver King mine, at Silver City, owned by A. A. Smith, has been bonded for $15,000.——The Dayton mine, in Silver City, is under bond for $30,000, and is being inspected and sampled.

Nye County.

The American S. & R. Co. is preparing to build a 50-ton automatic sampling works in the Lida district. Representatives are now in the field looking over the situation, under direction of San Francisco capitalists. The plant is to be of modern construction, with machinery for grinding and sampling fifty tons daily. The ore will be shipped to the Selby works and other plants of the trust.

Storey County.

L. M. Hall, consulting engineer in charge of the Comstock mines, says he has received orders to at once install the machinery and equipment that is to drain the 3100-foot levels. Two 800 H. P. motors will be placed at the bottom of the Ward shaft in the south end of the lode, and these will lift the waters from the lowest levels to the Sutro tunnel. In this tunnel the old flume will be replaced by a 30-inch pipe carrying 10,000 gallons of water a minute. Power to operate the great motors will be secured at Marmol, on the Truckee river, where a generating station is being built.

OREGON.

By the findings of the mining jury of awards of the Lewis and Clark Exposition, which have just been made public, Colorado receives 161 awards. Nine are gold medals, 13 silver medals and 14 bronze medals, while the remaining 125 are honorable mentions. Oregon stands second in the number of awards with 82. Out of 43 awards received, California got 13 gold, 14 silver and 13 bronze medals, with 3 honorable mentions. Montana got 13 gold, 11 silver and 8 bronze medals, with 25 honorable mentions—57 awards in all. Washington received 70 altogether, but few are gold and silver medals. Among her 55 awards Wyoming got 3 gold medals, 10 silver and 20 bronze, with 22 honorable mentions. Idaho got 29 awards, of which 2 were gold medals, 6 silver, 12 bronze and 9 honorable mentions. Utah received 9, 3 of which were gold, 3 silver and 3 bronze. Many of the States will appeal to the superior jury of awards.

Baker County.

The Cable Cove Power Co. has been organized to build an electric power plant to supply the mines near Cable Cove, including the Valley Queen and Sheridan in Grant county, near Granite. Water is to be obtained from Baldy lake.

The North Pole mine, near Bourne, is running steadily, as is the Columbia. The Bonanza, since being leased by Albert Geiser, the original owner, has been steadily worked, and, from reports, the results are satisfactory. Work is also being done on the Golconda, near Bourne, which has been reorganized. The Virtue, near Baker City, after being shut down for a time, has been sold to a Belgian company and is now reported to be taken out ore and shipping to the Sumpter smelter.

Grant County.

The dredger at Crane Flat, operated by Burch & Burbidge of Spokane, has been shut down for the season. ——It is reported that no work is being done at the Red Boy mine, near Granite.

Josephine County.

Manager F. Fowler of the Gold Pick, near Holland, has completed packing the small stamp mill into that property. Reduction work is to be commenced soon.

The Alder Gulch M. & T. Co., of which A. Osburn is president and W. T. Perry secretary and treasurer, is working in the Oscar Creek district, near Murphy.

SOUTH DAKOTA.

Pennington County.

(Special Correspondence).—Near Rochford the Ethel Co. is sinking a shaft and machinery for this property is being received. At Meyersville the Cochran mine is idle pending the overhauling of the mill and power plant. James Cochran has ore enough blocked out to keep his mill employed for several years. The ore is hornblende schist and is free milling. —— At the Golden West, 6 miles west of Rochford, the mine and mill are running steadily under direction of E. J. Kennedy. It has been found advisable to reduce the tonnage of the Chile mill, as a higher saving of values can be made if less ore be crushed. Canvas tables are being considered as an accessory in saving values from the plates.

Rochford, Sept. 27.

The Egyptian claims, at Keystone, have been sold to the Western Exploration Co. of Salt Lake City. P. O'Keefe is to be superintendent. The plan is to sink a shaft 500 feet before drifting and to put up a 100 stamp-mill.

Lawrence County.

(Special Correspondence).—At Lead the Homestake Co. is building a steel building on concrete piers for another compressor to supply compressed air to motors underground. The building is on the same grade as the Ellison hoist and east of the shaft. At Gayville construction on a separating plant to remove a large portion of the water from slimes is under way. The clear water will be reused and the slimes sent by pipe line to the new slimes plant to be built on McGovern hill at Deadwood. This plant will not be in operation before next spring, as its construction involves a large amount of grading, tank building and other work. At Pluma the tall stack of reinforced concrete at the new electric distributing plant is going up. This plant will supply electric light and power to mines, mills and other industrial concerns throughout the northern Black Hills. At the head of Strawberry gulch, 3 miles east of Lead, the Puritan Co. is putting in cyanide tanks and making other improvements to treat the silver bearing quartzite which constitutes the ore body in this property. The shaft on the Puritan is about 100 feet deep and the ore body 20 feet thick.

Lead, Sept. 28.

UTAH.

Beaver County.

The Majestic Copper M. Co., at Milford, has resumed shipments to the Newhouse mill. The developments on the Harrington-Hickory ground, according to Manager Hanchette, have been encouraging. The Gomer shaft for the last 80 feet has been in first-class ore.

The Moscow mine at Milford is shipping ore regularly. ——A new whim has been put on the Wasatch King in Beaver Lake district. Manager J. C. Brownfield has increased the working force of Milford. The tunnel is in 400 feet.

Salt Lake County.

The Pioneer mine, at Alta, is being developed under the direction of Arthur Murphy.——It is reported that the Centennial-Emma mine, at Alta, has been bonded to a Chicago company.

With a single shot the management of the United States Co.'s lime quarries at Topliff broke up recently 20.000 tons of rock, using 2500 pounds of black powder. There was broken enough limerock to supply furnaces at Bingham Junction for sixty days, as they use an average of 300 tons daily.

The cost of operating the mines, the mill and the tramway at the Alta properties of the Continental Co. has been reduced 50% by Manager Crowther. He has reduced the payroll to 65 persons from 120 and accomplishing the same results.

Summit County.

At the annual meeting of the shareholders of the West Quincy M. Co. of Park City, G. D. B. Turner was elected president and general manager; J. H. Moyle, vice-president; R. E. Miller, secretary, and S. Fargo, treasurer. The report of Manager Turner showed that from the Little Bell, a neighboring property, it had driven 3000 feet to a station 1100 feet under Bonanza Flat. The contact is now being run on, with the main ore bodies expected at its intersection with the fissure cut on the 600-foot level in the original workings.

Tooele County.

T. Jennings, of Salt Lake, has mining claims in the mountains 10 miles west of Grantsville, and has let a contract to Samuel Garnes of Park City to extend the 800-foot tunnel on the Third Term mine. The mines in the Lake Side mining district are being worked, and general activity prevails around Grantsville.

The management of the Honerine mine at Stockton has decided to continue the long tunnel to the main incline, giving a total length of 9500 feet. They will have 800 feet farther to drive. It means the unwatering of other ledges.

The bottom of the incline shaft on the Cyclone Co.'s property at Stockton is in the fissure and a body of good lead ore is being cut. The shaft is down, according to Superintendent H. T. Sappington, 660 feet.

Utah County.

C. B. Snyder, representative of the Snow-Darst Co. at Provo, will give a contract to drive a 300-foot tunnel on the company's holdings east of Provo. The tunnel will be driven near Provo canyon and is intended to open up one of the deposits of broken anthracite coal from which the company intends to generate gas to be supplied to Salt Lake and other towns of the State.

WASHINGTON.

Ferry County.

The Mountain M. Co. put in a 30 H. P. boiler, engine, hoist and machine drills at the Pomeroy mine, 10 miles northeast of Orient.——The First Thought mine, near Orient, in Kettle river district, is shipping 30 tons of ore daily to the smelter.——The shaft on the Comstock-Treadwell mine is gaining depth. This is the property recently bonded by P. Burns & Co.——Preparations are being made to resume work on the Trojan mine on Toulou mountain, near Orient. A new tunnel will be started, which will tap the ore body at considerable depth.

Snohomish County.

A power drill has been put in at the Imperial mine, near Silverton. Air connection has been made with the Copper Independent.——It is reported that work is to be resumed at the Copper Independent.——At the Justice mine, at Monte Cristo, the connection has been completed between the crosscut and the old workings. The production is to be increased.——F. W. Peabody is driving a 600-foot crosscut at the Sidney mine, at Monte Cristo.

Stevens County.

A. I. Goodell, manager of the Northport smelter, announces that the plant would be closed about Nov. 1.

WYOMING.

Crook County.

Paul Danckwardt, superintendent of the Golden Reward M. Co., which owns coal lands in the Sundance coal fields, announces that his company will begin the construction of a power plant at the coal mines and that in addition to operating and developing the collieries power would be transmitted by an electric line to the Black Hills to operate the mining and milling business at that place.

FOREIGN.

AUSTRALIA.

In New South Wales, South Australia and Tasmania marble of excellent quality is found. The principal quarries are at Caloola, near Newbridge. The Hawkesbury sandstone formation, which underlies Sydney, provides a supply of stone adapted to building purposes. Limestone is obtained in New South Wales, where it is largely used in the manufacture of hydraulic cement, as well as for fluxing purposes in smelting works. At Portland, near Wallarawang, extensive works for manufacturing cement have been erected, and works are also in operation at Granville, near Sydney. In South Australia 40,138 tons of limestone were raised from deposits at Yorke's Peninsula. In Western Australia a limited quantity of limestone is raised for fluxing purposes. The establishment of the cyanide process for the recovery of gold in which lime is freely used has led to the opening up of limestone mines in various parts of Queensland. Gypsum of good quality is found in Victoria, the production of 1903 being valued at £897, its use in the production of cement and plaster of paris being yet in its infancy. It is also found crystallized in clay beds in New South Wales, and in isolated crystals in the salt lakes of South Australia, where a small proportion of sulphate of lime is present in the water. In the latter State it is used as a fertilizer. Gypsum is also found in the form of an insoluble salt in Victoria and New South Wales. Quartz is of common occurrence in all parts of the commonwealth. Rock crystal, white, tinted and smoky quartz are frequently met with, as well as varieties of crystallized quartz, such as amethyst, jasper and agate. Asbestos is obtained in New South Wales in the Gundagai, Bathurst and Broken Hill districts. In Tasmania, asbestos is known to exist in considerable quantities in the vicinity of Beaconsfield. Tripoli has been found in Victoria. Mica has been discovered in the New England and Barrier districts of New South Wales. In Western Australia good mica has been met with at Bindoon and also on the Blackwood river, near Cape Leeuwin. Deposits have also been found near Herberton, in Northern Queensland. In the northern territory of South Australia mica has been obtained on a small scale. Kaolin, fire-clays and brick-clays are common in all the States.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Returns from the shipments of ore from the Crescent and Don Pedro, adjoining mines in Skylark camp, gave

over $60 per ton. Work on both properties is being done under H. H. Shallenberger, the manager.——At the Granby mine, in addition to the regular work of stoping and shipping 2000 tons of ore daily, development is going on at the Monarch, Gold Drop and Monte groups, recently bought. The winze in the Old Ironsides mine is down to the 500 level, the deepest workings yet reached in the Granby properties. Work will be started on the new 3-compartment main incline shaft at the Granby.

Work has been discontinued on the E. P. U. mine, near Greenwood, to make repairs to the machinery.

Slocan District.

Work has been stopped on the Mountain Con. mine for the season. The mine is in a basin at the head of the South Fork of Carpenter creek at an altitude of 8000 feet, 8 miles from Sandon, from which it is reached by a wagon road to Cody and a trail to the mine. It costs $20 per ton to carry supplies from Sandon to the mine and $12 a ton to pack ore from the mine to the K. & S. railway at Cody. The ore body occurs in a quartz fissure vein cutting through an abrupt granite peak, and the ore runs as high as $200 per ton in silver and lead. The crosscut tunnel on the Vera has reached the ledge after running 82 feet.

The new crosscut tunnel being driven by the Rambler Cariboo Mines, Ltd., is in 3000 feet, leaving 1400 feet yet to be driven to reach the vein at a depth of 1400 feet. The tunnel is 7½x7½ feet in the clear, and starts from Dardanelles creek, between McGuigan station and the mine. W. E. Zwicky of Kaslo is manager. The cost of hoisting and pumping has stopped work in the 800-foot shaft on the vein until a raise can be made from the tunnel.

ONTARIO.

(Special Correspondence).—The Dreyden district, 200 miles east of Winnipeg, is well mineralized, but little developed. There are several companies working, including the Reindeer M. Co., which recently started its 10-stamp mill. They are preparing to build a cyanide plant in connection with the stamp mill. North from here lies the new district of Sturgeon Lake and it is reported that $150,000 silver ore was taken from the surface by one man in six weeks. In the same district another 10-stamp mill is said to be netting $30,000 per month.

Dreyden, Sept. 29.

YUKON TERRITORY.

(Special Correspondence).—The electric gold dredger at the mouth of Bear creek on Klondike river went into commission August 15. The dredger was built and started digging in forty-six days from time construction work began. It is owned by the Canadian Klondike M. Co., Ltd., and was built by the Marion Steam Shovel Co. of Marion, Ohio.

Dawson, Sept. 25.

MEXICO.

Jalisco.

The Etzatlan smelter, at Etzatlan, has been started as a custom smelter by the Etzatlan C. S. Co., in which B. Kearns, M. E. Raines and E. Finley are interested. The smelter has a twenty-ton water jacket furnace.

The Carrizo copper mine, in the Autlan district, is to be developed by the Carrizo Copper Co., of which K. E. Keller is president. E. E. Nicholson, formerly foreman at the Granby mine in British Columbia, will take charge of the property as superintendent. H. A. Wheeler of St. Louis is consulting engineer.

Sonora.

At a meeting of the Promontorio Con. M. Co., in Nogales, Ariz., R. M. Eberle of Los Angeles, Cal., was elected president; Robert Christie of Owen Sound, Canada, vice-president; A. H. Merwin of Los Angeles, secretary; N. Robinson of Owen Sound, treasurer. Work at the mine has been resumed. Contracts have been let for moving out to the camp the machinery for a 100-ton plant, which has been some time at Nogales. The air compressor will be started at once and work of sinking the deep double-compartment shaft will be resumed.

PHILIPPINE ISLANDS.

H. D. McCaskey, Chief Mining Bureau, Philippine Islands, in a recent report of the United States Geological Survey, states that the outlook for a profitable mineral industry is more hopeful to-day than it has been at any time since the American occupation of the Philippine Islands. Modern machinery has begun to arrive from the United States. Mining development is being carried on in the provinces of Lepanto-Bontoc, Benguet, Pangasinan, Nueva Ecija, Bulacan, Rizal, Batangas, Tayabas, Camarines, Albay, Masbate, Cebu, and Mindanao, and prospecting is being done in almost every island and province of the archipelago. In Suyoc, south of Mancayan, Lepanto, on the Island of Luzon, prospects are being developed by American miners. Gold and copper ores both occur. In Benguet some important development work has been done, particularly in the district of Antamok. Here lie the claims of Kelley, Clark, Petersen, Clyde, Lehlbach, and others, most of whom have been at work on them for several years. Although the ore bodies have not yet been subjected to detailed investigation, this work will be taken up by A. J. Eveland, geologist mining bureau. The ore bodies are apparently extensive. Much of the ore so far uncovered is free-milling. Lehlbach has announced the intention of his company to order a 10-stamp mill with 1000-pound stamps, short drop, and rapid discharge, and a 100-ton cyanide plant complete. Kelley, Clark, Petersen, and Clyde have done sufficient work upon their claims to prove these deposits worthy of serious consideration and the quantity of ore to be large. Kelley has put in a 10-stamp mill with a cyanide plant and Clark has received a 3-stamp triple-discharge Hendy mill and a 60-ton cyanide plant, in charge of C. M. Eye, mining engineer. Petersen and Clyde have built in Manila shops a 3-stamp mill for development purposes. In the Bataan district the Philippine Gold M., P. & D. Co. has opened a number of drifts, but has not yet succeeded in getting its 10-stamp mill upon the ground owing to transportation difficulties en route. In the Bued River district Hanson and Meade have uncovered a rich gold-copper lead, for which a 3-stamp mill is being built. The Tacoma smelter has secured a rate from the Boston Steamship Co., per long ton, free on board, Manila Bay, and delivered on smelter wharf at Tacoma, of $5 per ton. In Pangasinan, in the foothills of the northern Zambales range, near Salasa, a number of claims have been recorded and worked. The ores here are copper carbonate and sulphides, assays of three samples from the claims of W. H. Miller, giving, respectively, 19.9%, 11%, and 18% in copper, 13.2 ounces, 0 ounces, and 2 ounces in silver, and $2.76, $1.60, and $3.80 in gold. In Nueva Ecija, near Gapan, and Penaranda, on the Rio Chico and elsewhere, extensive deposits of placer gold have been known for many years. In the Camarines Province the Spanish concessions upon the extensive gold deposits in the districts of Paracale and Mambulao have been relocated by American mining men under the present laws and without friction with the former concessionaries. In Masbate, in the northern part of the island of Visayas, near the town of Aroroy, work has been done upon claims, principally of free-milling gold ores in quartz, and upon gold placer claims on the Lanan and Guinabalan rivers. Manganese and iron ores of high grade have also been found here, but little attention has been given them. Upon claims of the Eastern M. Co., A. Heise has built a 5-stamp mill to handle the free-milling ores, and upon the trial run of this mill the clean-up from the plates showed $11 to the ton of ore. Upon the placer ground of the Philippine M. Co. on the Lanan River a Risdon dredge has been completed and launched. F. H. Kimball is in charge. Upon the placer claims of the Masbate and Oriental M. Co., on the Guinabatan River, a similar Risdon dredger is in charge of H. J. Robinson.

Books Received.

"The Philippine Mineral Industry in 1905," by H. D. McKaskey, extract from "Mineral Resources of the United States."

As an extract from "Mineral Resources of the United States," the United States Geological Survey has issued the "Stone Industry in 1904." It is largely statistical and deals with the production of granite, sandstone, slate, marble and limestone.

The United States Geological Survey has issued Bulletin No. 256, "Mineral Resources of the Elders Ridge Quadrangle, Pennsylvania," by R. W. Stone; Bulletin 266, "Paleontology of the Malone Jurassic Formation of Texas," by F. W. Cragin, with stratigraphic notes by T. W. Stanton; and Bulletin 271, "Bibliography and Index of North American Geology, Paleontology, Petrology and Mineralogy for 1904," by F. B. Weeks.

As Water Supply and Irrigation Paper No. 143, the United States Geological Survey has issued "Experiments on Steel-Concrete Pipes," by J. H. Quinton. The experiments have been made on large steel-concrete pipes designed to replace the iron, steel or wood stave pipes used in hydraulic work. The author introduces the subject with a discussion of the advantages and disadvantages of iron, steel and wood stave pipes, shows the need for a stronger material, and suggests the use of concrete-steel. He details method of construction and tests, giving results of same. It is concluded that the finished pipe is more durable and costs about the same as the wood stave. The main difficulty is to make a pipe that will stand 100 feet of head of water without leakage through the porous concrete. Many results of the experiments are negative and suggest the necessity for further investigation. The pipes made and tested were 5 feet in diameter inside and 20 feet long, with a 6-inch thickness of concrete shell inclosing an armor of steel rods sufficient to resist a head of 150 feet of water with a factor of safety of 4.

Analytical chemists will welcome a revised edition of "Engineering Chemistry," by T. B. Stillman, a book that is considered invaluable by many engaged in the analysis of iron and fuel. The most notable point in the revision is the improvement, coincident with recent progress, in the analysis of materials of construction. Additional matter relating to asphalts, lubricating oils, Portland cement and the technology of blast furnace products has been incorporated in the book. The methods described are exhaustive, and at the same time are clear and concise. All phases of the analysis, both physical and chemical, of the ordinary fuels and their waste products are treated in great detail. The determination of all elements employed in the manufacture of iron and steel is specifically described. Then follow directions for analysis of various materials of construction. Other materials, whose analyses are described, include paper, alloys, soap, petroleum, lubricating oils, paints, and water for boiler supply. The work seems accurate and reliable throughout. It is published by the Chemical Publishing Co., Easton, Pa., and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $4.50.

Trade Treatises.

"Dry Air for Blast Furnaces" is the title of an interesting leaflet from the De La Vergne Machine Co. of New York City.

De La Vergne Machine Co., foot of East 138th street, New York City, sends a finely printed and illustrated booklet showing a few of the numerous uses to which the "Hornsby-Akroyd" oil engines are adapted. It contains information valuable to any one interested in economical power production by oil engines.

Personal.

H. C. HOOVER is at Melbourne, Australia.

R. J. FRECHEVILLE is in Rhodesia, South Africa.

A. W. GEIST of Guadalajara, Mex., is now in New York.

FRED C. CORNING is expected in New York from London.

H. A. KELLER has returned to New York from South America.

I. H. ROLKER has returned to London from Western Australia.

PHILIP L. FOSTER is on his way from Lima, Peru, to New York.

R. S. ROBINSON has charge Century mill at Park Valley, Utah.

BEN S. REVETT has returned from Europe and is now in New York.

JAS. GUERIN is superintendent Hunter G. M. Co., near Mullan, Idaho.

W. G. PERKINS is superintendent Nevada Consolidated smelter at Ely, Nev.

JACOB KING has charge New England & Clifton Copper Co. at Clifton, Ariz.

HOWARD W. DUBOIS has returned to Philadelphia, Pa., from the Klondike.

E. C. VOORHIES has returned to Sutter Creek, Cal., from San Francisco, Cal.

R. C. TURNER, superintendent Dolores mine, near Minaca, Mex., is in New York.

JOHN MAYHEW has been made superintendent Big Jack M. Co., at Plattsville, Wis.

C. M. FUELLER has returned to Denver, Colo., from a business trip to Ontario, Canada.

W. J. BRACKING of Wallace, Idaho, is manager North Franklin M. Co. at Mullan, Idaho.

CHAS. D. WALCOTT, director United States Geological Survey, is visiting western Utah.

H. R. PLATE, mining engineer, has opened an office at 501 Majestic Building, Denver, Colo.

JAS. D. HAGUE, president North Star Mines Co., Grass Valley, Cal., is visiting his mines.

W. G. ARKILLS, manager Star tunnel of Clear Creek, Colo., has been in New York on business.

FREDERICK GRUNDY has returned to Los Angeles, Cal., from a mine examination near Ehrenberg, Ariz.

J. M. BOURKE of San Francisco, Cal., is examining mines in the Union Pass section, near Kingman, Ariz.

W. E. GARVER has been appointed manager Mount Theresa M. Co.'s new mines near Idaho Springs, Colo.

W. A. DOUGLAS, general manager Pearl G. M. Co. at Roosevelt, Idaho, has been visiting at Atlantic City, N. J.

J. H. CURLE AND W. A. PRITCHARD are making a reconnoissance of the Oroville, Cal., gold dredging field.

J. W. BUCHER, formerly with the Greene Con. M. Co. at Cananea, Mex., is at 1729 Champa street, Denver, Colo.

OTTY WAKELING succeeds H. S. Shelton as manager machinery department Baker & Hamilton, San Francisco, Cal.

R. R. LESLIE, assistant manager Creston-Colorado Co.'s mines at Torres, Sonora, Mex., is on a trip to Rossland, B. C.

ROBT. C. STICHT, general manager Mt. Lyell M. Co., has been elected president Australian Institute of Mining Engineers.

H. F. BAIN of the United States Geological Survey has been appointed State Geologist for the new Illinois Geological Survey.

FRANK AUGUSTUS has been appointed manager Mountain Monarch M. & M. Co. at Rollinsville, Colo., vice J. C. Barrows, resigned.

C. B. WISNER, president Montana Zinc Co. of New York City, has been in Denver, Colo., on his way to the works at Walkerville, Mont.

G. E. FITZGERALD has succeeded W. S. Dillon as general manager American-Mexico M. & Dev. Co. at San Lorenzo, Chihuahua, Mexico.

H. L. HUSTON, late superintendent Old Soulsby mine at Soulsbyville, Cal., is at Dayton, Nev., examining properties for the Ohio-Tonopah M. Co.

G. D. DOVETON, who has been examining Cripple Creek, Colo., low grade ores for a method of profitable treatment, has returned to Denver, Colo.

J. C. WELCH has been appointed superintendent Alaska Copper Co., which is building a smelter at Coppermount, Prince of Wales Island, Alaska.

H. S. MORRIS, formerly chemist of the Sand Pile cyanide plant in Amador county, Cal., has gone as chemist to the Creston-Colorado mine, Torres, Mexico.

L. T. POCKMAN, for some time past connected with mining in southern Oregon, has been appointed superintendent White Chief M. & M. Co.'s properties, Chinipas, Chihuahua, Mex.

B. S. WILLIAMS has been appointed superintendent Eagle & Blue Bell mine at Eureka, Utah, and James Clark, who has been acting in that capacity since the resignation of James Creighton, has been appointed mine foreman.

Latest Market Reports.

SAN FRANCISCO, October 6, 1905.

METALS

SILVER. — Per oz., Troy: London, 28⅞d (standard ounce. 925 fine); New York, bar silver, 61⅛c, refined (1000 fine); San Francisco, 61⅜c; Mexican dollars, 48c, San Francisco; 47c, New York.

COPPER.—New York: Standard, $16.75; Lake, $16.37½@16.75; Electrolytic, $16.62½; Casting, $16.12½@16.37½. San Francisco: $16.50. Mill copper plates, $17.50; bars, 18@24c. London: £71 5s spot per ton.

LEAD.—New York, $4.90; St. Louis, $4.90; San Francisco, $5.00, carload lots; 5¼c 1000 to 4000 lbs.; pipe 7¼c, sheet 8, bar 6¾c. London: £14 10s ℔ long ton.

SPELTER.—New York, $6.10: St. Louis, $5.75; London, £27 12s 6d ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $32.37½@32.62½; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔ lb., 40c. London, £148 7s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.25; gray forge, $14.75; San Francisco, bar, 3½c ℔ lb., 3¼c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$24.00; open hearth billets, $23.00@$25.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c; Lucol oil, boiled, bbl., 51c; cs., 56c; raw-bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 57½c; cs., 62½c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

Commercial Paragraphs.

THE S. H. Supply Co., Denver, Colo., are furnishing tanks for a 150-ton leaching plant to the U. S. Reduction Co., Colorado City, Colo., and a 100-ton leaching plant with crushing department, consisting of two No. 2 Wild mills and Sampson crushers to New Mexico.

C. M. FUELLER, 1750 California street, Denver, Colo., reports having recently secured an order for 10-stamp mill for Birmingham, Alabama. Work is to commence in the next thirty days.

CHAS. M. SCHWAB says that the Union Iron Works of San Francisco, Cal., is to have additions to its present capacity to the extent of increasing its facilities for the manufacture of mining machinery to equal that of any similar establishment in the United States.

THE Blaisdell Co. of Los Angeles, Cal., have a contract, through Chas. C. Moore & Co., engineers of San Francisco, Cal., for an installation of the Blaisdell system in the new cyanide plant of the Tonopah M. Co., Nevada. The Blaisdell Co. have the sole agency in the United States and Mexico for the Robins Conveying Belt Co. of New York on all work relating to cyanide plants.

THE American Car & Foundry Co. has added to its equipment at the Madison plant, Granite City, for the construction of steel and composite cars, among the equipment being 100 Boyer long stroke riveting hammers manufactured by the Chicago Pneumatic Tool Co. The company reports business in general continuing good and the prospects bright for the remaining months of the year.

THE Ingersoll-Rand Co. of 11 Broadway, New York, announces the establishment of a branch office at Houghton, Mich., under the management of T. F. Lynch, who has for several years past represented the Ingersoll-Sergeant Drill Co. in the copper and iron districts of the north. At the new office a complete stock of repair and duplicate parts for all Ingersoll-Rand machinery will be carried, assuring ready service to patrons of the company in the territory covered.

THE Power and Mining Machinery Co. of Cudahy, Wis., report the following contracts recently secured for mining machinery: Shannon C. Co., Clifton, Ariz., complete converter plant, including four 7x10-foot hydraulic converters of new design. This plant, when complete, will be modern throughout; Colusa-Parrot M. & S. Co., Butte, Mont., six 7x10-foot electrically driven converters; American S. & R. Co., new Garfield plant, near Salt Lake City, Utah, twelve 8x10-foot hydraulic converters of the same type as the Shannon and Colusa-Parrot; the same company, Aguas Calientes, Mexico, plant, three 8x17-foot vertical copper converters; Old Hundred mine, near Silverton, Colo., complete 40-stamp mill, electrically driven.

Obituary.

W. V. O'DALY, a mining man well known in Arizona and Mexico, was assassinated at Choix, Sinaloa, Mexico, on Sept. 28.

HENRY SEINCKE, aged 70 years, died at Boulder, Colo., on the 30th ult. He was the last of the four men who invented the diamond drill.

GENERAL DIRECTOR RICHARD AKERMAN of Stockholm, Sweden, reports the following statistics of the production of iron ore, pig iron, etc., in Sweden, in 1904, in metric tons: Iron ore, 4,408,647 tons; pig iron, 528,525 tons; charcoal blooms, 189,246 tons; bar iron and steel, 181,175 tons; nails, wire rods and iron and steel, 102,976 tons. During the year there was an average of 331 furnaces in blast, with an average daily production per furnace of 15.1 tons.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING SEPTEMBER 19, 1905.

799,866.—CAR COUPLING—Bennetts & Jones, Tacoma, Wash.
800,068.—WHIP SNAPPER—Bronaugh & Kistler, Los Angeles, Cal.
800,067.—BUILDING BLOCK—H. D. Brooke, San Francisco.
799,851.—SASH LOCK—H. Conboy, San Francisco.
799,891.—UNITING STAVES—D. Crane, San Francisco.
800,084.—WATER HEATER—W. C. Dice, Seattle, Wash.
800,111.—PARTITIONS—W. C. James, Los Angeles, Cal.
799,905.—TRAVELING ATTACHMENT FOR BUILDINGS—T. McConnell San Francisco.
800,000.—MODEL—C. Melrose, San Francisco.
799,920.—CHECK REIN—L. Moretti, Santa Cruz, Cal.
800,008.—RAIL JOINT—I. A. Oliver, Santa Clara, Cal.
799,801.—SEWING MACHINE TABLE—Pangburn & Olea, Seattle, Wash.
799,937.—SWAGE—J. A. Reid, San Francisco.
799,758.—ELEVATOR LOCK—R. J. Roulo, San Francisco.
799,870.—STONE SAW—W. B. Ruble, San Francisco.
799,806.—NURSING BOTTLE—E. H. Simonds, Berkeley, Cal.
799,684.—ELECTRIC FUSE—Snyder & Hardison, Santa Paula, Cal.
800,025.—TOY—A. Stein, San Mateo, Cal.
799,949.—OIL BURNER—H. B Stilz, Seattle, Wash.
800,029.—INSECT CATCHER—M. Terletzky, Goble, Or.
800,032.—SOAP TRAY—F. H Turner, Suttley, Cal.
799,765.—THRUST PLATE—A. W. Tweeden, Tacoma, Wash.
799,811.—OBTUNDER—C Van Wyck, San Francisco.
799,820.—CAN—Young & Symonds, San Francisco.
799,821.—CAN—Young & Symonds, San Francisco.
799,822.—CUFF HOLDER—M. P. Zindorf, Seattle, Wash.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

DIAPHRAGM PUMPS.—No. 800,356. Sept. 26, 1905. Frank Briggs and George N. Briggs, Yountville, Cal. This invention relates to improvements in pumping apparatus, and particularly in that class of pumps known as diaphragm pumps as distinguished from the ordinary plunger pumps. Its object is to provide a simple, practical pump devoid of bushings through which leak may occur and convertible at will from a lift to a force pump, or vice versa. It comprises a unitary structure, a divided casing and a centrally apertured flexible diaphragm secured between the two parts of the casing, said diaphragm aperture reinforced, a non-rotatable guide fixed centrally in the aperture of the diaphragm, a sleeve of less length than the guide and slidably mounted thereon, said sleeve having at one end an adjusting nut engaging a threaded portion of the guide whereby the sleeve is movable vertically on said guide, and having a foot piece or stop at the opposite end, and a flexible disk valve loose upon the guide and having a central opening through which the guide passes whereby the guide directs the loose valve in its opening and closing movements from and toward the aperture in the diaphragm.

VEHICLE TIRES.—No. 800,357. Sept. 26, 1905. Floyd Burnham, Fresno, Cal. This invention relates to a tire which is especially adapted for buggies and all carriages. The object of this invention is to provide a tire having all the advantages of a tubular elastic casing with a substantially rigid interior support, which is provided by an ordinarily formed rope of sufficient diameter to entirely fill the interior of the casing. It comprises an improved tire composed of an outer tubular casing having relatively thin walls of substantially uniform thickness and forming an inner chamber which is concentric with the exterior of the tube, and a multistrand rope filling said inner chamber and supporting the walls of the casing.

AMALGAMATOR.—No. 800,378. Sept. 26, 1905. Henry L. Lightner, San Francisco, Cal. This invention relates to an apparatus for the amalgamation or saving of precious or valuable metals. Its object is to combine with a surface of mercury or an amalgamated surface a device adapted to discharge air under pressure upon said surface in such a manner as to move the material which has been delivered upon the surface and to separate therefrom any gold or valuable heavy substance, which separated material will be retained and the gangue will be discharged. The device may be employed in various ways, either operating in a direct line or as a revoluble apparatus. The apparatus comprises a circular amalgamated concave surface, means for supplying water with pulp containing valuable metal centrally upon the surface, an air blast apparatus, a conducting pipe and radially disposed arms having perforations adapted to discharge a blast of air downwardly and outwardly upon the inclined surface.

CONCENTRATOR.—No. 800,379. Sept. 26, 1905. Henry L. Lightner, San Francisco, Cal. This invention relates to an apparatus for the concentration of substances having varying specific gravity. The apparatus comprises a tub with vertical slots made around its periphery, vertically movable gates having openings made therethrough, means for supplying pulp to the tub, an air blast apparatus, a revoluble vertically adjustable tube connected with said apparatus, and having radially perforated arms projecting from the lower end, and means by which said tube and arms may be gradually raised in unison with the movement of the gates.

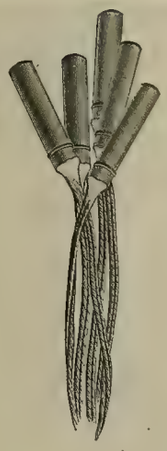
BALING PRESSES.—No. 800,384. Sept. 26, 1905. Chas. L. Miller, Berkeley, Cal. This invention relates to improvements in baling presses, and especially that class which is designed for baling hay and like substances. It is especially designed to be used in that class of presses having a vertical press box with a means for delivering charges of material into the upper part of the box, these charges being successively compressed by means of a follower which is moved downward by suitable connections, so as to compress the charges successively into the lower part of the press box, and when the bale has been completed and tied it is removed through a door opening, which is located below the point at which the material is delivered into the press. The device comprises a press box with an inclined cutaway side contiguous to the discharge door, a plate loosely fitting said cutaway section, and stops fixed to and swinging with the door, by which the plate is automatically moved forward or released by the closing or opening of the door.

SPLASH PLATES FOR STAMP MILLS.—No. 800,398. Sept. 26, 1905. Geo. C. Richards, Oakland, Cal. This invention relates to improvements in stamp mills, and especially in splash plates used in conjunction with stamp mill mortars. The invention resides in the use of vertically disposed amalgam plates instead of ordinary straight non-amalgam surface splash boards, the object being to save as much gold as possible where a good chance is offered to save it, and to prevent scouring, as would occur if a straight amalgam surface was used. It is not customary, however, to use amalgam plates in this connection, because the sand and water would scour off all the amalgam or "silvering," and leave nothing for the values to adhere to; employ a mortar having a conical ore chamber and segmental screens, disposing the latter coaxial with the chamber, so that all the splash from a stamp acts at right angles to the screen surface. The invention comprises the combination with a stamp mortar having a screened opening of a corrugated plate exterior to said opening and having an amalgamated surface presented toward said opening.

POWER PUMP HEADS.—No. 800,399. Sept. 26, 1905. Geo. C. Richards, Oakland, Cal. The object of this invention is to provide a power pump head which will be very simple in construction, easily set up and easily knocked down for shipment, which is adapted for either single or double acting pumps for deep wells, and which will be powerful and absolutely rigid. It comprises a triangular end castings having integral axially alined journal boxes at their apices, side castings disposed between and bracing the end castings, and long tie bolts passing through the end castings and side castings and extending across the latter.

Dividends.

Bunker Hill & Sullivan M. & C. Co., dividend No. 97, $150,000, payable Oct. 4th, a total paid since January 1, 1905, of $2,775,000, and total to date, $5,046,000.



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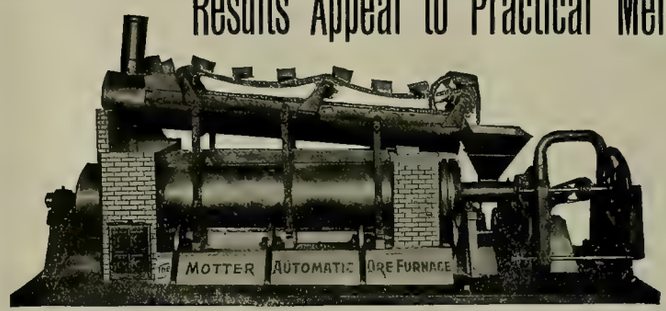

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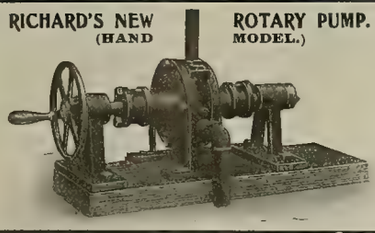

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MINING AND SCIENTIFIC PRESS

Whole No. 2360.—VOLUME XCI Number 16. SAN FRANCISCO, CAL., SATURDAY, OCTOBER 14, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

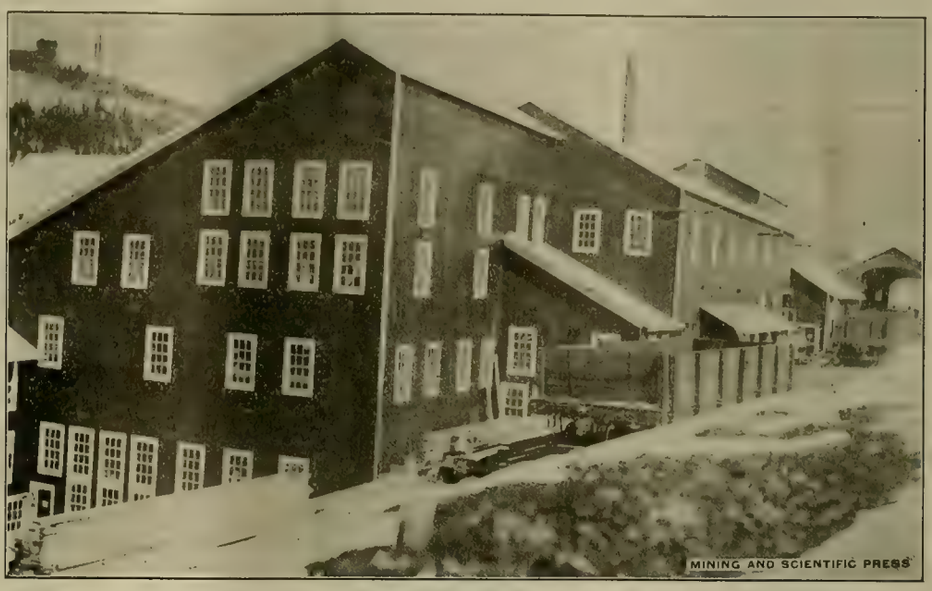
The Prospector and His Claim.

Good mines do not always fall into good hands. In this instance, by good mines are meant those which possess the elements of success, and by good hands is implied the ownership by those who are able to properly equip, develop and operate these mines. There are mines which require little capital at the outset, producing high-grade shipping ore from the grass roots, but such mines, though in former years fairly abundant in certain districts, are no longer so easily found. A man whose capital is limited to his strength and skill as a miner is placed at a disadvantage, as compared with the one who has the necessary capital of his own, or the backing of friends, in his enterprise. He may own a really meritorious property, as its development may later prove, but is unable to equip or develop it except in a very small way. He may perform a small amount of labor on it for a period of years, and in time dispose of the claim for a nominal sum, when the purchaser at once supplies the needed means, equips the property, and in a few months has it on a paying basis. Most miners who have good prospects realize fully the possibilities of their holdings, but, while realizing their own inability to develop and equip the mine, still ask a price so high as to prevent anyone from investing in what must necessarily be, at first, somewhat of a hazardous venture. The usual result is that the poor owner continues to be the owner, without making material headway. In such cases it is usually the part of wisdom to sell a good prospect for a reasonable price, and to use a part of the money thus secured in the development of another claim—as the prospector generally has a number of promising locations. In this way he may rise from absolute helplessness to a condition of independence and thereafter be able to proceed with the further development of his property in the same manner as the capitalist, and possibly with equally good results.

The prospector is, as a rule, not an experienced business man, nor is he always an accomplished miner and metallurgist, and for this reason he sometimes fails to accomplish the results secured by others later on the same property. Ordinarily it is the desire of the prospector to sell his claim at the highest price obtainable, and to continue to prospect as before, being unwilling to give up this most alluring of pursuits. These are the reasons why the owners of prospects wish to sell their holdings—unable to work them themselves, and not caring to be anything else than a prospector. "Once a prospector, always a prospector," is a common saying, and, generally speaking, is true. The prospector, after a fortunate sale of property, proceeds to enjoy himself after his own fashion, and in time, when funds run low, he goes optimistically forth once more into the wilderness, in the firm belief that he can repeat the exploit—a conceit which does not always materialize, but he continues to prospect just the same. There are many exceptions to this latter, the typical prospector, but he usually follows the well-beaten trail of his kind. The mere fact that the prospector offers to sell can in no wise be considered as evidence that his claim is worthless, for, as a rule, an experienced and successful prospector will spend little time on a poor showing. If he has done much work on the property, it may be taken as a sort of prima facie evidence that he has something worth looking into.

On one occasion the writer made a trip of 30 or more miles in Arizona to inspect a prospect on which the owner represented he had done over a thousand dollars' worth of work. On arriving at the mine the development was found to consist of one small hole which could have been dug in two days. The vein was small and not particularly promising. In explanation, this fellow said he feared, had he told the truth, he would not have succeeded in inducing any one to take a look at the so-called mine. It is needless to say that he was not from the ranks of the typical prospectors, but was a fraud who did most of his prospecting about town with his pockets bulging with other people's ore.

The investor can usually afford to listen to the bona fide prospector, and, making the necessary allowances for over-zealousness in description on the part of the latter, may safely offer to at least investigate what he has to proffer in the way of an undeveloped mine.



The Rowe Concentration Mill at the Portal of the Yak Tunnel, Leadville, Colo. (See Page 259.)

Prospector's Summer Camp in the High Sierra. (See Page 261.)

THE Transvaal government has appropriated $10,000 toward defraying the expense of a commission to investigate the means of preventing accidents incident to hoisting in shafts. It is said that the character of some of the shafts on the mines of the Rand is such that the deterioration of ropes is rapid and consequently dangerous. It has been found that in the upcast shafts, particularly, the corrosive effect of the polluted mine air on the hoisting ropes was very noticeable, the action mostly taking place in the interior portions of the cable, and where it could not be readily observed. The practice has been to handle most of the men through these upcast shafts, but it has become a matter of such importance that a searching inquiry into the existing conditions and means to lessen the danger is now deemed necessary. The mining rules of the Transvaal do not require that a mine have two shafts, though the advantage which two or more shafts possess is well known, but for commercial reasons it has been found expedient to overlook this matter, and good ventilation has been secured in most instances through the connection of the workings of adjoining mines. It may be that the commission referred to will suggest that the mining laws be so amended as to make two shafts a legal necessity. Safety-hooks to prevent over-winding are in general use on the Rand, but up to the present many shafts have no safety clutches attached to the skips or cages, though their necessity is recognized throughout the mining world elsewhere.

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The Value of Observation.

Many of the most successful mine managers owe their success to the habit of observation. They are quick to see whatever comes within the range of their vision; prompt to appreciate any advantage in a new device or method successfully applied, and are able to adapt the ideas and principles which this observation suggests to their own business elsewhere. There are others who, with the same or superior opportunity, fail to either see, understand or appreciate the object lessons which the successful operations of others should teach. Not infrequently men of this stamp are managing mines for other people.

There are in the United States many great and successful mining enterprises, and some of these are managed in a manner so practical and so thoroughly sensible that all may learn something by observing the methods employed, and carefully studying the various processes in the numerous departments which lead to ultimate success. The greatest gold mine in the world at present is undoubtedly the Homestake combination at Lead, South Dakota. The writer recently had an opportunity to visit and inspect the surface equipment and underground workings of this great property, after an absence of nineteen years. Having been familiar with the mine in its earlier history, its tremendous development and stupendous equipment were the more noticeable by comparison with what it had formerly been. There seems little lacking about the great plant, and the few improvements and additions to meet present requirements are being provided as rapidly as possible. There are six great shafts and hoisting plants; six mills containing in the aggregate 1000 stamps; two cyanide plants—the largest in the world—for the treatment of sands, and an equally large plant for treating slimes is to be built. There are machine shops, foundries, storerooms and warehouses, railroads, canals, ditches, pumping plants, and every accessory requisite to the greatest success. Millions of dollars have been invested in surface plant and millions more underground, but the mine has paid for it all, with the exception of an assessment of $200,000 levied in 1877–78. A rich mine can supply and afford all that may be necessary in the way of equipment, but the Homestake is not a rich mine; it is simply a series of vast low-grade ore deposits—so low grade that no extravagance is permissible. Notwithstanding all the above elaborate equipment, and the expenditure of the millions of dollars, which have been necessary to make this great mine a success, not a single innovation, not a new venture in plant, process or method, has been adopted without careful consideration and trial. From one end of this vast property to the other, from the surface to the lowest level, nothing is done by guess, no expensive installations are made before their necessity has become evident and their adaptability proven.

Throughout—underground and on the surface—one is impressed with the mature thoughtfulness evident in every operation, and in the application of every mechanical device. It is true, changing conditions have resulted in changes of plant and method from time to time, but when an installation is made it is the best that experience can suggest at the time, even though later it may be deemed advisable to displace it by another machine or method. Time and again the methods of mining have been changed, until to-day the methods in vogue are probably the best that can be applied in each particular case—for the ore is not all mined by the same method. Some stopes are much larger than others, and in some places the rock is softer than in others. The method adopted for each particular mine or stope is that one which has been found to give the best economic results at each place, irrespective of the others. Although mining has been reduced to almost an exact science on the Homestake belt, the engineers in charge are still studying the conditions and endeavoring to accomplish still better results, and without doubt they will succeed.

In the early history of these mines all underground stopes were heavily timbered, but not filled. The great stopes caved, and a different method had to be sought. Stopes were then timbered and filled with waste rock. This prevented caves, but was so expensive that some means of reducing the expense was sought. By degrees a method was evolved which has resulted in a great reduction in the cost of mining. The great stopes are now extracted with a minimum of timber, all of the ore is recovered, and the breaking of the ore is cheaper than before, as the miners are not limited in the amount of ore they may break, as they often were when the expensive square sets were in place. A plan is now being devised to reduce the cost of mining the pillars left after stoping out two rooms. The plan will result, if successful, in largely doing away with the shoveling of that block of ore. In a pillar 42 feet wide, 100 feet high and 500 feet long (the width of the vein) this will effect a saving of about $25,000. As the original stopes are 60 feet wide and the alternating pillars will be 42 feet, this will mean the saving of a large sum of money on each level.

The instance here mentioned is but one of the many improvements constantly being made. At the present one is inclined to believe that perfection has been about reached; but the experience of the past shows that this is improbable, and that the future will witness other changes in equipment and methods which will still further reduce the cost of mining and milling on the Homestake. It is safe to assume, however, that no radical change will be made which has not been first carefully studied out in its every detail and tested fully before it is adopted.

For many years the tailings from these mills ran to waste from the plates, the only effort to save any values being a few strips of brussels carpet, over which the pulp passed on its way to the canyon. The plate area was increased and silvered copper plates were put in. These were among the first in the United States. A section of plate was added below the original apron plates, but this lower plate was given a greater width than the old plate next to the mortar. This second plate saved considerable additional gold. A third and wider plate was added and a still further saving resulted. There being no room for more plates in the mills, plate houses were built, and in these one may see the unusual spectacle of thousands of square feet of silver-plated copper plates, over which the pulp runs in a thinly distributed sheet. When these great plate areas are being dressed the men walk about on them, sweeping them backward and forward with full-sized house brooms. Each of these plates yields a quantity of amalgam every twenty-four hours, which suggests that possibly additional plate surface may not be amiss. The providing of these extra plate areas was an abrupt departure from mill practice elsewhere, but the wisdom of the installation has been long since demonstrated. T. J. Grier, the manager of this great property, has grown up with it and he is familiar with its every detail. Many of the innovations are the outcome of his own careful study and observation; other ideas have been supplied by the efficient corps of engineers, foremen and assistants.

As stated above, the addition of what would elsewhere be probably considered abnormally large plate area resulted in the saving of much additional gold. Still the tailings carried an increasingly larger percentage of values as the mine workings went deeper and the proportion of oxidized ore grew steadily less. The cyanide process was then tried on these ores and was found to be fairly satisfactory at the outstart. C. W. Merrill took up the proposition. It was a large one—the largest in the world, as far as quantity of material was concerned. The method of treatment was worked out along rational lines. Improvements were made from time to time. Special apparatus was devised to meet various requirements and the methods were adapted to existing conditions. A system of classification was worked out and resulted in an almost perfect separation of sands and slimes. The sands were found to be readily amenable to cyanide treatment by percolation. The slimes, however, to the extent of 1600 to 1800 tons of material, still contained values upwards of $1 per ton, and these were and at present are still being used to sluice the sands from the tanks. By means of a long series of experiments involving many disappointments and failures, Mr. Merrill has eventually worked out a method by means of which these slimes may be treated at a profit.

Although such satisfactory results have been obtained in mines, mills and cyanide plants, the managers of the various departments are still endeavoring to make further improvements, that expense may be lessened and returns increased. It is only through a knowledge of the details of this great undertaking that one may fully appreciate what is now being done, and to what extent the methods of the present are superior to those of the earlier days on the Homestake.

There are few mines which could not find something in the equipment and methods of the Homestake worth following. Necessity has had much to do with the results now being obtained. It is only recently that it was decided that the water pumped from Spearfish creek over a divide to the head of Whitewood creek, several miles south of Lead, could be made available as a source of power. For some years this water has flowed down the bed of Whitewood gulch, to be taken up lower down and carried by flume to Lead. The water is now to be conveyed in pipes and a pressure of several hundred feet secured, when the water will be utilized to generate electricity, which will supply power to various motors at the mine, while the water will still be available for mill use as before.

Notwithstanding the fact that the Homestake mine stands as an eminent example of careful, conservative and successful management, whether viewed from the practical, engineering, scientific, metallurgical or business standpoint, there are within the radius of 5 miles of Lead some of the most ill-advised installations that may be found anywhere. There are mines equipped in a manner that one would not expect from any one but a novice who had never had an opportunity to see anything better—mills built in cramped position, with numerous devices to handle material that should be handled by gravity—for good mill sites are available close at hand. In one mill the grizzly was found so clogged with broken ore that not a pound of the fines could pass through to the bins beneath. In another the ore from the breaker

was so large that it would barely pass the feed slot in the mortar. This was inexcusable, for the reason that the breaker could crush to inch cubes if desired. Other similar defective methods and installations are in evidence, and always where better results could have been obtained, as the conditions were favorable to the application of the best appliances and methods.

The managers and superintendents of these mines evidently do not realize how impractical their installations are. They do not know, and in some instances, at least, they will probably never become aware that they do not know. With the unusual opportunities for observation of thoroughly practical up-to-date installations, mining methods and metallurgical practice, there seems little excuse for these so-called mistakes.

Notwithstanding the excellent examples supplied by the Homestake and some others, millwrights and others continue to place rock breakers in the mills and above the level of the floor, necessitating the shoveling into the crusher of every pound of ore. The apron plates are allowed to bank up with sand until one-half or more of the area is covered and therefore useless as an amalgamating surface. The feed in some instances is so fast that the mortars fill up and holes are constantly punched through the screens. Canvas tables are allowed to run for days without cleaning up, and are therefore serving no useful purpose. The mining methods are in some instances extraordinary—the work being done for to-day only, with no thought of the morrow. The result is the mines are being gouged, leaving the ground in bad and dangerous condition. Soon work must come to a standstill, as no more ore will be available without sinking, or filling the old stopes, in order that the backs, in which there remains thousands of tons of ore, may be reached. In some of these mines great headers are run through the ore, the work being carried up from 20 to 50 feet or more, the miners standing on the broken ore. The ore is then shoveled into cars and sent out of the mine, leaving the back high overhead and out of reach for the future, unless timber or filling be put in. This has not been the outcome of necessity, but is the result of a short-sighted policy.

Many other instances of flagrant mismanagement might be mentioned, but those cited are sufficient. The same conditions obtain in other districts and in other States, but they are particularly noticeable in Lawrence county, S. D., because of a comparison with the Homestake, which one can not avoid making, and because there seems no excuse for the lack of observation on the part of the managers of some of the mines of that district, for which every opportunity is afforded.

Live Business Methods.

A good example of business nerve is afforded in Cleveland, Ohio, where nearly all the machinery of a plant has been sent to the scrap heap, to be replaced by new machinery. It had been in use only one year, was in fine condition, cost over $200,000 to install, but the owner ruthlessly "scrapped" it for good business reasons—new and improved devices for the same kind of work had just come out and he felt that as between replacing his $200,000 outfit or running behind in the competitive race, it was economy to put in the new machinery, even though it involved throwing out the machines of which he had been so justly proud only a year previous, and which had cost what was in itself a fortune. It was simply a case of good business judgment, the quick, decisive action that puts the American manufacturer to the front and keeps him there.

This week comes another example of the same kind, which, while it does not involve the immediate pecuniary loss accompanying the case cited, is unique in its relation to the business itself. C. A. Schieren has one of the biggest belt making establishments in the country—and has thrown out all the belts in his own plant. The Schieren belt plant power is now furnished by direct-connected electric motors, and in their new big factory belts for other people to use for distributing power are made by machinery driven by direct-connected motors, instead of by belts, as before. This system has cost them a good deal extra, but, like the Cleveland establishment, they figure that it is economical. As for the fact being detrimental to the prestige of their business, they show that in other lines of business belts are still necessary and will be used, and that it does not follow that because they discard shafting and belt connection that others need do the same thing, it being with them a simple case of economical action. Mr. Schieren says "the simple turning of our shafting used to daily consume 15 H. P. There is a saving of $2000 per year in that one item."

Whether it be the factory, the mine, the mill or the smelter, the present effort is to adopt the most economical device to do the desired work, regardless of what it costs or what is discarded. Nor is the idea solely for the immediate time, to be determined by the expense or profit of the first year. In an established business that looks considerably ahead, it is always reckoned good business to seize upon possibilities of decreased cost of production whenever presented.

At What Depth Do Gold Mines Quit?

There is a growing tendency on the part of experienced mining engineers to discover some relation, or connection, between the enriched portions of veins and ore deposits and the topography of the country. In many instances the richest portions of veins are found at and near the surface, and particularly on the elevated ground through which a vein passes, while those portions lying in the canyons or along the lower ground do not, as a rule, afford equally satisfactory results. There are exceptions, and these are numerous, but without doubt the greater number are of the character above indicated.

For many years mining engineers and geologists have tried to establish the theory that there is no apparent relation between the occurrence of payable mineral and the topography of the country, but the more extensive the development of mining regions, the more noticeable the fact becomes, that there is apparently such relation.

In some districts it is much more noticeable than in others, but in a general way such relation can be traced out. The causes for this condition are, as yet, speculative, but are presumed to be due to secondary enrichment, caused by the downward flow of surface waters. Nearly all veins carry more or less iron sulphide, which, decomposing, partly becomes altered to iron sulphate. A solution of iron sulphate is said to have the power to dissolve gold in much the same manner as solutions of potassium cyanide. If this be true in nature (as it is known to be in the laboratory) then the iron sulphate solutions slowly dissolve to very fine gold, and reprecipitate it at convenient places in its downward flow—at the intersection of the vein with floors, cracks, seams, and with other veins. The pocket hunter is familiar with these accumulations of gold, at what he knows as "crossings." A floor or fault in a vein usually results in enriching that portion of the vein immediately above the floor or fault plane, and often there is little or nothing below it. Instances of this character are particularly numerous. Another locus of enrichment is in those portions of the vein where there is a flattening in the dip, forming a sort of roll or floor, on which there is often an accumulation of richer ore, and sometimes a pocket.

A careful study of the occurrence of gold in pocket mines would probably throw much light on the subject of ore deposition and particularly on the secondary enrichment of gold-bearing veins and deposits. The richest pockets ever obtained from California mines were found near the surface, or at least in the oxidized zone. The noted mass of gold found on Carson hill, in Calaveras county, at the Morgan mine, in 1850, occurred at the surface, the entire amount coming from the surface pit not over 30 feet deep. Other large pockets were found near the surface. The largest pocket found in the Bonanza mine at Sonora, in Tuolumne county, was obtained within 100 feet of the surface—vertical measurement. Other noted pockets in other mines have been found at or near the surface, while comparatively few—and no very large ones—have been discovered at great depth.

A noted writer stated recently in a current publication that it was doubtful if any gold mine was as rich below 1000 feet from the surface as it had been above it. There are many instances to prove that this statement is not borne out by the facts, for in California there are numerous mines which have proved to be richer below 1000 feet than above that depth. Among the mines illustrating the fallacy of this supposition are the Kennedy mine and Argonaut, near Jackson, the Central Eureka and Eureka mines, near Sutter Creek, and some of the mines of the Grass Valley region.

Then there are mines which continue to be largely profitable below 1000 feet which have also been good above it, but it cannot be said that this richness, nor that of the mines previously mentioned as being better below the 1000-foot level than above it, are due to secondary enrichment. In these cases the condition seems to be normal. To what depth the payable ore (or ore of the same grade as that now being mined) will continue, it is, of course, impossible to predict. As mining operations go deeper, the cost per ton usually increases somewhat, while the grade of ore may not improve, if it even remains as good as it is at present levels. Secondary enrichment, however, is a different proposition, and there are those who even say that no payable ore will be encountered below the zone of downward circulation of surface waters; but those who profess this belief fail to point out clearly where this level is to be found.

Payable ore is still found in the deepest gold mines of the world—those of Colorado, California, and Victoria, Australia. The latter are down 4000 feet, with pay ore still in sight. The deepest California mine is down about 2800 feet, with good ore in the lowest level. Some Colorado shafts have penetrated below the 2000 level, and the mines still are prosperous. At what level may we expect them to become barren? Deep mines may become unprofitable because of increased expense, while the value of the ore remains the same as above. On the Rand, in the Transvaal, for instance, the gold-bearing banket continues to produce nearly the same average values as above, while the expense of mining increases as the levels are carried to deeper and still deeper levels, this being due entirely to economic and not geological conditions.

A careful review of all that is known of the genesis of ore deposits, and particularly of secondary enrichment, leads to the inevitable conclusion that there still remains much to learn about both original and secondary ore deposits. At one time secondary enrichment was not recognized as an important factor in mining, but a study of the remarkable phenomena of the ore deposits of Butte, Montana, forced the conclusion upon the observing engineers that the rich ore bodies of some of the great mines of that district were due wholly to secondary enrichment. No one now doubts that the phenomenally rich ore of Fryer Hill, at Leadville, Colo., Treasure Hill, White Pine, a score of places in Arizona and Nevada and elsewhere, were due to similar causes. The gold mines of California owe their surface richness to the same cause. The notably rich deposits at Goldfield, Nevada, must be ascribed to this secondary enrichment, as must almost every other occurrence of unusually rich ore at or near the surface.

It may be that rich accumulations of gold ore in depth, such as those occurring in Cripple Creek district, in California and in many other places, are due to somewhat similar causes. The water levels may at one time have been much higher or lower than now, for in all mining regions is found usually abundant evidence of oscillations of the region up and down—now rising, now falling. These changes take place slowly and extend over a long period of time, but the best that may be said is that the problems of ore deposition and alteration have only been partially solved.

THE question in Mexico of what a "dollar" means has been authoritatively settled. The Department of Finance of Mexico has decided that the word "dollar" shall mean the American gold dollar, and that when the Mexican silver dollar is meant the word "peso" shall be employed. Some time ago an American resident at Tampico wrote "dollars" on a check, and the Tampico bank cashier to whom the check was presented paid the amount in gold values. The drawer of the check claimed that it was his intention to have silver paid. Litigation was threatened, but upon investigation the authorities decided against the drawer of the check. The Mexican ruling applies to all documents—notes, drafts, etc.

CONCENTRATES.

WHERE patent has been applied for to a mining claim the pending of patent proceedings does not excuse the performance of the annual labor prior to the issuance of a certificate of purchase by the Government to the claim owner.

ALUM used in paper manufacture is quoted in New York about as follows: For lump mineral $1.75 per 100 pounds; for ground alum $1.85 per 100 pounds; for porous $1.00 and for the powdered variety $3.00 per 100 pounds.

PULVERIZED mica is used in the manufacture of lubricants, and also in making certain kinds of wall paper. Sheet mica is bought by large stove manufacturers, and the smaller sheets are used as insulators by electrical manufacturing companies.

AN oxygen base consists of a positive (basic) radical joined by oxygen to hydrogen. An oxygen acid consists of a negative (acid) radical joined by oxygen to hydrogen. An oxygen salt consists of a positive radical or radicals joined by oxygen to a negative radical or radicals.

THAT steel rusts much more readily than iron under ordinary atmospheric conditions, is well known. This is supposed to be due to the fact that the microscopic particles of carbon and other substances in the steel render it more easy of attack by oxygen in the presence of moisture.

THE performance of an amount of work or improvements in excess of $100 during any year on an unpatented mining claim does not permit the claim holder to carry this excess over and charge it to the following year. If $1000 worth of work be done, or improvements made this year, not more than $100 of it applies for this year, and none of it can be credited to next year.

THE "market for burros" in any particular locality is a matter upon which no exact information can be given. On general principles, it may be assumed that in a district where much prospecting is in progress there would be a demand for these useful animals, particularly on the desert, where they can subsist on less than almost any other beast of burden. Southern Nevada should afford at present a good field for the burro stockman.

MINERAL claims cannot be "taken up" on agricultural lands which have been patented. If mineral is discovered on patented agricultural land after patent issues the only way to get possession is through purchase or lease. It is not necessary to file a mining location on such land. Mineral veins on patented agricultural lands have no extralateral right—that is, the owners have no right to follow the vein on its dip beyond the boundaries of the property. Otherwise mines may be worked on agricultural lands the same as elsewhere.

THE Helena, Mont., copper ore would bring $6 per ton and would cost $7 per ton to smelt and mine. The plan seems to be to haul an ore of about $16 per ton and hauling cost of at least $10, to be mixed with the copper ore in hope that some money could be made out of it. It is difficult to see how this could be worked to be a profitable venture and it is not strange that the smelter is shut down. Answering the last question—that it would be quite possible to estimate the possibilities of smelting this ore without the expense of an experimental run. The cost of such an investigation would probably reach $1000, but from data furnished it is doubtful if it would pay.

ABOUT 20 years ago a record run was made at a large hydraulic mine in California, where the cost of washing gravel did not exeed 3 cents per cubic yard. This was accomplished in a somewhat unusual manner. The bank was first prepared by drifting, crosscutting, etc., for a heavy blast. This having been placed and fired, the water was carried on to the face of the bluff above the pit, and allowed to fall in a cataract upon the broken loose gravel, which it gradually washed away, leaving the gold upon the irregular surfaces of the bedrock, to be cleaned up later by a few men. No manual labor was employed in the washing, and no water was used under pressure. As a result the costs were unusually low.

WHERE "stoping without timbers" is practiced on an extensive scale, it usually will be found necessary to reinforce the sets of the main gangways, as the pressure of the shifting masses of broken rock wrench the timbers first in one direction and then in another, depending on the settling of the mass. The timbers can never be kept in perfect alignment, but usually do not seriously interfere with tramming. Square set timbering costs from 20 to 50 cents per ton of ore extracted, depending on the price of timbers, the size of timbers used, cost of framing and labor in placing. Blockholing and shoveling in stopes where no timbers are used costs not to exceed 20 cents, and is therefore to be preferred to timbering, being cheaper, and all the ore may be recovered. Filling costs more or less, according to existing conditions.

THE slope angle at which the sides of a ditch or cut will remain open without caving depends upon the character of material and its position as regards dip. Some material, like cemented gravel, will stand with vertical sides. Near Auburn, Placer county, Cal., is a railroad cut in this kind of material, which is in places over 80 feet deep (Bloomer cut), which was made in 1867. It has never caved and the slope of the sides ranges from 80° to vertical. Some volcanic material, such as tuff, will stand when cut by vertical excavation. Stratified and slaty rocks give the most trouble, particularly when they have a dip of over 30°. One side of the cut may remain firm while the other constantly caves. Some material which stands well dry will not stand at all when wet, particularly that containing clay or talcose minerals.

GOLD accumulated on the plates of a mill makes the best amalgamating surface, but there is no real need of carrying several hundred ounces on a single plate for this purpose. A mill plate cannot be subjected to a more harmful practice than that of scraping its surface with steel chisels or other implements of metal. It not only removes the film of gold so desirable in amalgamation, but also the silver plating beneath, and it lowers the fineness of the bullion, owing to the presence of silver and copper. The gold should be allowed to accumulate in a thin film over the plate, and nothing harder employed in the cleanup than a solid rubber, such as is provided for this purpose. If the gold is entirely removed, the surplus amount thus taken off must be replaced on the next run (and this is always attended with more or less difficulty), before the plate is again in proper condition.

THE North Bloomfield ditch, according to A. J. Bowie, was 8.65 feet wide on top, 5 feet at the bottom and 3½ feet deep. It was run on a grade of 16 feet to the mile and discharged 3200 miners' inches. From 1870 to 1877 the North Bloomfield Co. washed 11,021,630 cubic yards of gravel, the average amount moved being 4.6 cubic yards per miners' inch. The nozzles used were 6 and 9 inches diameter, the head of water 450 feet. The pipe line was 22 inches diameter in the main line and 15 inches in the branches. At times the face of the bank was carried to the height of 250 feet. The yield of 1,858,000 cubic yards of gravel washed in 1874–75 was 3.99 cents; 2,919,700 cubic yards washed in 1875–76 produced 6.6 cents per cubic yard. During 1876–77 the amount washed reached 2,293,900 cubic yards, which yielded at the rate of 12.68 cents per cubic yard. The cost per cubic yard during the several periods was: 2.86 cents in 1874–5; 3.25 cents in 1875–6 and 6.19 cents in 1876–77. The misstatements found in some works dealing with mining operations and costs are difficult to account for.

SULPHURIC ACID is employed in the manufacture of fertilizers. Calcium phosphate is treated with the sulphuric acid to form what are commonly known as superphosphates of lime. The chemical reaction is as follows: $Ca_3(PO_4)_2 + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$. The calcium sulphate is filtered off and the super-phosphate is left in solution. The commercial super-phosphate manure is a moist mixture of calcium phosphate—$CaH_4(PO_4)_2$ and calcium sulphate ($CaSO_4$). It is prepared for the market by mixing the ground mineral phosphate with sulphuric acid. Its chief value lies in the large amount of soluble phosphate it contains. The compound deteriorates in time. A portion of the soluble phosphate reverts to insoluble phosphate, owing, it is supposed, to the action of the super-phosphate upon some of the undecomposed calcium phosphate remaining in the compound, resulting in the formation of the insoluble hydrocalcium phosphate. The presence of the sulphates of aluminum, magnesium and iron also have a bad effect on the super-phosphates, converting the phosphoric acid into insoluble forms. A super-phosphate is also made by dissolving bone ash in hydrochloric acid, precipitating with ammonia and digesting the washed precipitate of calcium phosphate with phosphoric acid. On evaporation the salt crystallizes.

AS TO the adaptability of the diamond drill in prospecting: It may be used to advantage in any firm ground. In soft or loose ground it usually proves unsatisfactory, and mining by ordinary means is not usually expensive in ground of this kind. When deciding to employ the diamond drill in prospecting two things are of greatest importance—a knowledge of structural and mining geology, and a man to set the diamonds and run the drill who thoroughly understands his business. The drill runner may be an experienced and capable man with his machine, but know nothing of geology. The probable result would be much loss of time and money in working at random. If the services of a competent geologist can first be secured to outline the general plan of operations, when this is understood the drill runner may then be trusted to go ahead under instructions, and results secured should be of value. Drilling must be conducted systematically and a careful map made showing the direction and depth of each hole and formations passed through. In this way a correct record is compiled, from which afterward the proper conclusions may be drawn. A diamond drill in proper hands affords an excellent means of prospecting at a minimum cost, otherwise the entire outlay may be a waste of time, money and energy.

WHEN driving a raise it is always a good idea to divide it by a partition, using one side for the passage of rock or ore, and the other for manway. This may be done by putting a line of stulls in a vertical raise, or posts, as they would be called in an inclined raise, and spiking planks to these timbers. By arranging a chute at the bottom, the rock broken above may be drawn into cars and handled cheaply. If the ore or rock is drawn away as fast as broken above, the partition will afford good ventilation. If the ore pass is allowed to fill up, only enough being drawn away to keep that side of the raise full, the air circulation will be reduced. If the latter case is necessary, a pipe should be carried up the manway side and air forced into the raise, either by means of fans or compressed air. In some mines a jet of compressed air is sent into a pipe of larger diameter extending up into a raise or stope. This jet gives the air in the pipe an upward movement and additional air from the atmosphere surrounding the pipe at its lower end is carried into the pipe by the suction. This is proper and usually satisfactory if the air at the foot of the pipe is free from foul gases, but which it usually is not. In the latter case a circulation of air results, but the air being already vitiated does not afford the necessary relief. When a long raise is started, sinking from some point above to make connection as quickly as possible is always advisable, and when the winze and raise approach each other sufficiently conditions may be improved at the last by drilling a long hole downward in the winze to connect with the top of the raise. A circulation of air may thus be secured when the faces are still 20 feet or more apart. Although the drill hole will be small, it will be found to make an appreciable difference in atmospheric conditions. If the winze above is wet, the water can be conducted to one side of the raise.

THE following notes on assaying copper ores by the cyanide method are from Ricketts & Miller's "Assaying:" The method is based on the decolorizing of an ammoniacal solution of copper nitrate by potassium cyanide. The reactions are complicated, as different organic compounds are formed under varying conditions. For this reason it is essential to the accuracy of the method that the bulk of solution, the temperature, the excess of ammonia, the quantity of ammonium salts, and approximately the amount of copper in the solution shall be the same as in standardizing. The solution for titration is made by dissolving 22 grams of pure potassium cyanide in water and diluted to 1 liter. In standardizing, weigh out portions of pure copper of about 200 milligrams each; dissolve in 10 c.c. 1.2 gravity nitric acid in a beaker capable of holding 200 c.c.; boil out the fumes; dilute with cold water to about 80 c.c.; add caustic soda solution till a slight permanent precipitate forms; then add 6 c.c. strong ammonia, specific gravity, 0.9. Run in cyanide solution from a graduated burette till the blue color is very faint, then dilute the solution to 150 c.c. and continue adding cyanide a few drops at a time until the blue color has disappeared. The bulk of the solution should be 150 c.c. at the end of each case. To obtain this the operation is continued until but a few drops more are required, then diluted to the correct volume. The beakers should be marked at a point where they hold 150 c.c. In making the assay—dissolve the ore, matte or bullion as already described; precipitate the copper by aluminum or zinc, or as sulphide by means of hydrogen sulphide, dissolve the precipitate in nitric acid and proceed as in standardizing. The amount of KCy solution required to discolor the blue solution indicates the percentage of copper present.

TO give a proper outline of treatment of any ore from description only is most difficult, and usually is also unsatisfactory. The Mexican ore containing gold $6, silver about 20 ounces, manganese dioxide 6.45%, etc., leaves a doubt as to the character of the silver—whether native, chloride or some complex compound. Naturally one would first expect to be able to amalgamate at least a portion of the gold on plates or in pans, and possibly, also, some of the silver. The manganese oxide may give some trouble in amalgamation, which can in some measure be overcome by the employment of a quantity of quicklime fed regularly with the ore at the rock breaker. The amount to be used must be determined by trial. The result of attempts at subsequent concentration is wholly speculative. If the silver occurs as black sulphide, and stamps are used in crushing the ore, a very limited saving of the silver sulphides will result. Another type of mill would give better results. Naturally it is desirable, if possible, to avoid roasting the ore owing to increased expense. The "dead roasting," it is said, resulted in good extraction of gold, but low on silver. In roasting ores for chlorination it is very important that the heat should not be too high in the early stages, or insoluble compounds of silver are likely to result, and the same may be the case in cyanidation. It is never possible to say whether or not the cyanide process is adaptable to any particular ore even after analysis. The experiment must be tried on a scale sufficiently large to demonstrate its commercial adaptability. The fact that a better extraction can be obtained from sands than from slimes is probably due to mechanical causes. These two classes of ore can be completely separated by a series of hydraulic classifiers, and each treated separately. Ordinarily there is no difficulty in treating the sands by percolation, but the slimes require an entirely different treatment — filter pressing or in some other manner—the scheme in each case to be worked out.

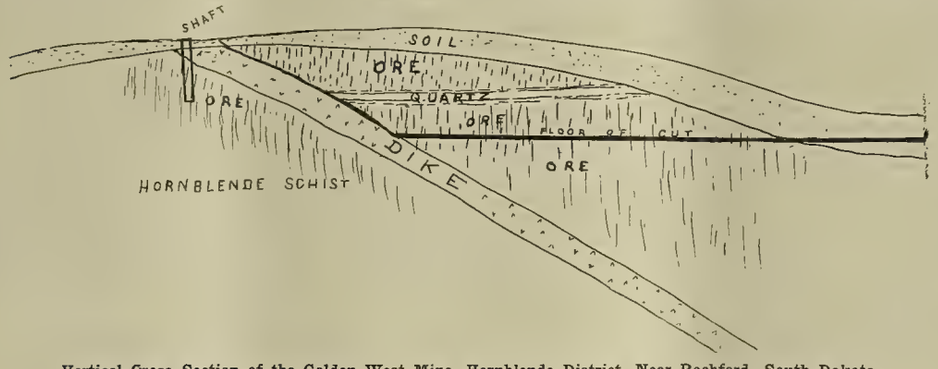
The Golden West Mine, Pennington County, South Dakota.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

One of the most interesting and unusual gold-bearing deposits in the Black Hills of South Dakota, a region noted for its strange and remarkable ore deposits and minerals, is that owned by the Golden West Mining Company. Some weeks ago there appeared herein a description of the mining methods in vogue at this property, written by E. J. Kennedy, the superintendent. Since that time the writer has had an opportunity to personally inspect the mine and plant and to watch its operation. A further description is not only of interest, but is justified by the facts. The geology of the deposit is of particular interest, and may be said to be an anomaly among the numerous gold mines of the Black Hills, there being no duplicate or other similar deposit there so far as known to the writer.

The ore deposit occurs near the summit of a group of rolling hills, near the head of what is known as White Weazel gulch, and about one-half mile from Castle creek, in Hornblende district, 6 miles west of Rochford. It cannot be said to occupy a basin, and yet, for most part, the deposit is found at the side of a "saddle" between the hills and is nearly flat. The country rock is hornblende schist, with numerous small stringers, and a few veins of larger size, of white or bluish granular quartz. The entire mass is impregnated with auriferous iron sulphide and free gold. The ore near the surface is colored, red, yellow, brown, black, and various other colors, in many shades, the result of the oxidation of the sulphide minerals. The strike of the formation is a few degrees west of north, and its dip slightly from the perpendicular to the eastward. Naturally in such a formation, and under the conditions described, it would be expected that the ore deposit would conform closely in strike and dip with the rocks in which it occurs. It may be that this will eventually be found to be the case, but as far as the development has progressed it leaves this important matter in some doubt.

The accompanying diagram will aid in giving an



Vertical Cross Section of the Golden West Mine, Hornblende District, Near Rochford, South Dakota.

understanding of the conditions as far as they have been determined by present development. As previously stated, the formation is nearly vertical, and is covered by soil and other debris to depths varying from 1 to 8 feet where exposed in the cut. About 15 feet from the surface on the west side of the cut is seen a flat sheet of quartz cutting the schists at nearly right angles. This quartz is shattered by pressure and slight movement, is mineral stained and gold bearing, as well as the schists both above and below it. The cut is irregular in outline, but is rudely circular and about 100 feet in diameter. On the south side of the cut the ore is abruptly cut off by what appears to be an intrusive massive rock dipping 17° to the eastward. This dike-like mass is seemingly a type of coarse-grained diorite, and consists largely of fibrous hornblende grouped in brush-like bunches with white feldspar, and little or no quartz. The rock presents every physical appearance of being a dike, which it probably is. It is wholly devoid of the schistose structure so pronounced in the overlying schists. A shaft sunk a few feet back from the rim of the open cut was started in this hard, tough diorite, but passed through it and entered schist similar to that above the dike, and this lower zone of schist is known to be gold-bearing also. The relative position of this shaft and lower ore zone is shown in the sketch. This seems to indicate clearly the dike-like nature of the massive amphibole rock. If further development of the mine proves this to be the correct conclusion, the dike is probably of pre-Cambrian age. In the northern Black Hills there has been extensive dynamic action, and dikes, both large and small, are very numerous. The northern Black Hills also furnish a number of examples of typical laccolithic intrusions, but south from Custer's peak few, if any post-Cambrian intrusives are known. The geological age of most of the igneous rocks—porphyries, felsites, rhyolites, andesites, phonolites, trachytes, etc. — is thought to be as late, if not later, than Cretaceous.

In the central and southern Hills, however, there are many intrusions of basic rocks, principally diabase and diorite. In the village of Rochford, near the Montezuma mill, a large diorite intrusion occurs in the micaceous and hornblende schists, and near the head of Irish gulch, 2 miles north of Rochford, a quartz-bearing diabase dike may be seen. Near Lookout, on Castle creek, are several dikes of diorite and diabase, showing that the Algonkian age in the Hills was not free from this sort of disturbance.

The Golden West mine involves some interesting problems in mining and transportation. Up to the present time mining and milling have been accomplished at very low cost, but in the future this cost will probably be somewhat higher. As stated above, the upper ore deposit is covered with from 1 to 8 feet of soil, grass and tree roots, and drift from the neighboring hills. This has largely been mined with the ore heretofore and sent to mill, but as the breasting out of the ore proceeds in the cut the thickness of this overburden increases somewhat, and although it contains some gold it is generally an insufficient amount to make its transportation and milling profitable. A method of stripping and disposing of this waste material must soon be provided. The lower ore zone is almost wholly unknown, but if on exploration it is found to contain payable values over a considerable area, it might be the better method to mine this zone or sheet, whichever it proves to be, and to fill the underground stopes with the waste from the surface. This would afford a means of disposing of what is now a source of expense, while providing a cheap filling for underground workings. It is not known whether the underlying schist is again cut by a second and lower dike, or whether it will form a zone of gold-bearing schist extending, like the Homestake, to indefinite depth. In either case the mine will be able to continue to supply a large amount of ore to the mill, and when contemplated improvements have been made the cost of milling, transportation, and possibly mining, may be somewhat reduced. Should it be found that the lower zone is of great depth when the ore lying above the dike has been removed, the dike itself could be broken and employed in filling the lower workings.

At present all ore is supplied from the superficial workings of the open cut. The ore is picked and barred down, being loose and easily mined, and very little powder is required. The ore is shoveled up at the face into cars and trammed a short distance to the loading bins, from which it is drawn into the buckets on the aerial tramway. At most terminal stations the buckets are pushed around the terminus by the men, but at this plant an automatic device takes the buckets when released from the running rope, at the lower end of the terminal, and by means of lugs on a chain the buckets are carried forward and are dumped automatically into a hopper which feeds the rotary rock breaker. The bucket continues on its way and the clip on the running rope automatically clutches the bucket carrier and the bucket is returned to the upper terminal. This tramway is 2700 feet in length and operates very satisfactorily, but it has a far greater carrying capacity than is demanded of it at present. An increase in tonnage would result in a decrease in running expense of this branch of the business.

Upon passing the rock breaker the ore falls into a large bin and from that by means of a chute goes to an automatic feeder, which discharges into a large Chile mill. Some time since this mill was run at higher speed than now and the feeding was forced so that the capacity reached 100 tons daily. It was found that by reducing the feed somewhat better amalgamation could be done. In the judgment of the writer the screens in use are too coarse, and finer crushing would result in reducing the values in the tailings materially. The plate surface, too, is deemed inadequate, and should at least be double what it now is for the amount of pulp passing over it. The mill is provided with one stationary plate 4 by 12 feet and two shaking plates of similar size.

The mill is so arranged that an additional grinding machine may be set up beside the first. As the company has an abundance of power available, it would be economy to add this equipment. The mine, the tramway, crusher, and entire paraphernalia are able to supply and handle the additional ore and the installation of another mill would materially reduce the cost of operations.

Selling Timber From the Forest Reserves.

The new rules for the national forest reserves, announced by the Secretary of Agriculture on July 1, were made to give freer use of the reserves to the residents of the States in which they are situated. Experience has already shown that they are welcomed.

The West understands what this means better than does the East. From the first the East has believed in the reserves and declared that there could not be too many of them; but in the West the first effect of their proclamation was widespread alarm. It was feared that the reserves would check the development of the region, would burden neighboring communities with taxes, and would prevent the taking for local needs of the timber which lay close at hand. Both in the East and in the West the wrong idea prevailed that a reserved forest was not for use.

A forest reserve is meant to yield up its wealth, as a farm does, or a stream which turns the wheels of many mills. In the long run it should both guard and increase the resources of the country in which it lies.

The mere creation of forest reserves, without provision for their administration, was therefore both ineffectual and annoying to local interests dependent upon their resources. Consequently the Secretary of the Interior, in 1896, requested the National Academy of Sciences to recommend a national forest policy. This resulted in the passage of the act of June 4, 1897, under which, with several subsequent amendments, forest reserves are now administered.

On the theory that the management of land, not of forests, was chiefly involved, this law gave the Secretary of the Interior authority over the reserves, and provided that their surveying, mapping and general classification should be done by the United States Geological Survey, and the execution of administrative work by the General Land Office.

The result was not satisfactory. The technical and complex problems arising from the necessary use of forest and range soon demanded the introduction of scientific methods and a technically trained force, which could not be provided under the existing system. The advice and services of the Bureau of Forestry were found necessary, but, under the law, could be but imperfectly utilized. The necessity of consolidating the various branches of Government forest work became apparent and was urged upon Congress by the President and all the executive officers concerned. Finally, the act of February 1, 1905, transferred to the Secretary of Agriculture entire jurisdiction over the forest reserves except in matters of surveying and passage of title.

Scientific forestry means wise use—not the locking up of forest wealth, but putting it to profit under well known laws which control the right utilization of the forest. It is just because a second crop is desirable that the first crop calls for the forester's ax, and the forester's skill is again needed in the reservation of seed trees and, above all, in protection from fire.

So when the reserves were transferred to the care of the forest service, in the Department of Agriculture, work was at once begun to bring the forests into larger use, to develop their resources both for the needs of settlers and for the good of the forest itself. The office was moved nearer to the applicant; that is, more authority was given to the forest officers on the reserves, so that settlers entitled to the free use of timber, as well as those wishing to purchase timber in small quantities, might be served on the spot, without delay. Whenever timber is wanted on a larger scale, experts are assigned to report on the advisability of a sale, and where large transactions are in due course completed, the timber is removed under contracts which provide for a second crop by fixing a diameter limit, by careful logging methods, and by burning the slash to prevent fires. Twenty-two forest assistants, assigned as technical assistants to forest supervisors, are at present engaged in the making of working plans. Forest inspectors inspect and report upon all the work done on the reserves.

Besides these technically trained foresters there are also employed forest supervisors, rangers, and guards. To these men is given general administration and care of the reserves. They must know their regions, be familiar with local conditions, and combine good sense, independence, and the physical, mental, and moral qualities which make good woodsmen.

The Secretary of Agriculture has, under the law, discretion to allow or refuse free use of forest reserve timber and stone by "bona fide settlers, miners, residents and prospectors." This free use is intended merely to provide for the immediate needs of the individual himself, not to permit him to cut timber for sale to others. Free use is expressly refused to sawmill proprietors, owners of large establishments or commercial enterprises, and companies and

corporations. The free-use privilege is also refused to any trespasser.

Under the present scheme of administration all timber on forest reserves which can be cut safely and for which there is actual need is for sale. Applications to purchase are invited. Green timber may be sold except where its removal makes a second crop doubtful, reduces the timber supply below the point of safety, or injures the streams. All dead timber is for sale.

There are three classes of timber sales. Setting aside California, where every sale of any class of timber must be advertised for sixty days, the classes are briefly these: The first includes dead timber worth not more than $20, on application to a forest ranger or a deputy forest ranger; the second, dead and living timber, worth not more than $100, for which the forest supervisor's approval must be secured; and the third, timber worth more than $100, which must be advertised, and can, as a rule, be approved only by a forester. All timber must be paid for, in full or in installments, before it is cut.

The local officers of the reserves receive all applications for permission to cut, and grant permission for small amounts, but they receive none of the money paid for timber or for any other use of the reserves. No one but the special fiscal agent of the forest service, in Washington, D. C., is authorized to receive any payments whatsoever. The regulations promulgated by the Secretary of Agriculture specify that:

"All money, whether payments, deposits, or settlements, must be sent direct to the special fiscal agent and not transmitted through a forest officer. Money must always be sent by postal money order, express money order, or national-bank draft on New York. Other forms of drafts, cash, checks or certified checks will not be accepted."

A Miner's Measuring Pole.

Written for the MINING AND SCIENTIFIC PRESS by MATT. W. ALDERSON.

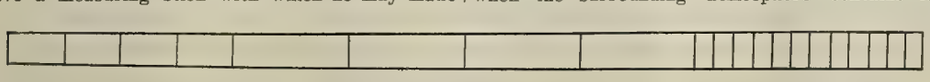
I called on a neighbor a few days ago, my nearest neighbor to the west, 6 miles away. For four years we had received our mail from the same postoffice and yet had not met. I found him a robust man, just past three score, a man with whom it was a pleasure to converse; for it was easy to see he was blessed with sturdy common sense. For eight years he has been prospecting at the head of a gulch for the vein from which rich placer deposits below him were supposed to have been derived. A few hundred feet from where he is at work one nugget was taken out valued at over $3000. If the generally accepted theory is correct he is doing intelligent work. But that little word "if!" And the tragedies that follow the belief in false theories!

But I am not writing of theories just now. The work of the man showed he had put heart into it. His tunnel was straight as an arrow and the timbering such as to delight the eye of a mechanic. Part of the tunnel was through soft ground and the sides were lagged up with stone — granite broken in driving the tunnel — laid dry, with the face as smooth as the wall of a well-built house. I stood back in the tunnel and looked out. It seemed as if there was not a cap in a distance of 150 feet that was a quarter of an inch out of line.

I could but think that a man who did such work was worthy of splendid remuneration. And in most lines he would receive it. But, as a friend says: "All the paths on this globe are not smooth ones. Some of the rough ones naturally occur in the Rocky mountains."

As I passed out of this man's tunnel I noticed his measuring stick and I said to myself, "There's a good idea." It was short, but embodied something I had not thought of. It was good any way it happened to lie. I have used measuring sticks for years in mines, but the marks on them were simple notches on one side. My neighbor's measuring stick had grooves that went entirely around the stick. And its advantages in other respects must be apparent to every man who does measuring of rough work around the mine.

To make these serviceable measures, take round, smooth sticks 1½ to 2 inches in diameter and of such length as will be most useful for the work in hand. For tunnel work let one stick be 4 feet and another 7 feet. On one end of the sticks mark 1 foot in 1-inch lengths, the next foot in 6-inch lengths. On the other end mark the first foot in spaces 3 inches apart, the next foot in 6-inch lengths. The space between the 2 feet on each end may preferably be in markings of 1 foot. Then carefully groove the marks around the sticks, cutting the groove in about one-eighth of an inch. Do this carefully with a saw, and one will have a measuring stick with which he may make accurate measurements even in the dark. Illustration herewith shows how such a stick will look when finished.



A Miner's Measuring Stick.

Extinguishing a Fire in a Pyritous Mine.

On the 27th ult., in an address before the students of the Mining College at the University of California, Berkeley, Cal., Lewis T. Wright, general manager of the Mountain Copper Co., gave an account of an underground fire in the Iron Mountain mine, Shasta county, Cal., and how it was overcome:

"The Iron Mountain mine is a large mass of cupriferous iron pyrite. In mining this the immense cavities formed by the galleries, stopes and workings are filled with rock. In course of time it was found that the mine temperature had increased and was increasing. The ventilation system was that almost invariably used in metalliferous mines, viz., natural ventilation. The pyrite in places became hot, and it became necessary to aid the ventilation by means of fans. One morning a faint odor of sulphurous acid was observed, and by midday it had increased to such an extent that a large part of the mine had to be abandoned. The mine was on fire and the gases from the fire made it impossible to live in the workings. The fire proceeded rapidly through parts of the filling and the workings, burning out the timber. That fire was extinguished by heroic means and the use of water. The problem now was to find a means of cooling the working places so that work could be carried on, to prevent gases from fires that might originate in filled ground from spreading to the workings, to extinguish fires that might originate in covered ground without interfering with the operations, and to prevent small traces of gases from such fire from entering the workings where their presence would drive out the miners.

"What was the cause of the heating of the ground that was the precursor and cause of the fire? Some thought it was the pressure of the backs on the filling. No doubt in the settling and packing of this by immense weight above there might be some heat generated. So many million tons falling so many feet in such a time would produce a calculable amount of heat. Some thought it was the kaolinization of the rock filling and adjacent country. I reasoned as follows: A mass of pyrite dry and at normal temperature like a specimen in a museum does not get hot, does not oxidize, and may from all we know last a million years without change if so preserved. But a heap of pyrite exposed to moisture and oxygen does oxidize or sulphatize. That reaction produces heat. The majority of such chemical actions proceed at a greater rate as the temperature rises.

"I once performed the following experiment on a coal that was known to be fiery: I powdered it into a fine condition, moistened it, and left it in a heap. When it commenced to warm up I placed some of it in a tube and allowed at first air to pass through it but very gently. It became warmer. I then increased the flow of air and it became hot, and then by greatly increasing the flow of air brought it into a state of vivid combustion. The essence of this experiment where there is such chemical action producing evolution of heat is to take care to lose heat by radiation at a lesser rate than that at which it is produced. The temperature then will rise and rising the action proceeds at a faster rate and the gain in temperature becomes increasingly rapid, and finally vivid combustion ensues.

"Heaps of cupriferous pyrite in Spain are washed judiciously with water for the extraction of copper, and their temperature rises, thus promoting the desired sulphatizing action, but the temperature is not allowed to rise to the point of combustion. I have seen heaps of iron filings by careful watering and protection from loss of heat brought in their interior to melting point. A single wisp of straw does not rise in temperature, but a heap of straw will get hot if damp and may catch on fire by itself.

"The heating of the ore was caused by the action of oxygen with moisture or water acting as a carrier. There are other factors in this problem. The workings had to be ventilated, but it will be thought that the adding of air to fire would be dangerous. Take the case of a coke fire burning actively in a grate. By throwing and spreading out the embers on the ground they will cease to burn and cool off. An excess of air will in that way put out the fire. With the natural system of ventilation then in use at Iron mountain I had frequently occasion to observe that air coming from certain crevices would put out the light of a candle. I had other evidence that the ground as a whole was porous.

"There was still another factor in the problem — an extinctive atmosphere — one in which certain classes of combustion cannot proceed for reason of either a total want of the combustion supporting element — oxygen or its dilution by other inert cooling gases Carbonaceous flames will extinguish when the surrounding atmosphere contains less than a certain amount of oxygen — say about 15%. This is an extinctive atmosphere for such flames. The roasting of metallic sulphides proceeds less slowly when the gases surrounding contain deficiency of oxygen, and will cease entirely when the oxygen falls below a certain amount, though still present to an appreciable amount. If the heat production is less than the heat loss by radiation or air cooling then the temperature of a burning body will fall, and, falling below the temperature of ignition, will cease to burn.

"These were all factors in the problem I had before me. There was porous ground, there was a material that was combustible and that could heat itself and take fire, and that could be cooled if hot, and if on fire could be extinguished either by a great excess of air or deficiency of it. I then argued, by forcing through the drifts a sufficient quantity of air I can cool off the external faces of heated blocks of ore. If I can maintain in the interior of the blocks of ore and filling an extinctive atmosphere I can prevent accumulation of this interior heating. By maintaining in the open workings an atmospheric pressure slightly above that in the ground which is practically that of the atmosphere, I can prevent the gases from the interior penetrating into the workings and driving us out of them with their suffocating properties. By not making this pressure too high I can hold the gases, so to speak, in the interior, where they will act as an extinctive atmosphere. I then had powerful fans fitted up at certain entrances, which were closed by doors, and provided with entry for the air from the fans, and ordered that air was to be driven by the fans through the workings, maintaining a pressure slightly above that of the outside atmosphere. If the friction of the air drifts was not sufficient to produce this excess over atmospheric pressure, then doors or baffles were to be adjusted to hold the gases in the interior of the blocks of ore and filling, the intent being to push back the gases into the filling slowly through the mass of ore and filling to the surface, using just enough pressure to make the movement of air from the workings through the filling and to assure that it was not in the reverse direction.

"The system was started and within twenty-four hours the workings operated on were freed of smoke and bad air, and in a few days the heated faces of ore cooled off and became dry. If the fans were stopped a few minutes traces of foul gases and sulphurous acid were perceived; on restarting the fans this disappeared.

"If evidences of fire are noticed in the interior of a section of ground by balancing the air pressure around it by means of the fans and doors, etc., the fire can be held in an extinctive atmosphere when it quickly dies out. Use is also made of this system in attacking blocks of heated ore when the ore faces are quickly cooled off by air currents. The positive plenum system of ventilation then had fulfilled its triple purpose. It supplied the fresh, cool air required by those working in it, it cooled off the heated faces of ore and the permeable nature of the ground enabled us to keep an extinctive atmosphere in the interior of the blocks of ore and filling and prevented the pernicious gases of any smoldering fire from entering the workings."

Hardness of the Diamond.

In an extended treatise on the "Genesis and Physical Properties of the Diamond," read before the British Association, Sir William Cookes says of the hardness of the diamond:

Diamonds vary considerably in hardness, and even different parts of the same crystal differ in their resistance in cutting and grinding.

Beautifully white diamonds have been found at Inverel, New South Wales, and, from the rich yield of the mine and the white color of the stones, great things were expected. In the first parcel which came to England the stones were found to be so much harder than South African diamonds that it was at first feared they would be useless except for rock boring purposes. The difficulty of cutting them disappeared with improved appliances, and they now are highly prized.

The famous Koh-i-noor, when cut into its present form, showed a notable variation in hardness. In cutting one of the facets near a yellow flaw, the crystal became harder and harder the further it was cut, and after working the mill for six hours at the usual speed of 2400 revolutions a minute, little impression was made. The speed was increased to more than 3000, when the work slowly proceeded. Other portions of the stone were found to be comparatively soft, and hardened as the outside was cut away.

I can illustrate the intense hardness of the diamond by experiment. On the flattened apex of a conical block of steel I place a diamond, and upon it I bring down a second cone of steel. With the lamp I project an image of the diamond and steel faces on the screen, and force them together by hydraulic power. I can squeeze the stone into the steel blocks without injuring it in the slightest degree.

The pressure gauge shows 60 atmospheres, and the piston being 3.2 inches diameter, the absolute pressure is 3.16 tons, equivalent on a diamond to 12 square millimeters surface to 170 tons per square inch of diamond.

Although not directly bearing on the subject, I will

introduce the only serious rival of the diamond as regards hardness. It is the metal tantalum, a fine specimen of which I owe to Siemens Bros. A hole had to be bored through a plate of this metal, and a diamond drill was used revolving at the rate of 5000 revolutions per minute. This whirling force was continued ceaselessly for three days and nights, when it was found that only a small depression ½ millimeter deep had been drilled, and it was a moot point which had suffered most damage, the diamond or the tantalum. In another respect tantalum is likely to rival graphitic carbon, as it has rivaled adamantine carbon. Its thin wire is extensively used for filaments of incandescent electric lamps; it shows a much higher efficiency than does the old carbon filament. The melting point of tantalum is about 2300° C., a temperature seldom or never reached in an ordinary lamp.

The Borax Industry.

The borax industry, as a branch of mining, is one of which, despite its value and extent, comparatively little is known, and of which, therefore, current knowledge can hardly be arrived at with any certainty, says the London Mining Journal. The industry is controlled by a Trust of European and American producers, under the title of Borax Consolidated, which, with the exception of the Diamond Syndicate, is probably the most powerful and favorably situated of the combinations which control any important part of the mineral industry. The company was registered in London in 1899, and embraced the consolidation of California interests known as the Pacific Borax & Redwoods Chemical Works, the San Bernardino Borax Co., the important Turkish concessions in the hands of the Borax Co. and the Societe Lyonnaise des Mines et Usines de Borax, with unexpired terms of forty and ninety years respectively, Mear & Green, Ltd., the chief producers of Chili and Peru, with a large number of options, especially in South America. The above list indicates shortly the main sources from which the commercial product, borate of lime, is mainly obtained. The United States is the largest producer, but owing to the great internal demand she is also an importer to some extent. The United States Geological Survey's report for 1903 gives the production as 34,430 short tons, six-sevenths of which is 25% ore. The following are the latest statistics we have of the other main producers, arranged as far as possible in order. Chili is the next in importance after the United States, the output for 1903 being 15,732 tons, which H. D. Hoskold, in his investigations into the position of the industry in South America, estimated at 44%. Turkey probably produces some 8000 to 9000 tons, but there are, of course, no official statistics. Peru gave 5055 tons of borate of lime in 1903, estimated by Hoskold at 45.9%. Italy's contribution in 1903 was 2583 tons.

Bolivia, according to official statistics in 1904, gave 1196 tons, of a percentage, according to Mr. Hoskold, of 38.74%. The output of India, probably the oldest source of borax, was in 1904 only 212 tons. The Prussian production is a similarly negligible quantity, being 135 tons for 1903. Like other portions of the subject the genesis and depositions of the known formations of borax ores does not seem to have been very fully studied, but it is generally believed that the boric acid was liberated from the containing magma, and rising in gaseous form was condensed on contact with air temperatures, being subsequently dissolved by atmospheric waters and carried into the lake and river beds where it is now found as lacrustine deposits. In some cases, also, it is believed that the fissures may have discharged their gases into water basins. In any case, it is to dry and desert tracts that attention mainly turns for such discoveries, and this fact is, no doubt, largely responsible for the success of the control in checking competitors. The distance of the unworked supplies and the desolate character of the country in which they occur make the construction of railways or some similar medium a necessity, so that they are valueless save to a concern with large capital; thus the combine is easily able to secure options over any new district, which is in this way closed to further operations. Deposits exist, and have been worked, in Oregon, Nevada and California; the principal active source of supply in the U. S. A. is the Calico deposit in San Bernardino county. The American industry, moreover, owes its existence largely to the import duty, which under the Dingley tariff is 5c per pound, and against any loss from its removal the great interests of the Trust in South America amply secure them. What arrangements they may have with the administrations of Chili, Peru, and Bolivia, is not known, but apparently they of late years sought to obtain from the Argentine Government an exclusive concession of all occurrences in the Republic, but without success.

The total annual yield of boric acid is estimated by Mr. Hoskold at 22,000 tons. The treatment which the crude ore undergoes varies considerably according to it richness, and the form in which it occurs, the chief being the Stassfurt salt, consisting of pure boracite containing 61% to 62% of boric acid; priceite, 49% to 50%; hydroboracite, 41% to 48%; ulexite, 42%; tinkalzite, 37%, which derives its name from the material shipped to Europe from the Tibetan deposits in earlier days; pandermite (named from the Turkish port of shipment), and colmanite. The Chilian supplies are derived from the districts of Ascotan, Salinas Grandes, and San Pedro de Atacama. The Trust has a line connecting Ascostan with the Antofagasta railway, and the operating costs are given by Mr. Hoskold as follows: Exploitation and drying, 5ls 5d; carriage to Antofagasta, 27s 4d; freight to Europe, 26s 10d; insurance excise, ls 6d; total, 107s 6d per ton, which, considering that the percentage of boric acid is about 44, is believed to be representative of the most favorably situated deposits. With the growth in production, the price of borate of lime has gradually declined. The price in 1864, when the industry started in the United States, was £150, and in 1899, when the Trust began operations, it was £13 10s, falling to £9 at the end of that year. The retail price of borax, according to Messrs. Sacre's table published at the beginning of the present month, was £12 5s 0d The policy of the Trust appears to be to restrict the price to a figure such as not to tempt competitors into the business, while relying on reduction in price to broaden the basis of consumption, though if the figures quoted above are representative there is a good margin of profit. The uses of borax are extensive. It is widely employed in glass, tile pottery and enamelled iron work, as a flux in metalling, and for solder, as a constituent of soaps and washes, in the textile turning and printing trades, as a drying agent in paints, oils, and varnishes, while as a food preservative and in medicine its use is widespread.

The Yak Tunnel.*

One of the most interesting mining enterprises in Colorado is the Yak tunnel in the Leadville district. This tunnel starts in California gulch, about 1½ mile from the center of Leadville, and continues for a distance of over 2 miles under Iron and Breece hills to the Little Johnny shaft of the Ibex M. Co. It also connects with several other well-known properties along the route, among them certain parts of the Iron Silver M. Co. It is used as a drainage tunnel for several mines, as well as for the transportation of ores to the mill and railroad at the mouth of the tunnel. Considerable ore from different companies is now being treated at the Rowe mill, which was erected last winter by the Yak Co. for the handling of their own as well as custom ores. The tunnel was started in 1887, and the present company commenced operations in 1894. The large area drained by the tunnel saves considerable money each year to the owners in pumping plants. The Tucson on Iron hill, which is a portion of the Iron Silver property, is drained through this tunnel. About 6000 tons of ore per month is taken out of the company's mines through the tunnel and 150 tons per day from other companies whose property is tapped or adjacent to the tunnel. An electric motor is used in transporting the ores from the mines to the railroad. The Yak Co. is operating the Cord mine from the tunnel level, and about ¾ of a mile from the tunnel entrance in the Cord ground they have sunk a winze and installed an electric hoist. In sinking the winze the following formation was encountered, which was taken from the drill book of the company:

	Feet.
Limestone	0 to 25
Intrusive porphyry	25 to 27
Blue limestone	27 to 187
Quartzite	187 to 207
Lime contact	207 to 209
White limestone	209 to 219
Quartzite	219 to 222
Ore	222 to 282
Sulphide porphyry	282 to 332
Sulphide	332 to ...

From the surface down a distance of 500 feet the ore is oxidized.

The company has recently installed an Allis-Chalmers 400 H. P. cross-compound engine and Bullock generator, and have left room for a duplicate plant in the same building, which will be installed as soon as needed. From this plant, which is at the mouth of the tunnel, wire has been strung for about 1 mile up the hill to the Horseshoe shaft where transformers are being installed. The electric power from these transformers will be used in hoisting and in operating the electric pumps, which are being installed to pump water from the shafts and winzes up to the tunnel level.

*See Illustration on Front Page.

THE bane of compressed air in expanding engines has been the freezing at exhaust ports, says Page's Weekly. At the Gray Canyon plant at North Amherst, Ohio, this trouble was anticipated and provided for. A large part of the entrained moisture is condensed and collected in the inter-coolers and after-coolers; another portion finds lodgment in the primary receiver. From this point the lines grade to secondary receivers, where the condensation of the entire line is collected and removed through cocks. So perfect is this system for removing moisture that the plant was operated for weeks in freezing weather without reheaters and with no freezing whatever.

Power Required to Operate on Inclines.

All are familiar with the fact that less power is required to lift a load on an incline than vertically, and that more power is required to move a given load on even a very low grade than on the level. The pressure on the rails on any given grade is determined by multiplying the weight of the load—including the car or skip—by the sine of the angle of inclination. Thus a load of one ton on an incline of 30° from the horizon exerts a downward pressure normal to the track of 1000 pounds. The following table was designed to make readily available information of this kind on tracks at any angle up to 36° 31′, and will be found useful to those who have traction problems to solve where the road runs on grades and has more or less numerous curves. The table, with accompanying foot notes, is self-explanatory:

FORCES ON INCLINED PLANES

% of Grade Rise Ft. per 100 Ft.	Angle A	Sine	Cosine	Perpendicular Pressure on Plane per Ton of 2000 lbs.	Stress in Rope per Ton 2000 lbs. Friction 1/40	Stress in Rope per Ton 2000 lbs. Friction 1/32	Stress in Rope per Ton 2000 lbs. Friction 1/25	% of Grade Rise Ft. per 100 Ft.	Angle A	Sine	Cosine	Perpendicular Pressure on Plane per Ton of 2000 lbs.	Stress in Rope per Ton 2000 lbs. Friction 1/40	Stress in Rope per Ton 2000 lbs. Friction 1/32	Stress in Rope per Ton 2000 lbs. Friction 1/25
1	0°35′	.0101	.9999	1999.8	70	82	100	38	20°49′	.3553	.9347	1869.4	756	763	784
2	1° 9′	.0200	.9997	1999.4	90	102	120	39	21°19′	.3635	.9315	1863 0	773	785	801
3	1°44′	.0302	.9995	1999 0	110	122	140	40	21°49′	.3716	.9283	1856 6	789	801	817
4	2°18′	.0401	.9991	1998.2	130	142	160	41	22°18′	.3794	.9252	1850 4	805	816	832
5	2°52′	.0500	.9987	1997.4	150	162	179	42	22°47′	.3872	.9219	1843.8	820	832	848
6	3°27′	.0601	.9981	1996.2	170	182	199	43	23°17′	.3952	.9185	1837.0	836	848	864
7	4° 1′	0700	.9975	1995.0	189	202	219	44	23°45′	.4027	.9153	1830 6	851	863	879
8	4°35′	.0799	9968	1993.6	206	221	238	45	24°14′	.4104	.9118	1823 6	866	878	894
9	5° 9′	0897	.9959	1991.8	228	241	258	46	24°43′	.4181	.9083	1816.6	882	894	913
10	5°43′	.0996	.9950	1990 0	248	261	278	47	25°11′	4255	.9049	1809.8	897	909	925
11	6°17′	.1094	.9939	1987.8	267	280	297	48	25°39′	.4328	.9014	1802 8	911	923	939
12	6°51′	.1192	.9928	1985.6	287	300	317	49	26°07′	.4402	.8978	1795 6	926	938	954
13	7°25′	.1290	.9916	1983.2	307	319	337	50	26°34′	.4472	.8944	1788.8	940	952	962
14	7°59′	.1388	.9903	1980.6	326	338	356	51	27° 2′	.4545	.8907	1781.4	955	967	981
15	8°32′	.1483	.9889	1977.8	345	357	375	52	27°29′	.4614	.8871	1774.2	968	980	994
16	9° 6′	.1581	9874	1974.8	365	377	395	53	27°56′	.4684	.8834	1766 8	980	992	1008
17	9°39′	.1676	.9858	1971.6	384	396	414	54	28°23′	.4753	.8797	1759.4	994	1005	1022
18	10°13′	.1773	.9841	1968.2	403	415	433	55	28°49′	.4820	.8761	1752.2	1008	1018	1036
19	10°46′	.1868	.9823	1964.6	422	434	452	56	29°15′	.4886	.8724	1744 8	1021	1032	1049
20	11°19′	.1962	.9505	1961.0	441	453	471	57	29°41′	.4952	.8687	1737.4	1034	1045	1061
21	11°52′	.2056	.9786	1957.2	461	472	490	58	30° 7′	.5017	.8650	1730.0	1047	1958	1071
22	12°25′	.2150	9766	1953.2	473	491	509	59	30°33′	.5052	.8611	1722.2	1060	1071	1087
23	12°58′	.2243	.9745	1949.0	497	509	525	60	30°58′	.5145	.8574	1714.8	1073	1084	1100
24	13°30′	.2334	9723	1944 6	514	527	543	61	31°23′	.5207	.8537	1707 4	1085	1096	1112
25	14° 3′	.2427	.9700	1940 0	533	540	562	62	31°48′	.5268	.8498	1699.6	1097	1107	1124
26	14°35′	.2517	.9677	1935 4	551	563	580	63	32°13′	5331	.8460	1692.0	1110	1120	1137
27	15° 7′	.2607	9653	1930.6	569	580	598	64	32°38′	.5392	.8421	1684.2	1122	1132	1149
28	15°39′	.2697	.9629	1925.8	587	599	616	65	33° 2′	.5451	.8383	1676.6	1134	1144	1161
29	16°11′	.2787	.9603	1920.6	605	617	634	66	33°26	.5509	.8345	1669.0	1145	1154	1171
30	16°42′	.2873	.9578	1915.6	622	630	651	67	33°50	.5567	.8306	1661.2	1159	1167	1183
31	17°14′	.2962	.9551	1910.2	639	650	669	68	34°13	.5623	.8269	1653.8	1168	1178	1194
32	17°45′	.3048	.9523	1904.6	656	660	686	69	34°37	.5680	.8229	1645.8	1180	1190	1206
33	18°16′	.3134	.9496	1899.2	673	686	703	70	35° 0	.5735	.8191	1638.2	1191	1200	1217
34	18°47′	.3219	9467	1893 4	690	703	720	71	35°23	.5790	.8152	1630.4	1202	1211	1227
35	19°18′	.3305	.9438	1887.6	708	721	738	72	35°46	.5844	.8114	1622 8	1211	1221	1238
36	19°48′	.3387	.9408	1881.6	724	737	754	73	36°08	.5896	.8076	1615.2	1222	1231	1249
37	20°19′	.3472	.9377	1875.4	741	754	771	74	36°31	.5950	.8036	1607 2	1233	1243	1260

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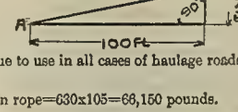
NOTE.—Stresses and Pressures are in pounds.

NOTE.—1/40 should be used in all cases of straight inclines planes.

NOTE.—1/32 should be used on haulage roads moderately curved.

NOTE.—1/25 should be used on haulage roads with sharp curves, and is a safe value to use in all cases of haulage roads likely to be met with up to 1½ miles, on longer roads weight of rope should be added to load.



EXAMPLE.—105 tons to be hauled up a road moderately curved, 30% slope stress in rope=630x105=66,150 pounds.

RULE.—Multiply number opposite grade, and in column headed Friction, corresponding to kind of haulage road by tons to be hauled. Product equals pull in cable to haul load.

History of Pyritic Smelting.*

By ROBERT C. STICHT.

Among the great mines of the world is the copper property of the Mount Lyell Mining & Railway Co, in Tasmania. The general manager of this property is Robert C. Sticht, who was recently elected president of the Australasian Institute of Mining Engineers. In his address to the Institute, upon his acceptance of this honorable office, Mr. Sticht gave a most interesting and valuable history of pyritic smelting. The valuable and interesting data comprise a good-sized volume, and, while it is interesting throughout, space required for articles on other subjects makes it impossible to reproduce the work of Mr. Sticht verbatim. An abstract of the essential features, however, will be presented, and will be found of interest to all who are engaged in or in any way identified with pyritic smelting:

For the purpose of dealing with the subject it will be convenient to divide it into two concurrent heads, and to distinguish, for historical reasons as well as for metallurgical ones, between that branch of the general method of matte smelting, which, until about 1891, has been called "pyritic smelting," and the more recent offshoot of the latter, which, by distinction, may be called "pyrite smelting." The nature of pyritic smelting was clearly defined by Dr. John Percy in 1880, and his interpretation may be accepted as well known.

Whereas "pyritic smelting" is fairly ancient, "pyrite smelting," on the other hand, is a distinctly novel and modern achievement. Both are blast furnace operations, using pyrites as a collector. But, while pyritic smelting demands carbonaceous fuel in order to flourish, true pyritic smelting suffers with its use.

The historical course of development has broadly been, first, pyritic smelting; then pyrite smelting; and lastly, partial pyrite smelting. Yet the interval of time intervening between the second and third is extremely short compared with the long step from the beginning of pyritic to pyrite smelting.

As remarked above, the introduction of pyritic smelting took place in 1555, and to Barthold Kohler belongs the credit of having first conceived the notion of using iron pyrites for the special purpose of acting as a collector of the precious metals, without the use of lead, or the presence of copper in the furnace. His endeavor was to make what is now called an "iron matte."

For several centuries progress in pyritic smelting was slow and but little advance was made. Improvements were made in the blast and in the tuyeres. Except in rare instances, all smelting during this long period of years was done with "noses." Even down to forty or fifty years ago the proper method of charging the furnace to obtain the correct and only suitable length of nose before the tuyere, together with the correct inclination of the tuyere and blast nozzle, was a matter for the most serious differences of opinion in European metallurgical circles.

In the twenty years preceding 1827 pyritic furnaces had risen in height from 10 feet to one 24 feet, but still had usually but one tuyere, with a double set of bellows. Wooden box or square piston blowers replaced the triangular wooden blowers at Freiberg from 1823 to 1827, but all of the important works had cylindrical piston blowers by about 1831.

Coke was first tried in Freiberg in 1818. * * * The results were immediately successful, and it was observed that the products came out purer and cleaner. * * * In consequence of coke, the year 1823 saw a pyritic furnace run seven weeks for the first time at Freiberg, and later the same year a campaign of twelve and one-half weeks was accomplished.

Of considerable interest, and of some bearing on pyritic work, were the facts established by Lampadius in connection with the application of a heated blast in pyritic work. J. B. Neilson had successfully introduced hot blast in iron smelting in 1828-9, and Lampadius recommended its use in 1831, but actual trials were not made with it at Freiberg until 1836 and 1837. They were then carried out not only in connection with the pyritic smelting operation, but with all the rest where a heated blast appeared of possible service.

Hot blast was given up at Freiberg after a few years, and in the other localities it also appears to have dropped out of use the same as at Freiberg, and probably the most notable instance of its permanent retention, in pure pyritic work, is Kongsberg. Here, however, it dwindled down, in course of time, to a mere hollow tuyere arrangement, in which the blast circulated prior to entering the furnace.

The number of tuyeres began to increase, and three or four became common in due course—i. e., about the middle of the nineteenth century. The "great furnace" at Freiberg, built in 1845, after a Swedish model, had three tuyeres. In Sweden pyritic smelting furnaces with three and four tuyeres were in use, and the furnaces 18 and 24 feet high, while campaigns lasted eight to ten months.

*Abstract of Proceedings Australasian Inst. Mining Engineers.

With the spread of smelting operations in America since the sixties, the easily transportable rotary blowers found a rapid application to the smelting of metals other than iron, the older Root's blower, however, giving way, for a time, to the Baker. The water tuyere gradually developed into the water jacket, and from that time on the furnace construction was to receive a prodigious furtherance in perfection of detail. In connection with the progressive movement then established in the United States, which has since quite dislocated the center of merit in blast furnace management by shifting it from Europe to America, not the least signally useful and convenient invention is that of the independent—i. e., outside—movable forehearth, which is so typical of Yankee practicality.

Pyritic smelting received a check which undoubtedly injured its advancement. It occurred at Freiberg, the very home of its birth, where, after careful comparative trials, extending from 1847 to 1852, the whole scheme of pyritic work was altered by casting aside the blast furnace for the purpose, and substituting the reverberatory. The incentive to the change was the low capacity of the blast furnace, the reverberatory trebling the figures obtained by its rival.

The middle of the nineteenth century, among other advances pertaining to metallurgy, was characterized by a renewal of the interest in combustion and oxidation among the chemists and physicists, and the foundations were laid for our present and future knowledge of thermo-chemistry at the hand of extensive study. In the less abstruse and more immediately useful field covered by the purely chemical side of the reactions taking place in slow oxidation phenomena, one name, that of Plattner, still stands alone as that of the paragon of painstaking investigation and close research. To this day his work on the roasting processes is the authoritative one and has received no important modification, although published in 1856

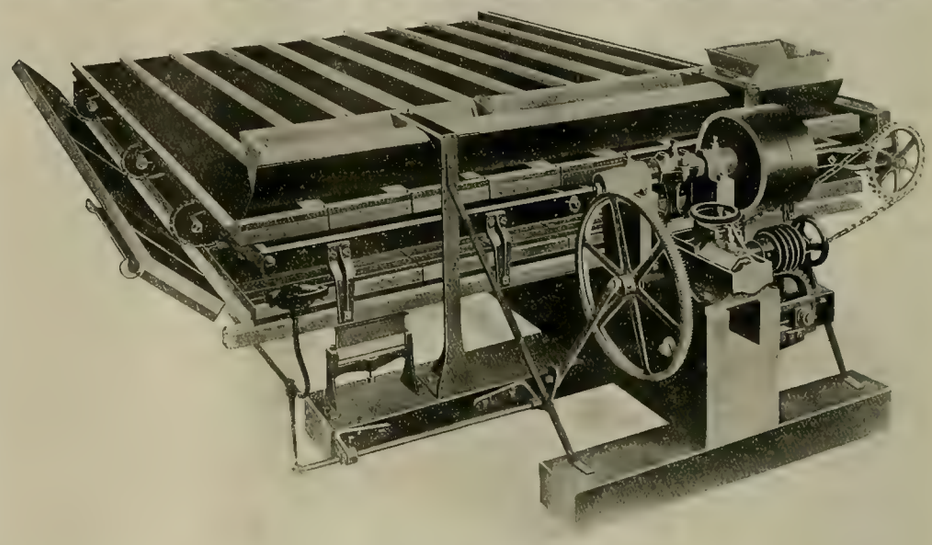
However, as far as the practical utilization of the oxidation idea is concerned, its most magnificent application was not vouchsafed to a metallurgical or analytical scientist, but to a man whose modicum of early scientific training had left him so untrammelled by considerations of philosophical exactitude as not to make him shrink from announcing to the world of science that he had found a method of making wrought iron and steel "without the use of fuel." This was Sir Henry Bessemer. The first Bessemer patent was taken out in October, 1855, but the details were first broadly published in the celebrated article read at the Cheltenham meeting of the British Association in 1856. Thus the principles of slow and the surprising effects of rapid oxidation were first given to the world in the same year. Of the two it must be said that the revelations of the latter have had by far the farther-reaching consequences and have revolutionized the whole domain of metallurgical thought, or, at all events, bestowed upon what might indefinitely have remained mere speculation the endorsement of the most concrete and material feasibility.

In 1866 the management of the steel plant in the Bogoslowsk district, in the Ural mountains, at the initiative of the official head of the district, Semennikow, successfully carried out a series of tests in the local Bessemer apparatus to work up copper mattes from the adjacent copper works to a richer metal, or black copper. It was this Russian engineer, therefore, who demonstrated the actual practical feasibility of the expected reactions; but, for the present, the efforts did not achieve the production of metallic copper, as was hoped. Fifteen trials were made with rather small quantities, and, although the experiments remained inconclusive in the chiefly desired respect, still the experience demonstrated that, for substances that contain them in sufficient quantity, iron and sulphur are as effective fuels as the constituents of pig iron, which are burned in the Bessemer process proper, are in its particular instance.

(TO BE CONTINUED.)

The Wilfley Slime Table.

The No. 2 Wilfley slime table illustrated herewith has several improvements over the old style table. The movement is self-contained and mounted upon a strongly ribbed base made of close grained cast iron.



Wilfley Slime Table.

The frame is securely bolted to the girder support, doing away with the lost motion. The table proper, or deck, consists of a number of shallow troughs or trays, having the bottom of each covered with duck or heavy canvas, which is dipped in a specially prepared paint before putting in tray. These troughs are arranged side by side and attached to link belts, forming in the whole a large belt moving across the table very slowly, taking about forty-five minutes to make one complete revolution. While this belt or series of trays is slowly moving across the table, from left to right when standing facing the movement, a lengthwise, oscillating motion is given to the deck by the movement head. The revolution of the belt is produced by sprocket wheels and a link belt driven by means of a worm gear and shaft, geared to the head motion eccentric shaft.

The oscillating motion, according to the manufacturers' statement, carries off the particles of silica and gangue, while the smaller particles of ore, concentrates and slimes remain in the cavities in the canvas bottom of the trays and pass slowly over the side of the table, returning on the underside of the table, and, as they pass over a concentrates box, the values are sprayed by a small stream of water and washed into the concentrates box. The machines are fully explained in Bulletin S—8 of the Mine & Smelter Supply Co., Denver, Colo., who are sole owners and manufacturers.

Working Costs on the Rand.

A contributor to the London Mining Journal writes as follows on mining costs on the Rand:

An impression seems to be gaining ground that all is not being done by the mine managers to reduce the working costs. It is undoubtedly a fact that, considering the cheaper stores, explosives, and fuel, the working costs do not show the advantage anticipated, nor do the lessened railway rates show any diminution in the cost of living. Stores and explosives are undoubtedly cheaper, but an instance was seen the other day, where the whole of this advantage apparently went to the white employes. There has always been a liberal consumption of stores on the Rand, and until every item is closely watched there is likely to be wastage. As for the reduction of railway rates and the connection of the mines by railway sidings bringing about an appreciable reduction in the cost of fuel, the unduly high charges placed upon the use of the new sidings have to a large extent neutralized the good results anticipated. Then, undoubtedly, native wages are high, and the same may be said of the wages at present paid to the Chinese; but it is to be hoped that, as they become more skilled, this difficulty will disappear. As the result of the lengthened scarcity of unskilled labor and the attempt to employ poor whites, more money is being paid away in white wages than formerly, while the skilled white employes are earning as good wages as formerly. If the matter be closely examined, it will be seen that no definite attempt appears to be made to reduce working costs, and until this is taken more thoroughly in hand, the high wages, coupled with the fact that lower grade rock

is being treated than was the case before the war, cannot help but make themselves felt in the shape of lessened profit.

Undeveloped Resources of the Sierra Nevada.*

There is unusual activity in the high Sierras of California the present summer. From several localities, from Tulare county on the south to Plumas county on the north, comes the news of energetic search for new mineral deposits, and stories of ample reward for these efforts. The Sierra region is known to be rich in minerals, both precious and base, but of late years comparatively little attention has been given to the development of these resources. The ore deposits are in many cases large, and the grade of ore is not too low to allow a good profit if the mines be properly equipped and managed, though the difficulties attendant upon mining operations in that high region are greater than in the warm low foothills to the westward, and even greater, in some places, than in the camps situated out on the desert in the Great Basin to the eastward of the mountains. The peaks are from 12,000 to 13,000 feet or more in height, and few of the most promising mines are below 8,000 feet, while the greater number are at 10,000 feet altitude or higher.

The snowfall is heavy, the winters are long, but when adequate means for transportation is provided there is apparently nothing that need prevent a proper stocking of the camp during the summer months with supplies to last throughout the succeeding winter. In Colorado this is nothing unusual, and in many districts of that State nothing better is expected or apparently wanted. Both Leadville and Cripple Creek are more than 10,000 feet above the sea, and many small towns in Colorado are considerably higher; yet climatic conditions there interpose but a small obstacle to the development of the mines. The present season's work in the Sierra Nevada of California will probably be a long step toward the reopening of the idle mines of that elevated region, and in the development of new discoveries. The accompanying illustrations give a good idea of two types of scenery in that part of California. The rugged, treeless slopes face the Great Basin on the east side of the range, and the gently sloping timbered ridges are on the west side. Mines are found under both conditions.

A Glacial Lake in the High Sierra, California.

In the Mineral Belt of the Sierra Nevada.

*See Illustration on Front Page.

With the approach once more of cold weather in the northern States, the usual number of powder-thawing accidents may be anticipated.

THE PROSPECTOR.

Those sending rock and mineral samples for determination must send their names and the locality from which the samples were obtained, otherwise it will be impossible to identify them. A great many samples are received, and many of them bear no name nor letter of explanation. With these nothing can be done.

The samples from Burnt Ranch, Cal., are: No. 19. Gouge produced by the crushing and movement of country rock; the original rock apparently consisted largely of feldspathic and magnesian materials. No. 20 is serpentine. No. 21 is a much altered feldspathic rock.

The black, flat rock from Hardy, Or., marked J. A. W., is a piece of foliated clay slate. The prismatic colors are due to the partial oxidation of a small amount of iron and copper sulphide present in the rock.

The rock from Lyon county, Nev., is not of unusual weight. It is a much altered dike rock, which accounts for the mass having "walls." It should be assayed for gold and silver. It may be, however, that the values, if any, occur in the flint-like quartz forming the hanging wall. The dike and walls should be assayed wherever they can be cut in search of a pay shoot. In flinty quartz the gold is likely to be extremely fine and possibly could not be detected by panning, which would render assays necessary. The brown mineral in some of the rock is limonite, an oxide of iron, due to decomposition of iron sulphides.

The rocks from Clifton, Ariz., are principally carbonate of lime (limestone).

The rocks from Liscum, Ariz., are very much altered, but were apparently originally rhyolite. It is not likely that large bodies of copper ore will be found beneath this outcrop—at least, the rocks give no indication of it. They should rather be tested for gold and silver.

The rocks from Grants Pass, Or., are: No. 1. Diabase. No. 2. Diorite, with some iron sulphide.

The greenish rock specimens from Lake City, Colo., are sandstone, consisting chiefly of crystals of magnetite cemented by grains of glauconite (iron silicate). By crushing, the magnetite might be recovered by either water or electric concentration.

The red mineral from Winkelman, Ariz., is earthy hematite, with some calcium carbonate. No. 2 is amphibole (hornblende).

The black mineral specimen from La Sal, Utah, on which there is a coating of green and blue copper carbonate, is apparently a volcanic scoria, or sort of pumice, which has included small pebbles from the sands over which it flowed. The presence of the copper can only be accounted for by the assumption that there are or have been waters carrying copper in solution, and the copper has been precipitated in and on this rock. This is not an unusual phenomenon. At Copper Basin, Yavapai county, Ariz., copper carbonate has been deposited in acres of gravel in this manner.

The lead-colored mineral in sample No. 1 from Cerrillos, N. M., is molybdenite (sulphide of molybdenum), and the bright yellow metallic streak is pyrite (iron sulphide). No. 2 is largely kaolinized feldspar, with bunches of "wad," an impure ore of iron and manganese oxides.

The rocks from Pearl, Idaho, have been classified as follows: No. 1 is chert (flint) carrying considerable very fine iron sulphide; it may be gold-bearing, but would have to be crushed very fine to liberate the pyrite and gold. No. 2 is so much altered as to make positive identification impossible; it resembles a devitrified volcanic glass or pearlite and appears to be breaking up into rounded grains. No. 3 is composed of rounded grains of quartz and chalcedony, cemented by carbonate of lime—a fragmental rock. No. 4 is volcanic ash. No. 5 is similar to No. 3. No. 6 is very much like Nos. 3 and 5, except that the cementing material in No. 6 is iron instead of lime. No. 7 is a quantity of quartz pebbles. No. 8 is a coarse sand rock composed of rounded quartz grains and cemented by clay and iron. If these rocks and sands contain gold, the question of being able to extract the gold by the cyanide process is one which must be determined by experiment. This question can never safely be answered without making a test.

The small mineral specimen from Las Cruces, N. M., is apparently a variety of obsidian (volcanic glass).

The rock sample from New Bridge, Or., is metadiabase and is evidently an ancient breccia, as it presents a semi-fragmental appearance, consisting of various sized pieces of angular greenstone, recemented by the later magma of the rock mass. It is an interesting rock and sometimes forms the walls of gold-bearing veins.

The Ventilation of Mines.

NUMBER VIII.—CONCLUDED.

FUMES FROM THE CYANIDE PROCESS.—From time to time there have been many complaints as to vitiation of the air of mines by fumes arising from the tailings from cyanide treatment very commonly used for filling stoped ground, and some of the witnesses heard by us were of opinion that the use of these should be absolutely prohibited; others thought that the tailings should be stored at surface till thoroughly dry and freed from cyanide. On the other hand, it was claimed by many managers that if the sands were well washed and not left too wet they may be used underground with perfect safety. The question is a very important one. Huge heaps of tailings have to be got rid of in some way at the big mills, and it is not always possible to get suitable dumping ground for them close to the mills, so that they may have to be carried some distance before they can be stored. If they are not used for filling, the expense of removal becomes a perceptible item in the costs sheet, and amounts to a very large sum of money annually in mines with a large output. At the same time the spaces underground from which the ore has been extracted must be filled with "mullock" for safety, and in most of the larger mines of the State there is not nearly enough filling material obtained in the course of development work to fill the stopes, and if tailings may not be used, "mullock" has to be quarried and sent down into the mine, again leading to further expense. The tailings, apart from the fumes arising from them, are a highly desirable sort of filling, running well in the passes, easily shoveled, and packing the ground admirably. The prohibition of their use should therefore, be contemplated only on demonstration that they are a serious danger to health. The occurrence of two fatal accidents from fumes given off from tailings used for filling has been recorded, one causing the death of one man in the Paddington Consols mine and the other the death of two men in the Jacoletti mine. In the first case three other men were also affected, but recovered. Witnesses have also informed us of numerous cases of men being turned sick by the fumes from the tailings, though not made seriously ill. In both the fatal cases the sands were new and damp, and the ventilation became blocked, so that the fumes could not be removed. The smell s usually very noticeable, and the men working find a bitter taste in their mouths. It can easily be understood that if the ventilation is bad the poisonous gas may accumulate to a dangerous extent, even if there is only a very small percentage of cyanide present. As the decomposition of potassium cyanide is mainly due to the carbonic acid of the air, it seems likely that in a badly ventilated place, where the amount of carbonic acid rapidly rises to, say, ten times the normal percentage, and the humidity is considerable, the liberation of hydrocyanic acid will be correspondingly more rapid. It would seem from these considerations that even well-washed tailings might become dangerous in a badly ventilated place. Where the ventilation is good there appears to be practically no danger, which indicates that when these sands are to be used the first provision to be made is that the place should have a good current of air passing through it.

We would, therefore, recommend that tailings should not be used for filling (1) in a wet state, nor (2) when they contain more than .01% of their weight of cyanides calculated as cyanide of potassium, nor (3) in any place in which there is not a current of air passing freely In some cases where it is not possible to thoroughly wash the sands, and a larger amount than .01% of cyanide of potassium is left in them, it would be necessary to expose them to the air at surface for several months before using them, until the cyanide is reduced below the prescribed limit. The stacking of the tailings at surface prior to use as filling certainly necessitates some expense that would be saved by putting them direct into the mines, but we consider that the danger is so great and real that this expense must be borne rather than that there should be any question of using doubtful sands where they might cause loss of human life.

RISING.—Of all mining work, the operation of "rising" from a lower level to a higher one is generally regarded as most likely to lead to injury of health, and among the workers' witnesses who came before the Commission there was a very general desire evinced to have the height to which rises might be carried limited by law. The relative danger of accidental injury in this sort of work, as compared with other kinds of mining operations, is a question outside the scope of our Commission; but, from the standpoint of ventilation, we have given it considerable attention. Most of the mining managers examined were against high rises, partly on account of the health of their men, partly because the working difficulties, and, consequently, the costs, increase with height. The opinions expressed both by managers and men as to the height which should not be exceeded were very various, from 20 feet above the level to as much as 200 feet being considered fair limits. The most general opinion appeared to be that rises should not be carried up more than 50 feet, unless special circumstances made a greater height unavoidable. A great deal of difference of opinion was also expressed as to the best method of construction of rises to ensure both ventilation and safe working, the ordinary practice in this State being, as a matter of fact, to go up with stages on "spreaders," without any division of the rise. The air from the rock-drilling machines is in these cases usually relied on entirely for ventilation. In some of the mines strong platforms or pent-houses are made at intervals, alternately on each side of the rise, leaving a small open space in the center for the dirt to be thrown down. This, evidently, is a method peculiarly well adapted to preventing any natural ventilation. The workers' witnesses were almost unanimously strongly in favor of the "box" system of rising (that is, constructing the rise in three compartments, with the center one filled with broken rock), and many under-managers and managers supported them. We saw only three such rises, however, in our visits to the mines. The advantage is that, when there is a current passing through the level beneath, by putting a door under the central compartment of the rise, the air may be sent up one side of it and down the other, thus maintaining good ventilation. It also affords greater safety in working, and there is less liability of the timber being knocked out by the blasting than with the ordinary spreaders. Some managers considered these boxed rises were more expensive than the ordinary type, but others thought there was very little difference in point of cost, the advantages of the box, and speed gained in the work, being held to make up for the cost of the timber used in it. We were unable to get any direct comparison of cost. We are, however, of opinion that the advantages of the box in ventilation and safety of working are very great, and recommend that its use should be compulsory in all rises intended to be over 20 feet in height. If the box is well constructed, and provision made as well for mechanical ventilation in case of the compartment for sending down the dirt becoming choked, there seems no reason why rises should not be carried to any desired height, and for high rises the cost with a box would almost certainly be less than without one. The method of rising diagonally on the plane of the lode, instead of directly up it, so as to have a rise with an inclination of not more than 45°, instead of whatever may be the underlay of the lode, has also been brought to our notice; but while it would, undoubtedly, tend to greater safety from accidents, it does not appear to have any advantages from the point of view of ventilation.

The analyses made by Mr. Mann of the air in rises show clearly that they are much worse ventilated than most others parts of the mines, the tests proving to be often very hot and foul. This is only to be expected, as the heat of the men's bodies, of their candles, and of the rock after blasting, all goes to warm the air in the top of the rise, and this warm air cannot escape except by diffusion unless a strong air current is sent through the rise. The tendency is for a stagnant body of warm air to remain in the top of the rise, receiving all the vitiation, and being removed only slowly by diffusion. There is a popular misconception as to the behavior of carbon dioxide gas in such places which should be corrected, namely, that, being half as heavy again as air, it will fall down from a rise. This would be so if a quantity of the pure gas were liberated all at once in the place; it would fall directly downwards. But if instead of pure gas it was a mixture of say 3% of carbon dioxide with 97% of air, both thoroughly mixed together, there would be very little tendency to fall, as the specific gravity of the mixture would be very little greater than that of air. A rise in temperature of 9° F. would make its specific gravity the same as that of air. With percentages of carbon dioxide in the mixture of not more than one-tenth of the example taken, as is the usual practical condition, a very slight rise in temperature prevents the vitiated air from falling at all. The carbonic acid formed by breathing and by burning of candles is so dilute, and produced so slowly, that it becomes entirely diffused at once into the surrounding air, and even that produced by explosions is much diluted when generated, becomes greatly mixed with a large volume of air at once by the action of the explosion, and is highly heated, so that it does not fall down the rise, but remains at the top and is only removed by diffusion or ventilation.

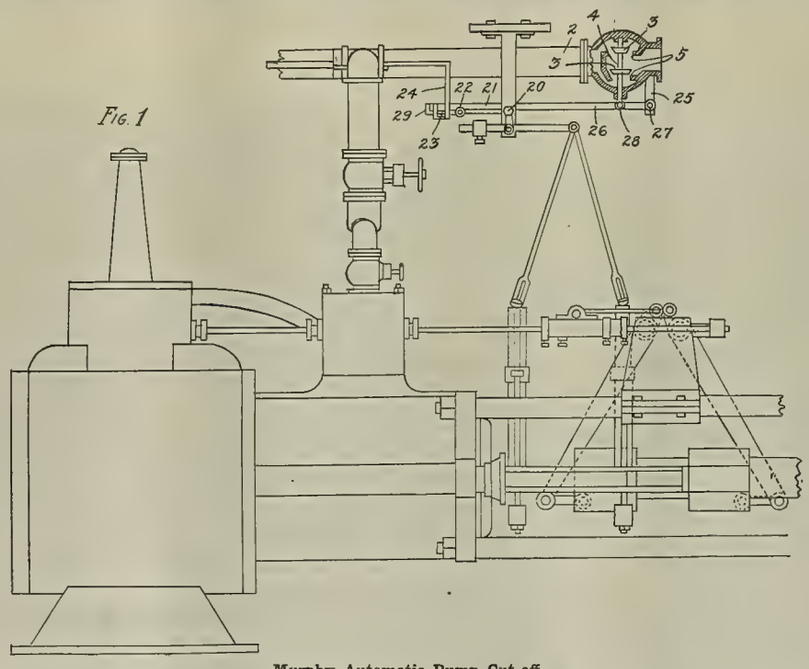
We would not, however, recommend any specific limit to the height of rises, as high ones are not infrequently unavoidable, and such a restriction would operate very injuriously to economical working in such cases. We think that the use of the box and mechanical ventilation, and the enforcement of the previously recommended standards of allowable temperature and purity of air, would remove the objections to rising.

WINZES.—The ventilation of winzes is usually simple, the cool air from the levels going down and the warmed air coming up. Several bad accidents, however, in winzes show that the removal of fumes after blasting has sometimes been unsatisfactory. So long as natural ventilation is alone relied on there is liable at any time to be a cessation of air currents entering winzes, and then they may be very dangerous to go into after firing. We think that in all winzes provision should be made for some effective mechanical means of ventilation.

Automatic Pump Cut-off.

Herewith is illustrated the Murphy automatic pump cut off, which device has been in use at the Resurrection mine, Leadville, Colo., for ten months. It is used on a Knowles compound condensing pump, pumping 225 gallons per minute, a lift of 750 feet. The shaft where the pump is located is not being worked, all the work of the mine being done at another shaft, ½ mile away. To run this plant, two firemen are required, one on day shift and one on night shift. Twice a day, every morning and evening, one of the men employed at the other shaft, taking care of the machinery about the property, goes down this shaft and oils the pump. The manufacturers say that the pump runs by itself all the time, and that it is safe with this attachment to let it do so. "During the time it has been in use, the pump dropped a suction valve; it stopped immediately, doing no harm. The large cast-iron 'Y' at the bottom of the water column burst when no one was there; the pump stopped and did no harm."

FIG. 1



Murphy Automatic Pump Cut-off.

The illustration is a side elevation of a double-acting pump showing the automatic cut-off in accordance with this invention arranged in operative relation with respect to the pump. 1 denotes the double-acting pump, 2 the motive fluid supply pipe which is provided with an automatically operating cut-off in the form of a double valve, as at 3, the stem 4 of double valve projecting below the pipe 2. A pair of seats 5 is provided for the valves 3.

When the device is used in connection with a double-acting pump, a pair of supports is provided; if used in connection with a single-acting pump, but one support is necessary. The device is manufactured and sold by the Carnahan Manufacturing Co., Denver, Colo.

Placer Mining in Alaska.*

NUMBER IX.

DRIFTING IN THE FAIRBANKS DISTRICT.—As has been stated, the only mining practiced at Fairbanks is creek mining. In the open season, although the bulk of the ground can be worked by drifting, a smaller proportion is workable by open cutting. By far the larger portion of the ground must be worked by drifting on account of the depth to bedrock and, in many cases, the thinness of the pay. The ground is in the main frozen, but thawed streaks occur. The gravels are of the angular and subangular character, which marks all the gravels deposited in recent time in the northwest. The angularity is more pronounced than in the Birch creek district or the Klondike.

One characteristic feature of the Fairbanks gravel has an important bearing on the method of thawing the frozen gravel. This is the fact, that while the layer of so-called muck is comparatively thin, from 2 to 7 feet in the workings on the creeks themselves, exclusive of the slopes, the gravels, which are from 6 to 15 feet in thickness, do not carry pay throughout their section, but only in the lower part. The pay is sometimes as thin as 6 inches in the gravel, and rarely exceeds 3 feet. It is then frequently necessary to take only a portion of the gravel down, and to run the drifts as low as possible, i. e., not to exceed 3½ feet. To do this economically, and so that the top and barren gravel will not be continually caving and falling during the drifting, the ground must either be timbered or the method of steam thawing must be abandoned. Another reason why the method of steam thawing has a limited application in the Fairbanks district is the fact that the gravel is very argillaceous in its pay portion, and the thawing and drying with the steam result in the baking of the ground. Thus the gravel which was frozen becomes in its dry state cemented, and the difficulty of getting it out is not avoided, but only lessened.

Thawing by means of hot water driven through a force pump and conducted to the bank by means of cotton hose and piped against the bank by means of a small fireman's nozzle is the most successful method which has been so far tried to thaw ground under the above-mentioned conditions. As regards the heating of the water, the system adopted at Fairbanks is to conduct the exhaust steam of the pump back into the suction of the pump as it draws water from a sump alongside of it. This has been found more effective than simply turning the exhaust pipe directly into the sump itself. The water used is sometimes supplied in sufficient quantity from the mere seepage from the ice mixed with the thawed gravel. But sometimes it will have to be introduced into the pit in small quantity. On the other hand, especially where thawed streaks occur naturally in the gravel, the water must be pumped out. This is done by the same pump used for hydraulicking, without changing its position.

The method of thawing by hot water piped against the bank has two advantages. The strongest appears to be the fact that gravel thawed by this method can, as it were, be selected in the face, and no higher gravel than may be profitable need be taken down. The portion of the gravel above the part taken down remains solidly frozen, and consequently the roof of the drift or wide stope does not cave any worse than does the roof of solid muck in drifting operations, where all the gravel in its complete vertical section is extracted. Another advantage is that the gravel is moved from its original position further than by steam, and if it contains clay the clay has less opportunity to bake and cake than by steam thawing, and the amount of hard work in picking down is lessened.

A serious objection to thawing by hot water may justifiably be raised in cases where the bedrock consists of large slabs of schist, into which the gold sinks from 1 to 4 feet and even more. In such a case the water cannot be piped to reach all the frozen gold-bearing material. Although I am not aware that a combination of the hot-water and steam-thawing methods has been tried in such a case as the above, it seems not impossible that such a combination would be the most economical. On the other hand, where the bedrock consists of a finely comminuted schist or softened, thoroughly rotten rock, even should the gold be found in it to the depth of 2 feet, there can be no valid objection to the hot-water hydraulicking method. In the Nome district of Seward Peninsula, where the hot-water method was tried, it was found that the water finally became too thick with sediment to be used in the pump, and the system was abandoned.

A minor recommendation for the use of the hot water method is the fact that all the unpleasantness of the steam method, which fills the workings with steam, creates dampness, etc., is obviated, and the walls and roof of the drifts are dry, while ditches cut in the bedrock on grade to the pump sump can be so cut as to prevent the floors from being wet. The obscurity of the air in the workings by steam, especially in the early part of the day shift, is frequently a source of danger, as the roof can not be watched so closely as it could were the air clear, and consequently slabs of the roof that are ready to fall can not be easily seen, so that the liability that men will be crushed is greater.

I should especially recommend the method of hot water thawing to the consideration of the miners of Cleary and Pedro creeks, while on Fairbanks creek, as hitherto developed, the method of thawing with steam points seems more applicable.

In the Fairbanks district shafts sunk for work in the summer time are in nearly all cases timbered, either wholly or partially. In very deep shafts—as, for example, on the left bank of Cleary creek, near the junction with Chatham, where 40 feet or more of solid muck is encountered—timbering does not appear to be always necessary throughout the whole of the shaft. The muck forms a wall which resembles in its consistency a wall of solid ice, and in working throughout a season of four months, with the shaft in constant use, there will be little caving of the walls. All shafts that extend 20 feet or less, however, especially where gravel composes half or more of the section—shafts intended for working out a block of ground, conducting steam connections, pump connections, and connections for hoisting—should be securely timbered.

In view of the local conditions, the following method of timbering appears the most satisfactory: After the hole is sunk to the required depth by thawing, a square set with 6-foot centers—or should the shaft be 4 by 6 feet, of this dimension—is put in at the bottom. Three-inch pole lagging, with cross sets of 6-inch timbers inside at 6-foot intervals, is carried up to the collar. Inside the sets 6 or 12-foot poles, 3-inch, are nailed in the four corners to the cross sets. Moss is laid up outside the pole lagging, as dry as possible, and packed against the gravel or muck walls. In cases where it is impossible to sink without timbering as the shaft is sunk, the timbering is carried down and the lagging is driven as each set progresses, the square set being put in at the bottom on the completion of the shaft. Shafts timbered in this manner have been found to stand for periods of from one to two years—as long as the work in the Fairbanks district has been in progress—and there is no reason why they should not stand much longer. Timbering of this sort can be done for the most part with the ordinary cordwood delivered for fuel, and this is much the cheapest method available.

The cribbing method is sometimes adopted, accompanied by the same packing, with moss outside the cribbing. It is, however, more expensive, and in a shaft of considerable depth is much more likely to get out of plumb in this frost-ridden country.

In the Fairbanks district it has not yet been found necessary to timber the underground workings to any great extent. The main runway, if it be used for the whole season or for a period exceeding a month, should be timbered for safety. Six-foot sets of posts and caps only, with lagging over the roof, are generally sufficient. Pole lagging is cheaper and more advisable than split lagging. The caving system, working always toward the shaft, allows the faces to be carried forward without timbering the stopes. The elaborate timbering methods necessary in the Klondike benches and in many parts of California in drifting operations are happily not needed in this portion of Alaska, and are not likely to be required in any extension of the Tanana area. No case has been seen in the operations, as thus far developed, where false sets were carried in taking out gravel. When the operations at Fairbanks become more extensive, however, and drifting is carried on more systematically with wide faces, it is very likely that the workings will require timbering. At present it is not possible to give the cost of this work, as the figures were not obtainable.

(TO BE CONTINUED.)

*Bulletin 268 U. S. Geological Survey.

Electric Locomotives.

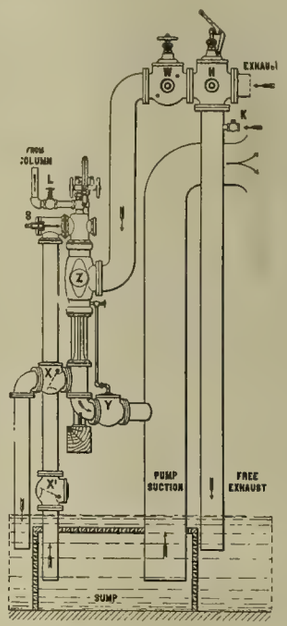
The New York, New Haven & Hartford Railroad will put twenty-five alternating current single phase electric locomotives on the New York end. It is the first order for electrical apparatus purchased by them as a part of the scheme for the electrification of their entire road between New York and New Haven, Conn.

Each locomotive will have a total weight approximating 78 tons, and will be equipped with four 250 H. P. A. C.—D. C. gearless motors of the Westinghouse type, the motor armatures being built directly upon the axle. They will be equipped with the latest type of unit switch system of multiple control for A. C.—D. C. operation. The locomotives will be so arranged that they can be connected two or three in multiple on a train. Each locomotive will have sufficient capacity to haul a 200-ton train (exclusive of locomotive weight) at a schedule speed of 26 miles per hour for the local service on the New York end, and will have a capacity for hauling a 250-ton train at a maximum speed of 60 to 70 miles per hour for express service where there are fewer stops. Locomotives are designed to collect direct current both from a third rail on the side of the locomotive and from an overhead conductor, and alternating current from an overhead conductor.

This is the first large order for electric locomotives awarded in open competition by a steam railroad in this country, and appears to mark the beginning of a new era in railroading.

A Universal Condenser.

The Schutte & Kœrting universal condenser is shown in accompanying illustration: Z represents condenser; W water-check valve; H free exhaust valve; S basket strainer; Y automatic discharge valve; X discharge relief valve; XI suction check; K air check. This arrangement is deemed desirable in deep mines having a great discharge height and consequently greater volume of exhaust in proportion to the volume of water pumped. Under these



Universal Condenser.

conditions, if discharge from condenser were returned to sump, the temperature of sump water would increase, causing annoyance and damage to the timber and detract from the effectiveness of the condenser. By discharging direct into the suction of the pump, the warm water is removed as it is produced and the sump water remains cool. The danger of having steam enter the pump through accidental stoppage of pump or condenser (and thereby destroying the valves and otherwise disturbing the action of the pump) is intended to be eliminated by the automatic action of discharge valve Y, which closes when vacuum in condenser is destroyed, while condenser is free to re-start through check X. And as soon as condenser resumes its action valve Y will open automatically diverting the discharge from the condenser again into the pump suction. Schutte & Kœrting, 702 Security Building, Chicago, are the designers and manufacturers of several condensing or recooling systems.

THE scientific investigators of Polytechnic University of Vienna, Austria, have devised an apparatus to be utilized in entering mines filled with smoke, deadly gases or otherwise dangerous to human existence. This apparatus is portable and may be carried on the backs of members of rescue crews, firefighters or others, and contains the chemicals necessary to generate a liberal supply of oxygen for a considerable period. It is based upon the principle of producing the oxygen required for breathing by means of the exhalation products themselves, by filtering them through a layer of sodium potassium peroxide, whereby the exhaled products—carbon dioxide and water—are absorbed. There are two types of this apparatus, one for constant use while at work and the other for use in the moment of danger. The first type will support life in an atmosphere which is wholly irrespirable for about an hour, thus giving the miner sufficient time to escape from the impending danger. Briefly the apparatus consists of a frame provided with a hose, mouthpiece and a bag sufficiently large to hold a box which contains the layer of sodium potassium and the necessary filters. Equipped with this apparatus, the miner places the breathing tube in his mouth and clamps a spring pin to his nose to prevent breathing of the vitiated air, and, breathing naturally through the tube, he goes to the rescue of those who are in danger. Without doubt, apparatus of this kind may be found extremely useful, and, if found to answer the purpose for which they were designed, should be promptly adopted by mining companies everywhere.

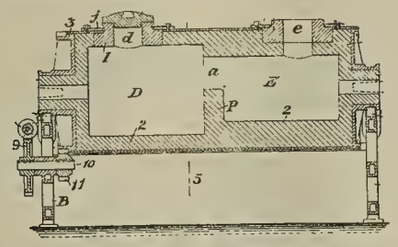
WITH mechanical stokers the poorer grades of bituminous coals can be used, and a higher efficiency of the boiler obtained. It is customary to use with the stoker the poorest and cheapest grades of slack coal obtainable, and the resultant saving over hand firing with run-of-mine or lump coal is apparent without considering the higher efficiency.

Mining and Metallurgical Patents.

PATENTS ISSUED SEPTEMBER 26, 1905.

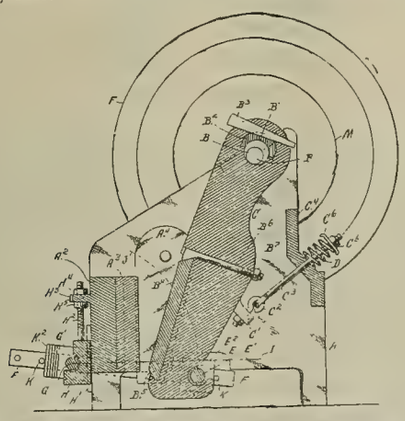
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

SMELTING OR MELTING FURNACE.—No. 800,148; A. B. Griffen, Verona, N. J.



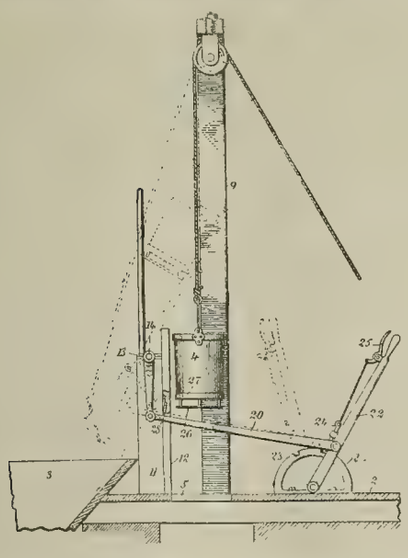
Furnace comprising tiltable body provided with two chambers arranged in horizontal line, one chamber constituting preheating chamber, and other augmenting chamber, vertical partition between two chambers having eccentric opening for establishing communication between chambers for passage of flame or gases when furnace body is in melting position and for establishing communication between chambers for passage of molten metal from preheating chamber to augmenting chamber and for closing off communication when furnace body is tilted for pouring.

ROCK CRUSHER.—No. 800,278; J. H. Elspass, Denver, Colo.



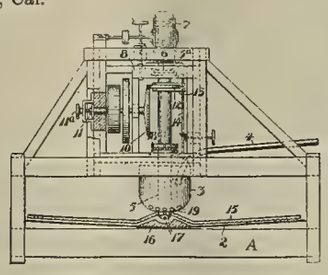
In rock crusher, combination with suitable frame and fixed jaw, movable jaw, means for imparting circular motion to one end of movable jaw, means for causing other end of movable jaw to move on arc whose center lies beyond fixed jaw, and means for adjusting center of arc in line parallel with face of fixed jaw.

BUCKET DUMPING DEVICE. — No. 800,449; J. C. Kirsch and J. J. Hartman, Granite, Colo.



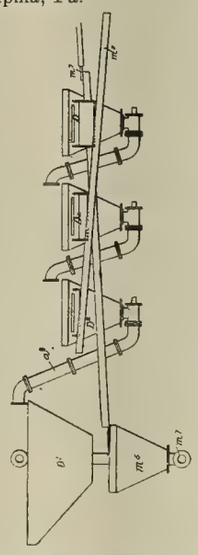
In bucket dumping device combination, pivotally supported bucket holder, means for holding same in inclined position, bucket adapted to descend upon bucket holder when held in inclined position, holder having hooks at lower extremity thereof, and bucket having ring adapted to engage hooks to form point of rotation to dump bucket.

CONCENTRATOR.—No. 800,379; H. L. Lightner, San Francisco, Cal.



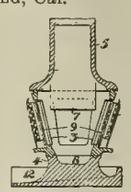
In concentrator, horizontally supported tank having peripheral discharge openings, means for supplying tank with pulp and water, air blast apparatus, vertical revoluble conductor extending centrally into tank, hollow arms fixed to and radiating from bottom of conductor and having perforations whereby jets of air are discharged over and through material within tank.

MACHINE FOR GRADING SAND.—No. 800,480; C. W. Palmer, Philadelphia, Pa.



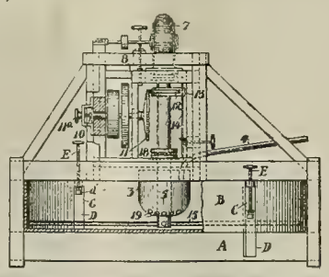
Combination of series of containers each having conduit for liquid overflowing therefrom, means for conveying material from bottom of each container and discharging into another container, receptacle for finished product, conduit connecting overflow conduits with receptacle, and another conduit connecting lower portion of last container of series with receptacle, with adjustable means for directing material from overflow conduit of any container into conduit to receptacle.

SPLASH PLATE FOR STAMP MILLS.—No. 800,398; G. C. Richards, Oakland, Cal.



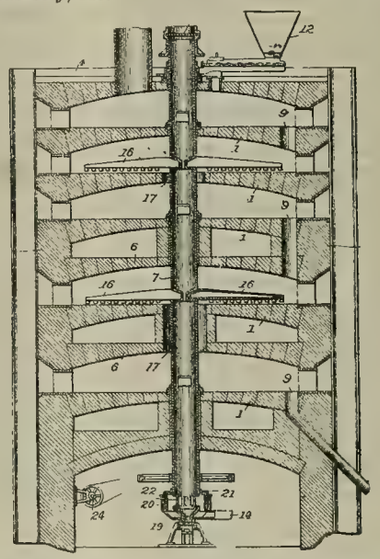
Combination with stamp mortar having screened opening, of splash plate exterior to opening and having inner face presented toward opening and amalgamed and provided with means on face to retard flow of water and sand thereover.

AMALGAMATOR.—No. 800,378; H. L. Lightner, San Francisco, Cal.



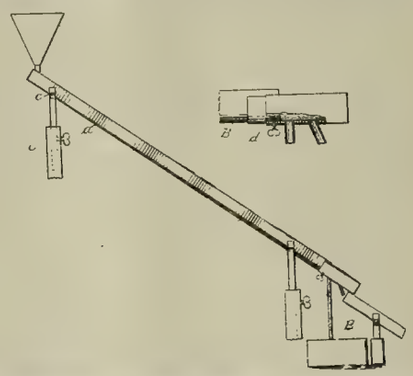
Amalgamator comprising concaved pan having surface coated or charged with mercury, raised concaved center within pan, receiver for water and pulp suspended above pan center and having discharge openings around bottom, air blast apparatus, air pipe extending vertically therefrom through bottom of pulp receiver having perforations in bottom discharging into convexity of raised center, radial arms extending outwardly from tube below receiver and in proximity with concaved bottom, arms having air discharge jet openings in lower part, mechanism by which arms are revolved and rate of speed changed, frame upon which apparatus is carried and means by which frame may be raised or depressed with relation to pan.

ROASTING FURNACE.—No. 800,588; A. R. Meyer, Kansas City, Mo.



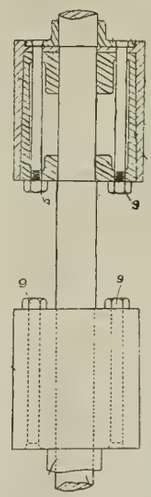
Furnace having side and end walls of masonry and external buttresses, at opposite sides connected by cross beams, with arches 1 extending from end to end and plurality of hearths above each arch, other arches 6 arranged below hearth arches to form intermediate flues, flues connected in series, and plurality of shafts and rabbles carried thereby to sweep over different hearths.

CONCENTRATOR. — No. 800,293; S. L. Hague, Salt Lake City, Utah.



In concentrator having inclined spout with lateral curvatures and converging sides, bottom of spout having downward, transverse curvature and channel along bottom, which is nearer outer than inner side of spout in lateral curvatures.

PROTECTOR FOR THE ROLLERS OF DREDGE LADDERS, ETC.—No. 800,276; R. R. Douglas, Dunedin, New Zealand.



Protector for rollers of dredge ladders, elevators and like, consisting of combination with tapered roller of correspondingly tapered liner provided with circular flange at one end and means for securing flange to roller.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

A report on the stone industry in 1904 by the United States Geological Survey states that the total value of stone reported was $74,200,361, a gain of $1,254,453 over the value in 1903, when it amounted to $72,945,908. Granite, marble and limestone increased in value, while slate and sandstone decreased. Granite showed the largest increase. In 1904 its total value, including that of trap rock, was $19,992,983; in 1903 it was $18,436,087, a gain of $1,556,896 for 1904. The granite production increased from $15,603,793 in 1903 to $17,169,437 in 1904, a gain of $1,565,644; and the trap rock from $2,732,294 in 1903 to $2,823,546 in 1904, a gain of $91,252. Sandstone, including bluestone, decreased in value from $11,262,259 in 1903 to $10,295,933 in 1904, a loss of $966,326. The value of bluestone included in the sandstone was $1,779,457 in 1903, and $1,791,729 in 1904, an increase of $12,272. The sandstone figures decreased from $9,482,802 in 1903 to $8,504,204 in 1904, a loss of $978,598. The value of marble increased from $5,362,686 in 1903 to $6,297,835 in 1904, a gain of $935,149. The slate output was valued at $6,256,885 in 1903, and at $5,617,195 in 1904, a loss of $639,690. The limestone output remained nearly the same, being valued at $31,627,991 in 1903, and $31,996,415 in 1904, a gain of $368,424 in 1904.

ARIZONA.

Cochise County.

At the Gold Nugget mine a new shaft is being sunk on the vein and the management intends sinking another one. Sufficient ore is being taken out to keep the mill going. The Gold Nugget is managed by J. G. Pritchard of Bisbee and is in the Bowie mountains, south of Bowie station.——At the Copper Queen mine at Bisbee the new change houses are completed. A new cable has been supplied for the hoist at the Holbrook shaft. It is expected the Holbrook shaft will supply the greatest amount of ore for the reduction plant at Douglas. The Oliver shaft has been thoroughly equipped and is ready for hoisting. At the shaft of the Junction Co. there is a great deal of exploration work is going on under unusual difficulties. A compartment shaft is being raised from the 90-foot level to the surface, and it is hoped it will be finished this month. It will add to the ventilation of the mine, which is now hot, and work can be carried on only in short relays. In the Shattuck-Arizona shaft drifting is going on in the 700 and 800-foot levels. In the latter there are indications that it is approaching the ore body recently passed through by the drift on the 700-foot level. Work in the latter continues with the expectation of finding another ore body beyond the lime formation it is now in. The 8x21-foot shaft on the Denn-Arizona is down over 500 feet and it is the purpose of the management to go at least 400 feet farther without stopping. This shaft was started five months ago. ——A. D. Brewster and others, owning the Randolph mine at Tombstone, have resumed work. A whim will be used at first and until greater depth is attained, when a gasoline motor hoist will be put in.

J. A. Collier of the Vermont & Arizona Copper Co. is crosscutting the ledges that run across the property. The property is 4 miles from Gleason, in the Dragoons.

Rebuilding the Girard mill for the Consolidated Company at Tombstone is progressing rapidly. The grading for the additional twenty stamps has been finished, as has most of the grading for the cyanide tanks; the concrete foundation has been completed.

Gila County.

J. W. Bordman is putting up a custom stamp mill 4 miles west of Payson. Some of the high-grade ore of the district is being shipped to Globe.

The Arizona & Eastern Con. M. Co. has given A. A. Patterson a contract for the development of copper claims on Mineral creek, near Globe.——The output of the Old Dominion smelter for September was 1255 tons, or 2,510,000 pounds, of blister copper, which is a gain over the two previous months. Three furnaces are in blast and the concentrator running day and night. About 5000 tons of Bisbee sulphides have been accumulated and shipments will continue until a stock pile of 20,000 to 25,000 tons has been accumulated. The company also has on hand 7000 tons of coke and a large quantity of fuel oil.

Graham County.

(Special Correspondence).—At the Copper Creek mines, in the Bunker Hill district, Galurio mountains, the company has put in a hoist suitable for sinking 1000 feet, and air compressor and air drills. The machinery is in operation and shipping has been resumed. The main shaft has been enlarged and straightened and timbering put in. A level has been opened at 120 feet, and drifts are in sulphides in both directions from main shaft. The main shaft is 180 feet deep, and the second level will be opened in the sulphide body at 200 feet. The ores are cuprite and chalcocite, with small quantities of malachite and chrysocolla, and occur as fissure veins in rhyolite and as contact veins between rhyolite and porphyry. F. J. Sibley, at First National Bank building, Chicago, Ill., is secretary.

Clifton, Oct. 9.

Maricopa County.

J. Osborn has resumed development work on the Ben Hur mine, near Cave Creek.

Yavapai County.

Diamond drill prospecting is being done at the Verde Chief mine in Black canyon, 9 miles south of Jerome, under the direction of D. N. Bartholdi. —— The shaft of the Golden Idol, near Cherry, is down over 100 feet. The mine is being worked with three shifts.——The Arizona Gold Lode has completed the grading for a 10-stamp mill and cyanide plant at Cherry. —— The Poland mill at Poland has been started, and it is reported that thirty more stamps will be added to it, making fifty stamps in all. The Poland mine had a 3000-foot tunnel and other development before the completion of the Poland tunnel, which cut the main Poland ledge 500 feet from the mouth of the tunnel and at a depth of 300 feet. Drifting on this ledge from the tunnel will give a depth of 800 feet. The Poland tunnel cut a number of other ledges which can be drifted on and the ore cheaply handled and transported to the mill.

W. A. Dearing has charge of work on the claims of the Thumb Butte M. Co., near Prescott.——The claims of the Knickerbocker M. Co. in the Thumb Butte district, west of Prescott, are being developed under the direction of G. U. Young.

The character and amount of assessment work being done near Walnut Grove, in the Bradshaw district, seems to indicate that the great dam washed out by the floods of 1890 is to be rebuilt. The flood took with it $600,000 worth of property, besides causing the death of 100 people. Originally the dam was built as a hydraulic mining proposition. The storage or the upper dam was located at the lower end of Walnut Grove, 35 miles from Prescott. It measured 400 feet from end to end and 12 feet wide on the surface, and at the stream base was 125 feet in thickness. It had a height of 112 feet. At least $5000 a year has been expended for the past fifteen years, in complying with the law governing mining expenditures, as the ground held by the company comprises fifty locations. All the assessment work has been directed toward the rebuilding of the dam. The bedrock foundation has been completed on both sides of the river, and, in the performance of this year's work, it is the purpose to continue the laying of the foundation to greater elevation on both sides of the river.

CALIFORNIA.

Amador County.

Superintendent Webb Smith says that the Kennedy east shaft, near Jackson, has reached a depth of 2945 feet, and that further sinking was discontinued on September 30th. A new station will be opened at the 2850 level, and the work of cutting out for the water tanks, the station levels and chutes is now in progress.——The Keystone mill at Amador City is running to full capacity with sixty stamps dropping and one of the Griffin mills is running.——A. M. Hambric has started the new canvas plant at the Fremont mine, near Amador City.——G. Hambric and J. Glavich are putting up a canvas plant below the Keystone mill at Amador City, to handle the concentrates from that mill.

Butte County.

The Amoskeag mine, near Oroville, is to be pumped out preparatory to being opened up by E. Moore & Co.

Del Norte County.

(Special Correspondence).—Prospecting in the interest of foreign capital continues along the south bank of Klamath river for several miles above Requa. The drill work is to be pushed. The operators have a long term option on many miles of bench and bar deposit. Drills and pumps heretofore in use will be duplicated by those of greater power. It is expected that the lower Klamath river district will be a lively one. On high bars rich gravel has been lifted from a depth of 30 feet, and the showing seems to be satisfactory so far.

Crescent City, Oct. 9.

Humboldt County.

(Special Correspondence).—The Humboldt quartz claim and Humboldt extension quartz claim, Red Cap district, have been located by G. and B. H. Wilder. Many locations have been made in this and Orleans district of late. Sixty placer, quartz and water locations have been made along the Klamath and its tributaries, between Orleans Bar and Klamath Bluffs, since June 1. A new quartz mill has been put in at Orleans district, prospects are being developed, and the outlook for renewed mining effort is good in this isolated region. The same awakening is noticeable along the Trinity river from Willow Creek to the Hoopa reservation.

Orleans, Oct. 10.

Kern County.

(Special Correspondence).—The California Mines Co. has bonded the Baltic mine, ½ mile from Randsburg, and is sinking a 200-foot shaft and building a 60-ton cyanide plant. E. R. Abadie, Jr., is superintendent.——C. A. Burshaw contemplates opening up the Phœnix mine in Johannesburg.

Randsburg, Oct. 10.

(Special Correspondence).—The Exposed Treasure M. Co., operating at Mojave, has decided to cease milling operations for a few months, and will deepen their shaft another 1000 feet. High grade ore, unsuitable for treatment in a free-milling gold mill, has been found below water level. The quantity of water has proven very large, and a large pump will be put in. After further development a new plant, suitable for treating the unoxidized ores, will be put up. C. De Kalb has been retained as consulting engineer.

Mojave, Oct. 11.

Mariposa County.

(Special Correspondence).—The Tennessee & California G. M. Co., near Indian Gulch, have shut down their mine and 10-stamp mill, discharging all employes. The company may be reorganized.——The Grimshaw mine, 6 miles from Indian Gulch, is being unwatered preparatory to opening it up.

Indian Gulch, Oct. 12.

Nevada County.

(Special Correspondence).—The Ethel mine, on Canyon creek, is showing good values as the drift progresses. The new 5-stamp mill is making big cleanups and a 10-stamp mill is planned for next year by Superintendent A. Maltman. The mine has been opened by 1700 feet of tunnels and has already 400 feet of backs. This is believed to be a continuation of the Gray Eagle lead.

Graniteville, Oct. 10.

Sierra County.

(Special Correspondence). — A large cleanup is reported, after running twenty stamps for ten days, at the Mountain mine, near Sierra City. Last year work was resumed on this property after an idleness of several years; the result was the discovery of a parallel vein 150 feet in the hanging wall from the veins previously worked.——Work has been resumed on the Alice and Pappoose quartz claims in Jim Crow canyon, 3½ miles southeast of Downieville. They are repairing the ditch and flume and when that is completed the cannon ball mill will be started.——The new tunnel started recently on the Yuba location of the Sovereign G. M. Co. property is said to show up good values. This property is 3½ miles northwest of Sierra City. G. B. Morse has charge of work at the mine.

Sierra City, Oct 10.

(Special Correspondence).—At Forest City the South Fork Co. have their flume completed and will commence washing gravel in two weeks.——The Maple Grove Co. of Forest City intend to start work on their claims. It is expected that they will strike the continuation of the South Fork channel.——The Forest City M. Co. have a large crew doing development work.——The Lightner, at Alleghany, continues its production of specimen ore. ——T. F. Baker of Honolulu and F. C. Le Blond of San Francisco recently inspected their mine, the Hilo, at Chaparral Hill, which is producing pay gravel.——Wm. Brady of San Francisco has put on a crew to run a tunnel in to gravel on the Irwin ground, adjoining the Hilo.

Forest City, Oct. 10.

(Special Correspondence). — Peckwith & Spaulding have struck the White Bear channel in their ground at West Point. It prospects well.——The Telegraph mine, near Downieville, is putting in an electric plant in Goodyear creek to furnish power to run their mill and hoist. ——The Sierra Buttes Co. have their new cyanide plant running, and will start the 40-stamp mill as soon as their tramway is completed.——The Oaklick Co. are sinking a winze in their lower tunnel, in Jim Crow canyon, near Downieville.

Downieville, Oct. 11.

Siskiyou County.

It is reported from Etna Mills that Geo. V. Gray & Co. have bought the Lanky Bob mine, in the Salmon river district, from George Skillen. The new company will put in a 2-stamp mill at once and commence development work.

Trinity County.

(Special Correspondence).—At Denny, near the headwaters of New river, the Hunter mine, owned by F. J. Ladd, has been acquired by J. P. Hennessy and R. Hicks. The Hard Tack and Cape Nome quartz mines, in the same district, which yielded satisfactorily while operations continued, are awaiting a resumption of development work. The pay streak in all these ledges are small but rich. The purchasers of the Hunter have a 3-stamp mill.——Operations at the Quimby mine, on the lower river, are suspended because of shortage of water. ——Placer miners along 30 miles of New river are hurrying preparations for the winter work.

Denny, Oct. 11.

COLORADO.

(Special Correspondence).—Considerable discussion has taken place recently over the establishment of a National park on the White River forest reserve, on the western slope of the Rocky mountains in Colorado. The reserve mentioned above is located in the counties of Routt, Rio Blanco, Eagle and Garfield. A petition opposing the project is being circulated among the residents of the counties and will be presented to Congress or President Roosevelt. It is claimed in the petition that a park at the point mentioned will be of no benefit to the State or to residents of the district, but will in fact be a detriment.——It is understood that all bids for the completion of the Gunnison tunnel, near Montrose, in the Uncompahgre valley, have been rejected and that the Government will continue the work to completion. The parties who had the contract for the tunnel were obliged to discontinue work, on account of not being able to come out even on the price agreed upon. It was stated at the time that the bondsmen would be held for the completion of the tunnel, and that the Government would not be the loser by having to do the work itself. ——Good roads for Colorado is still taking the attention of parties who are interested in the movement. A project is on foot to build a pike from Trinidad in the southern part of the State to Greeley in the northern end of the commonwealth, touching Pueblo, Colorado Springs and Denver en route. Another one is to begin at Pueblo and end at Grand Junction, near the Utah line. Convict labor is being talked of for doing the work. This part of the programme will undoubtedly be fought by the labor unions.

Denver, Oct. 9.

Boulder County.

(Special Correspondence).—The Jenny Creek, operating at Frantz, has recently put in a 30 H. P. hoisting engine and is developing its property. Sinking is proceeding on the Snow Ball vein. A crosscut is being driven to connect with the Tootsey and Argo veins.

Frantz, Oct. 9.

(Special Correspondence).—The Progressive M. Co. is operating the Mark Hanna mine at Sunshine and is putting in a 25 H. P. hoist and boiler, and expects to have everything ready for development work some time during the month. The shaft on the property is down 70 feet, but will be continued to the 500-foot level.

Sunshine, Oct. 9.

The St. Louis mill has been closed down by Manager Harabel, owing to a failure to provide a settling reservoir for the tailings.——A recent cleanup from the vats of the Cash mill at Magnolia indicates a saving of over 90%.——New machinery has been put in in the Eagle Rock mill and it is now running on wolframite.

The tungsten properties of the Boulder County Farm, at Nederland, under the management of C. F. Lake of Boulder, has been closed down. The mill having but ten stamps and not being fitted for the best saving of the tungsten concentrate, it was deemed best to put in another plant before working tungsten ore. It is said that Manager Lake will build his mill at Nederland on the site of the old Boulder county mill, as Middle Boul-

der creek is a much better water right than the gulch stream, where the present mill stands. The mill now working will continue to operate the gold and silver ore for which it was originally built. Nederland is 18 miles north of Boulder and 4 miles from Rollinsville, on the Moffat road.

Chaffee County.

Work is to be resumed at the Mary Murphy at St. Elmo.

Clear Creek County.

The Red Mountain & Mad Creek M. Co. has been formed at Empire for $2,000,000. The properties are 12 miles west of Empire, in the Dailey district. J. D. Williamson is president.——A. N. Shepard of Denver has commenced work on his claims on Red Elephant mountain, near Empire.

The Centurion G. M. Co. and the Banner Con. Mines Co. of Idaho Springs have entered into an agreement whereby the latter will continue the Rockford tunnel 800 feet, to the intersection with the Little Champion vein. The Centurion management has suspended operations below the tunnel level, and will continue to operate ore bodies above.

The crosscut tunnel being driven by the Leavenworth Mountain M. Co. near Georgetown is in over 180 feet. Manager J. K. Brown is directing the work. The Leavenworth Mountain M. Co. controls fifty-four claims and six millsites on Payne's peak, and every lode may eventually be cut by the crosscut tunnel.——The upraise from the Ashby tunnel level to the old and rich workings of the Dunkirk vein, near Georgetown, has been finished. It will result in proper ventilation for the underground workings, and the work of development being pushed by the Dunkirk M. & L. Co. can be carried on without interruption. E. F. Kendall, manager of the Pay Rock mines, supplied the compressed air, which enabled the leasing company, of which J. H. Crandall is general manager, to finish the work.——A. M. Hill is operating the Julian claims near Georgetown. The Julian lode was recently cut by the crosscut tunnel.——J. O'Connell of Silver Plume has men cleaning out the old crosscut tunnel on the Bertha claims, located on Kelso mountain, near Georgetown.

The Lorella M., M. & T. Co. is working in the East Argentine district, near Georgetown. The Sandberg vein was cut 140 feet from the portal of the tunnel and drifts are being run east and west. A shaft sunk on the Silver Edge vein to a depth of 15 feet resulted in 20 inches of high-grade ore being uncovered. The lode will be cut by a tunnel in another 100 feet. Manager Sandberg has ordered compressor, boiler, engine and water-Leyner drills.——Machinery for the Vidler tunnel power plant has been delivered.——The St. Paul M. Co., operating in East Argentine on Green Lake mountain, is driving the crosscut forward at the rate of 5 feet per day. Manager Mont Tong is employing ten miners.——After driving 60 feet through vein matter the hanging wall of the Domino lode has not as yet been penetrated. H. Cochran is superintendent. The crosscut tunnel is in 320 feet. This property is on Payne's peak, opposite the Sidney tunnel, operated by the East Argentine M. Co. Power drills will be put in and the power secured by running a pipe line from the East Argentine.——The Mazeppa mine on Democrat mountain, near Georgetown, is to be developed by D. W. Shepard. The tunnel is in 700 feet. It is probable that arrangements will be made with the Anglo-Saxon mill for treating as soon as the new mill is put into commission.——Work has been started this week on the Aspen-Promise claims, on Leavenworth mountain, near Georgetown. E. J. Butts of Georgetown, president and general manager of the company, states that he has enough money for continued operation for at least three years to come.

Eagle County.

The Lion's Head M. & M. Co., at Minturn, has suspended temporarily while arrangements are being made for further development. The shaft is down 100 feet, is in the gray lime and will be sent down to the carboniferous, where ore is expected.——On the Lucy, at Fulford, considerable copper is coming in.——Superintendent M. McHale of the Holy Cross M. & M. Co., 16 miles from Red Cliff, is getting the machinery in place on the Bailey properties, and will drive the tunnel ahead soon. This tunnel runs 2000 feet on the vein and is expected to cut the Grand Trunk vein at the 2350-foot point. Air drills are used and the tunnel will be driven with three shifts all winter.

Fremont County.

(Special Correspondence).—Chicago and local parties are making arrangements to build a plant either at Florence or at Canyon City for the treatment of low-grade Cripple Creek ores. The ores they expect to handle will be ores that the present mills in this vicinity do not treat at a profit.

Florence, Oct. 8.

A defective electrical generator started a fire at the Fremont coal mine at Florence, Colo., Oct. 6. All the buildings, including the shaft house, were destroyed. Fifty miners were working in the mine at the time the fire was started, and ten of them were rescued without difficulty. By good fortune the air compressor was not damaged by the flames, and the work of saving the other men was made possible. By the prompt work of their companions they were rescued alive through the air shaft. The men were in the main working shaft when the fire started and were unable to get to the surface by reason of the flames having destroyed the main shaft. Superintendent McAllister, realizing their danger, signaled them to hasten to the air shaft and that ropes would be let down to rescue them. They acted at once, and while all the available men in the camp were fighting the flames, which were extinguished several hours later, Superintendent McAllister and twenty men were hoisting the miners from the air shaft one at a time.

Gilpin County.

A gasoline hoist is being put on the Hampton mine, Russell gulch.——R. G. Griffith & Co., of Russell gulch, are leasing on the Saratoga No. 3, west of the main shaft, in the Russell district. They have a good plant of machinery and are stoping west from the shaft at a depth of 300 feet.——The Dump lode on Gregory mountain, operated by Phillips & Co. of Central City, is ready to start shipping. The shaft is 350 feet deep and levels have been driven east and west.——Frank Poole, of the West Notaway mine, near Central City, has ten men working on the lease system. The ore is of a smelting character and does not do well in the stamp mills, as it is too refractory. The main shaft is down 500 feet, but most of the work is being done between the 200 and 400-foot levels.——The East Notaway, on which the shaft house was destroyed by an explosion, is again running. Tom Martin is looking after operations and running the hoist.

Charles Horning of Nevadaville has leased the Smuggler claim in South Moon gulch from Hawn, Stephenson & Co. of Rollinsville. The property is developed with shaft and a tunnel in 300 feet. Horning has made plans for a ten slow drop stamp mill of the amalgamation and concentration pattern. —— Grading is under way for the new 10-stamp mill of the Penobscot M. & M. Co. in Gambell gulch, near Central City, near the mouth of its main tunnel, which is in 1900 feet on the vein. The tunnel workings are 400 feet below the bottom of the Penobscot shaft and an upraise is to be made. They intend to drive their main tunnel 8000 feet to Tip Top mountain. —— Sinking at the Clay County mine in Lake gulch, near Central City, has given a depth of 640 feet. —— Eilmann & Co. have commenced work in the main shaft of the Susan Mary mine near Lake gulch.

Gunnison County.

A new air compressor has been put in at the North Pole mine, near Crested Butte, by Manager W. T. Deaner. The company have purchased the Hard Cash ore that was not treated by the mill at Gothic and will ship the same to the smelter at Grand Junction.——The Ruby Peak M. & M. Co. has resumed work near Irwin under the direction of Superintendent M. Pennington.

At the Napoleon mine, near Pitkin, the ore body has been drifted on for 15 feet, and assays show the ore to run from 40% to 48% zinc. The main incline will be sunk 75 feet to catch this ore body.

Hinsdale County.

The Hanna mill at Capitol City may be completed by Nov. 1. Three sets of jigs are being put in.——The Pittsburg Metals M. & M. Co. will put in an engine, dynamo, 3-drill compressor and boiler. Bunk and boarding houses will be built and preparations made for continuing operations throughout the winter. Underground drifting is now in progress on the Wyoming vein, and several carloads of the material will be sent to Durango and Salida smelters for test runs.

Lake County.

The connections with the Yak tunnel and a drift in the Tuscan at the bottom of the drift have been made and the shaft of the Tuscan is now going down and will be sunk another lift of 450 feet, making it 950 feet when completed. All of the water struck in sinking will be lifted to the 550-foot level, and from there diverted to the upraise and then through the tunnel. This will reduce the expense of sinking considerably. It will probably be the first of the year before sinking is completed.

The owners of Peoria Boy on Breece hill, near Leadville, are drifting from the tunnel level to the shaft, a distance of 400 feet.

South of Yankee hill, near Leadville, the large tanks for the tailings of the Wolftone mine are being housed. ——The Bohn shaft, near the Penrose mine, Leadville, has been started, with J. W. Newell as manager. The mine has been idle for some time.——Lead and zinc ore has been struck on the Ponsardin shaft on Yankee hill, which was recently started up again after an idleness of seven years.——The El Paso mine on Fryer hill, Leadville, is shipping two cars of ore a day. The pump works from a depth of 550 feet and has a capacity of 560 gallons.——A. V. Bohn is sinking a shaft on his Mammoth placer claim. A depth of 450 feet has been reached. An air compressor has been put in the mine.

More work is being carried on at present in the downtown section of Leadville than for several years. The last property to be started after several months of idleness is the A. V. shaft. The drifts are being cleaned out and put in good working order, and when completed breaking ore will commence. A switch will be laid to the ore bins to facilitate the shipping of ore. When this shaft was first opened considerable high-grade chloride ore was shipped, and the present lessee, T. S. Schlessinger, expects to open another body of it in the ground to the south, which has never been prospected. The south drift of the Cloud City is being driven to connect with the bottom of the Home Extension shaft. The Coronado is producing from 250 to 300 tons daily of siliceous lead ore and from the Northern, Poverty Flats, 100 tons daily of a good grade of iron is going to the smelters.

Montezuma County.

(Special Correspondence).—The center of activity in quartz mining in this county is the Old Kentucky, on the East Mancos, 10 miles from the town of Mancos. A good deal of prospecting and assessment work is being done, but the only real mining is in the O. K., where air drills have been steadily at work since spring and now have the tunnel in 450 feet. The vein remains strong, from 1 to 7 feet wide, and carries good milling values all the way, with a good streak of shipping grade. All the ore is being left in the dump, as the company intends to put in a mill next spring.——A good strike was recently made on the East Mancos, 3 miles above the O. K. The vein is a true fissure, 1 to 3 feet wide so far as opened, all shipping ore, much of it assaying over $600 in gold.—— Placer mining in this section has received an impulse this summer which bids fair to put it far ahead of quartz mining within a short time. Half a dozen different concerns have been at work on the San Juan, southwest of Mancos, and the bars for 100 miles are being systematically prospected. One small outfit has been at work for some time with a hydraulic plant and has obtained good results. Another company recently acquired an option on a large area and has shipped in a Keystone driller, with which it intends to put in the entire winter prospecting. The manager of another company has gone East to order a plant which will handle 1000 yards per day. It will consist of a floating mill, power shovel, and tramway, probably operated by electricity. The high bars are said to average over $2 per yard.

Mancos, Oct. 9.

San Juan County.

Among the new mills under construction, all slated for completion on or before the last of December, are the Gold Prince 500 tons, Old Hundred 300, Grand Mogul 150, Green Mountain 200, Hamlet 75, Arkansas Company 100, Sound Democrat 100, making from these sources 1425 tons daily of crude oil reduced to concentrates. Adding to these the product of the Gold King 400 tons, Silver Lake 500, Iowa-Tiger 250, Silver Ledge 150 and the Sunnyside (which is preparing to double its capacity and has purchased an electric separator for zinc saving, thereby enabling its owner to handle 300 tons a day) gives a total of 3025 tons of crude material daily that will be raised and treated at the several establishments named. This should yield over 600 tons of concentrates on the estimated average of five tons to one.——The lower terminal station of the Iowa M. Co.'s tramway line from the mill to the Silverton & Northern railroad was burned recently. The terminal building was a two-story frame structure, from which concentrates from the mill were loaded for shipment. The loss will amount to about $4000. The Iowa mine and mill have been idle for the last three years. It is not likely the terminal will be rebuilt or the tramway repaired before next year.

The Champion 1500-foot aerial tramway, on Sultan mountain, south of Silverton, has been completed. Heretofore the mineral has been transported down to the railroad by burro pack train. Work on the Champion will continue all winter, and the output of the mine will be steadily increased.——A big strike is said to have been made on the Moses claims, on the eastern slope of Bear mountain, owned and operated by Mrs. M. A. Garrett of Silverton. The strike was made on one of the crosscut tunnels, 175 feet from the portals and at a depth of 200 feet.

San Miguel County.

A mill for the treatment of vanadium ores is to be built at Newmire by S. W. Traylor and H. A. Hillman. Considerable vanadium ore has been taken out at this place and it is thought that a mill will stimulate the search for other bodies of vanadium ore.

Summit County.

(Special Correspondence).—The Old Union mill is running continuously with two shifts of twelve hours each, handling over 100 tons and producing 25 tons of concentrates per day.——The Lucky mine on Mineral point is shipping high-grade ore from the main shaft workings and is producing a good grade of milling ore for concentrating at its own mill. The same management has the Carbonate mine on Mount Baldy. —— The Reliance Dredging Co.'s large dredger is working smoothly now that the excavation is large enough for it to move around.——The Summit Banner Placer Co. in a cleanup of its sluice boxes and tables saved $1.03 per cubic yard. The black sand that is being saved in the steel riffles and on the new patent concentrating tables has given assays of 8.39 ounces per ton.——The Washington-Joliet M. & M. Co. are increasing their milling capacity by additional concentrating tables and will resume milling operations soon. —— The Morning Star mine on Mount Baldy, besides having been shipping a high-grade silver-lead ore for some months, has discovered a good, rich ledge, which is producing high-grade ore. —— The Sallie Barber mine is making considerable shipments of zinc ore to Kansas City.——The Abundance mine is being opened up at the lowest levels with good results. The shaft is being continued down.——The Jessie mine and mill are being worked continually by the leasing company and good returns from bullion and concentrates are being obtained.——It is reported that there is to be a consolidation of the Gold Pan M. Co. and the North American M. Co., to work both properties.

Breckenridge, Oct. 9.

Teller County.

Good shipping ore is being taken from the Bill Nye claim of the Copper Mountain Co. by the Metallic M. & L. Co. of Cripple Creek, under the superintendence of R. Blanchfield.——A good strike is reported from the C. F. Springer lease on the Oro, on Ironclad hill.—— Preparations are being made by A. Holman and associates to work the Christmas mine of Bull hill on a larger scale. They have bought a 10-drill compressor and 125 H. P. boiler from John Sharpe, lessee of the Colorado Boss, and will soon have it in position and operation. With this plant it is proposed to increase the depth of the shaft, the bottom of which is at the 300-foot point, and at 1000 feet to crosscut for some of the bodies known to enter from neighboring mines. These shoots will also be sought on existing levels.——E. S. Johnson of Colorado Springs, operating on the Blue Bird, on Bull hill, near Cripple Creek, has put in a 250 H. P. Corliss hoist. The shaft has been fixed to accommodate the cage, replacing the bucket hitherto used. Drifting to break into the Portland workings to secure ventilation has been started.

The main shaft of the Golden Cycle mine at Cripple Creek, that is now 1000 feet in depth, is to be deepened an additional 200 feet immediately, and when that is completed will be extended out and the ore cut again. The Golden Cycle Co. has decided to build a cyanide mill of 200 tons capacity, which will cost $200,000 when completed. The building will be so constructed that, if necessary, additional tanks can be put in which will bring the capacity up to 500 tons daily. The management has not decided if it will erect the mill on its property near Goldfield, or whether it will be constructed on a millsite which the company owns near Colorado City.

IDAHO.

Blaine County.

Superintendent Ruthrauff announces that the Dollarhide mill, 20 miles west of Ketchum, is enclosed and will be ready for operation by October 1. It will be run only a short time, however, as it is the intention to have the ores thoroughly tested before installing any extensive concentrating system. The ore is carrying 25% to 35% zinc, which will be separated and sold as zinc concen-

trates. Considerable ore is accumulating and over 400 tons are now waiting to be moved to the mill.

Boise County.

Manager W. T. Nassaur of the Whitman Co. of Pearl has opened the fourth shoot of the Leviathan vein after driving the adit level 622 feet.— The new cyanide plant at the Lincoln mine at Pearl has been finished and is running.

Idaho County.

Seattle lessees have resumed work on the Comstock mine near Dixie.——A 100-ton mill is being put in at the Bandette mine, near Oro Grande. Oro Grande is 70 miles from Stites, the nearest railway point. —— The Champion 10-stamp mill, near Elk City, is running. —— It is reported that a new mill is to be put in at the Oregon mine, near Elk City. —— The Sunnyside mine, near Roosevelt, is being worked with forty-six men under the direction of R. W. Purdom. Cyanide tests on the ore have been satisfactory and a plant may be put in.

Kootenai County.

The Golden Reward mill on upper Alder gulch, 1 mile north of Cœur d'Alene, is making good progress and Superintendent Kepp is pushing the work.

The Tyson Con. M. & M. Co., at Tyson camp, 20 miles from St. Marie, on the St. Joe river, is putting in an 8-mile pipe line for box and hydraulic sluicing of the gravel. The quartz leads are also being exploited. J. S. Haviland of St. Marie is general manager.

Lemhi County.

(Special Correspondence).—After a number of years of inactivity, the Texas mining district is again on the boom. Present operations are at Gilmore and Spring mountain, at the head of the Lemhi river, 80 miles from Dubois, Idaho, and 65 miles from Redrock, Montana, the nearest railroad points. Salmon City lies 70 miles down the valley, at the mouth of the Lemhi river, which flows into the Salmon river. The Gilmore M. Co. are down 275 feet. New machinery is being put in to sink to the 500-foot level, as well as an increase in their concentration plant to fifty tons capacity. At present the ore is hand sorted into first and second class, the first class going to bins for immediate weighing and shipping, and the second class is dumped on floors, screened and concentrated with jigs, the coarse or large pieces being resorted and emptied into the bins for shipment. Crushers are to be put in. The cost of transportation, including smelter charges, amount to $30. The ores are first hauled by wagon to Dubois, Idaho, 80 miles, and from there to Pittsburg, Pa., by rail. Freighters haul over a ton to the animal, it being a water grade and good roads. They receive $10 per ton for ore delivered in Dubois. The output of the mine is now about a car per day. This vein lies between porphyry and limestone, and varies in width, in some places being 20 feet wide. The shaft is equipped with a gasoline hoist, and concentrators are operated by steam power. The mines of Spring mountain lie 10 miles south of Gilmore. These properties are being worked on a large scale by Salt Lake people. No ore has been shipped this season, the supposition being that a smelter will be put in when sufficient ore has been blocked out to justify it. Many new strikes are reported and a number of sales made, notably a property 25 miles southeast of Gilmore, on Birch creek, to be operated by an English company. The Texas mining district promises to be one of Idaho's best silver-lead camps.

Gilmore, Oct. 7.

The 30-stamp mill and cyanide plant at the Kittie Burton mine, at Indian creek, north of Salmon City, has been destroyed by fire. The mill cost the company about $45,000 and was insured for about two-thirds of that amount.

Shoshone County.

The German-American M. Co., developing the Phœnix property, near Osburn, has the main tunnel in 975 feet, with a depth of nearly 900 feet below the surface outcrop. It is stated by the management that for a distance of 150 feet the average daily progress made with the 18-pound Hardsoeg hand drill was 7½ feet, the ground being broken 7x5 feet. It is the intention to continue the main drift, as indicated, and crosscut to the several parallel leads on the property. W. P. Belding is superintendent.

The Gold Ridge M. Co. intend sinking 100 feet deeper on their claims in the St. Joe mining district, 18 miles south of Wardner. D. Davis is manager.

MISSOURI.

Jasper County.

During September the lowest price paid for top grade zinc was $40 a ton during the first week of the month, since which the top price has been above $50, and the month closed with the price at $55. The output of zinc for the nine months just ended has been 376,456,780 pounds, which was sold for $8,424,385. During the corresponding period of 1904 the output was 386,719,490 pounds, which sold for $6,500,790. These figures show that the 1905 shortage of over 21,000,000 pounds in production, which existed September 1, has been reduced to a little over 10,000,000 pounds during the month. For the first time in 1905 the value of the lead output exceeded that for the corresponding period of 1904, although the output of lead is still below that of last year—the total production being 45,971,340 pounds, which sold for $1,358,540, as against an output of 48,702,560 pounds, which sold for $1,324,450 during the same period of 1904. The total value of both ores during the first nine months has been $9,784,124, which is an increase of $1,958,885 over the total production for the corresponding period of last year.

MONTANA.

Chouteau County.

Whitcomb & Phillips are working the Ruby Gulch properties near Zortman. It is reported that they intend to put up a new mill. They already have a mill and cyanide plant.

Granite County.

In the Red Lion district, near Philipsburg, the Southern Cross litigation which has kept the mine closed down is so far over that work has been resumed by Lucien Eaves. He had gone down 200 feet on the incline, on the new ore body opened up a year ago, when the mine was closed down. Operations at the mine have been resumed by putting men to sink this shaft on the new ore body 100 feet. Shipping ore is to be commenced as soon as the 300-foot level is reached.

Jefferson County.

The Pen Yan and the Blue Bird mines, near Corbin, have been bonded to a Michigan company by Parchen & Keefe. Superintendent McCabe has started work with three shifts.

Powell County.

At the Coloma mines, 1 mile from Coloma, work is under the supervision of H. V. Salisbury. The Comet group comprises fourteen claims and is owned by Philadelphia capitalists, H. J. Seible, Jr., being the president of the company. About 3000 feet of work has been done. The property is being developed by means of an incline shaft, which is down 400 feet. There are two main levels, at 200 and 400 feet. A crosscut is being run from the bottom of the 400-foot level in the direction of the Mammoth mine, of the group at Coloma. It will be required to run this crosscut about 800 feet to reach the lead in the Miner's Dream. Superintendent Salisbury is also starting to sink from the bottom of the incline shaft.

Silver Bow County.

(Special Correspondence).—In September the Butte mines yielded 409,500 tons of ore and 26,970,000 pounds of copper. To each pound of copper there was a bi-product value of 2½ cents. The following table shows the monthly output:

Companies	Tons of Ore.	Pounds Per Ton.	Pounds of Copper.
Boston & Montana	90,000	70	6 300,000
Anaconda	132,000	55	7,260,000
Butte & Boston	18,000	63	1,134,000
Parrot	16,500	68	1,122,000
Washoe	24,000	70	1,680,000
Trenton	18,000	58	1,044,000
North Butte	18,000	140	2,520,000
United Copper	45,000	70	2,700,000
Clark Mines	33,000	70	2,310,000
Miscellaneous	15,000	60	900,000
Totals	409,500		26,970,000

The rich yield of North Butte is due to the fact that only a very high grade of ore is being mined, while the shaft is being retimbered and the ore is hoisted through the shaft of the High Ore mine, one of the Anaconda properties. It will be a month or six weeks before the shaft is completed, and then the output will be increased fully 30%. The general average of the ore of the North Butte group is double the value of any other ore mined at present in the Butte district.——A new company, that will probably be known as the East Butte, is being organized for the purpose of consolidating about ten or twelve producing mines in the southeastern portion of the Butte district. The company will take in all the territory lying between the Pennsylvania mine of the Boston & Montana Co. and the Kane shaft of the Butte & Boston. Within the territory already secured are ten producing shafts, but the claims are all small, with the exception of the Oneida, which is a full mining claim. Among the properties already taken in are the Yankee Boy, with a 250-ton concentrator; the Mary MacLane, Oneida, Dutton, Symon and two others not made public. The shafts are from 53 to 300 feet deep, and ore is being taken from all of them. The ground is surrounded by the Pennsylvania, Glengarry, J. I. C., Kane, Silver Bow Nos. 1, 2 and 3, and Heinze's Belmont. It is predicted that the East Butte will rival the North Butte as a producer. Butte and Boston and New York men are interested in the new company.

Butte, Oct. 9.

NEVADA.

Esmeralda County.

Arthur Winslow of Boston, manager of the Combination Co., is at Goldfield looking after the new addition to the mill and the development of the mine. The details of the mill work are in the hands of F. L. Bosqui. The original mill was built as suggested by him after he had made tests on the ores. The present mill is adapted for the reduction of the oxidized ores, but in the new addition provision will be made for treating the sulphide ores of the lower levels, and Mr. Bosqui expects to make the same high saving of values that he does on the oxidized ores. The concrete work for the batteries and bins is finished, the material for the building is nearly all on the ground and the machinery all ordered. From the stamps the ore will go to a grinding mill, then a Wilfley table, then to four Frue vanners. All the tailings from the Frue vanners are reground in a tube mill and then concentrated, followed by cyaniding. The ores do not amalgamate as well as is generally believed, the saving on the plates being but 35% to 50%; 7% of the values are saved in concentration and the balance by cyanide. When the new addition is finished the mill will treat 80 tons per day. At the mine, a gallows frame for the new 30 H. P. electric hoist is being built at the new working shaft, which is now down to water level—240 feet. A cage will take the place of the bucket. E. A. Collins is superintendent of the mine.——The American M. Co.'s mill and cyanide plant at Goldfield is running under the direction of F. A. Doran.

Operations have been resumed in the main workings of the Goldfield-Portland Co.'s ground and the work of sinking the shaft to the 500-foot point is to be started as soon as the necessary timbers can be landed at the property. John McKane has a lease on the territory and is planning to develop and prove up the ore bodies. D. B. Gillies is in charge.

Eureka County

The Eureka M. & M. Co. are putting in new milling machinery and a compressor at the Bay State mine at Newark, near Eureka. C. M. Perry is president of the company.

Humboldt County.

(Special Correspondence).—H. Bender has bonded three claims, near Jackson creek, for $12,000 to Copley of Kansas City.

Humboldt House, Oct. 10.

Lincoln County.

S. P. Moore, superintendent of the Interstate M. & R. Co., is developing a gold property at Fay. A mill is to be put up.——G. E. Otis of the Cyrus Noble M. Co. of Searchlight states that the company will put up a 10-stamp mill on its properties near Searchlight.

The shaft on the Techaticup mine, at El Dorado canyon, is being driven to the 500 level. At the 400 a crosscut was run to the vein. The mine is under the management of Charles Gracey.

Washoe County.

The Harris mine, near Washoe City, has been sold to Indiana capitalists, who are getting the workings in shape and intend to build a 10-stamp mill near the mine. ——The Smith mine in the same district has been sold to Colorado men, who will open it up. They purchased a millsite of four acres and will build a mill.

NEW MEXICO.

Grant County.

W. E. Hockie has charge of the properties of the North American Co. at Lordsburg. Men are sinking the main shaft on the Cobra Negra under his supervision.——The Morning Star Co. have decided to sink a development shaft on the Atlantic, near Lordsburg, to a depth of 800 feet.——The main shaft of the Cobra Negra, of the North American M. Co., at Lordsburg, has been unwatered and sinking has been resumed.—— Work has been resumed on the Old Commerce at Ash Peak.

Sierra County.

A concentrating plant is to be put on the Virginian, Templar and Keystone, near Kingston. The plant will have a capacity of 100 tons a day. Ore thrown on the dump in 1885 and 1886 is to be treated. J. H. Moffatt is the superintendent and A. W. Harris of Kingston is the principal owner. The property has been leased to a company, of which B. S. Rodey of Albuquerque is the president.

OREGON.

Baker County.

The mill and cyanide plant at the Mayflower mine, near Cornucopia, is nearly completed. Work is being pushed on the aerial tramway.——The 10-stamp mill and concentrators at the Gold Coin mine, 3 miles from Rye Valley, are almost completed.——Manager T. Kennerly has finished surface improvements at the John B. Sipe group, near Bourne, and will continue work through the winter.——The Victor crosscut near Bourne is in 1000 feet. Machine drills are being used in drifting on the No. 2 vein cut by the crosscut.

Douglas County.

The aerial tram connecting the Musick mine and 30-stamp mill, near Bohemia, has been finished. Development has been resumed in the mine.——The Bohemia Mine Owners' Association will hold their annual meeting in November. —— The Vesuvius mill at Bohemia has resumed operations after a shut-down for repairs.

Grant County.

It is reported that the main Gold Bug vein, near Granite, has been cut after running the crosscut tunnel 800 feet. Manager T. S. Van Fleet has sacked some of the ore for shipping.——The new mill building at the Standard cobalt mine, near Comer, has been finished, and the crushing and concentrating machinery is being put in as it arrives.

Jackson County.

The Maid of the Mist property, 4 miles from Applegate, is to be worked by E. M. Wright and brother of Union, Oregon, and C. Hawkins of San Francisco. They are building cabins and intend to put up a mill building soon, as there is said to be enough ore in sight to warrant construction of a small plant.

Josephine County.

A good pay shoot has been opened by the 525-foot tunnel at the Eureka mine, near Selma. A. F. Nelson is manager.——C. B. Kelton has started work on the Calumet main tunnel, near Selma.

Manager O. L. Tutt of the Takilma smelter says that he will have to close the smelter by November, owing to the condition of the roads. The 42-mile haul from Grants Pass becomes impossible when fall rains set in. During the winter the smelter management will rush development.

Malheur County.

A large seam of coal, reported by prospectors to be 20 feet thick, has been located at the mouth of Dry creek, 35 miles southeast of Ontario. The preliminary work done on the discovery indicates that the seam will produce a good grade of ore, and it is the purpose to arrange for thorough prospecting. The discovery is in the same general vicinity as Malheur oil formations, which attracted much attention a few years ago. Miners have been confident of coal in the district, but exploratory work had never been thorough enough to determine where the measures would be found and the wash of the country is too heavy for the prospector to learn much from croppings.

SOUTH DAKOTA.

Lawrence County.

The annual report of the Homestake M. Co. for the year ending June 1, 1905, has recently been issued, and is of more than usual interest. The company has developed the largest body of gold-bearing ore in the world, and though low in grade—less than $4 per ton—so carefully has the business of mining and ore reduction been systematized there, that a substantial profit results from these operations. The company is mining and crushing nearly 1,500,000 tons of ore annually, the daily run being about 4000 tons. There are six shafts from 800 to 1400 feet deep; six mills, containing in the aggregate 1000 stamps (some additions having been made the past year), crush this ore through a 40-mesh screen, much of the pulp being reduced to a fineness of 200 mesh. Two great cyanide plants handle the sands, there being an almost perfect separation of sands and slimes, and a plant is now being installed which will remove a large percentage of water from the slimes, which will render

the latter amenable to cyanidation as readily as the sands. The more important items of mining and milling cost are here mentioned, together with the cost of similar operations during the previous two years for the purpose of comparison, and will prove of interest to miners elsewhere:

Item.	1903.	1904.	1905.
Total production	$4,526,942 04	$4,800,558 48	$5,221,089 30
Tons milled	1,279,075 00	1,299,057 00	1,398,100 00
Average per ton	3 539	3 695	3 734
Dividends paid	819,000 00	655,200 00	819,000 00
Property purchased	5,167 76	210,168 85	1,784 48
Mine labor	1,548,447 07	1,570,740 00	1,671,271 84
Taxes	67,530 59	78,758 10	85,861 46
Water	96,099 44	65,747 48	30,313 78
Interest	31,139 56	.....	16,028 47
Indebtedness	425,784 97	.....	.....

The cost of mining the past year was about $1.14 per ton. The cost of milling, cyaniding, etc., is not given. In former (recent) years the dividends were somewhat larger than during the past three years, being in 1900, $1,175,000, in 1901 and 1902, $1,260,000 each year, but owing to extensive and expensive additions to plant, the dividends have of late been somewhat lower, though higher the last than the previous year. It is anticipated that the dividends of the present and immediately succeeding years will show an increase, as the increase in milling capacity will have a noticeable effect. The contemplated slimes plant, the construction of which is now in the preparatory stage, will form a large item of expense, as will also the water power installation now being made, but the economy of these investments will later become evident. The total dividends paid by the Homestake Co. proper up to and including September, 1905, is $13,896,350. If with is included those paid by the De Smet, Deadwood-Terra, Caledonia, Highland, Golden Star and other subsidiary companies absorbed by the Homestake Co., the total amount would be about $25,000,000 from ore averaging not above $4 per ton. The annual report of the superintendent, I. J. Grier, is characteristically brief and contains the following: "During the twelve months now closing no mishap to the property of especial importance occurred. Developments in various parts of the mine progressed steadily and satisfactorily. The ore at the 1250-foot level has just been reached and is now being crosscutted. The Ellison shaft has been sunk to 1400 feet and the work of opening a level at that depth begun. The B. & M. shaft has attained a depth of 1250 feet, the Golden Prospect 900 feet. The Old Brig and the Golden Gate remain at 800 feet each and the Golden Star at 1100 feet. The plant generally is in fine condition, with ore in sight for a great many years."

Work commenced October 6 for the new slime plant which the Homestake Company is about to build at Deadwood. Men were put to work grading for the ditch through which the iron pipes containing the slimes will be run. A tunnel will also be driven beside cyanide No. 1 through the hill to the north. The pipes will be laid through this tunnel, thus cutting off several hundred rods of distance between the mills and plant. For the past month work has been carried on in Blacktail, fixing foundations and moving buildings in order to obtain a suitable site for the new settling tanks, which will have to be built on that side of the hill. Work for the grading of the plant itself will be begun in Deadwood as soon as the houses on the site can be moved.

Pennington County.

(Special Correspondence).—A spur is being built westerly from Rapid creek, near Nahant, by the Burlington road, toward the Wyoming line, presumably to the coal fields of western Wyoming.

Nahant, Oct. 7.

UTAH.

Beaver County.

The first shipment of ore from the Majestic Co.'s Harrington-Hickory mine, under the Newhouse management, has been made from Milford.——The Hecla, 10 miles east of Milford, is being developed by H. Harris. ——A. C. Washington, president of the Horn Silver mine at Frisco, accompanied by Manager P. T. Farnsworth, visited the mine recently.——Manager J. A. McMullin is having the assessment work done in the O. K. Extension Co.'s properties, near Milford.

Carbon County.

The shaft being sunk at the Overland mine at Sunshine is down 220 feet.

Juab County.

The management of the Mammoth M. Co. contemplate putting in an aerial tramway to convey ore from the mine to the loading station at Robinson, a distance of 1 mile.

Tooele County.

It is reported that Manager Trenam of the Stockton mine at Stockton intends to put in a new hoist and air compressor. The present hoist is taxed to take out ore from the 850-foot development work. The mill has been running with but one shift because of water shortage.

WASHINGTON.

Okanogan County.

The Palmer Mountain T. & P. Co. is putting in a 3000 H. P. power house and a 300-ton milling plant and an air compressor at the mines near Loomis. The first unit, 750 H. P., of the power plant, will be in readiness within a month, when the work of extending the 4400-foot tunnel will be resumed. It is the plan to extend this bore an additional 4700 feet, making a total length of over 9000 feet. J. Boyd is the manager and E. Beidler is the superintendent in charge.

Stevens County.

Silver Queen Mines, Ltd., are working claims in the Kettle river valley, 3 miles south of Kettle Falls. Hoisting and pumping plant will be put in. W. W. Warner is the superintendent and R. K. Green is manager.—— The new smelting plant of the Turk M. & M. Co. in the Cedar Canyon district, near Davenport, is temporarily out of commission. The Silver Seal Co., F. M. Van Horn manager, is producing steadily. The Providence M. Co., S. L. Boyer, manager, has also made a number of profitable shipments. The Deer Trail M. Co. has started work at the Royal. The First Jump M. Co. has taken over the Brooks property between the Silver Seal and First Jump. The Deer Trail Consolidated M. Co. has adjusted its difficulties and will resume work with W. W. Tolman of Spokane as manager. These mines are all tributary to Davenport.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District.

(Special Correspondence).—The 40-stamp mill of the Daly Reduction Co. at Hedley is crushing over 3000 tons of Nickel Plate ore per month, with returns of $14 to $15 per ton. They have 250,000 tons blocked out in sight. R. B. Lamb has charge of the mill and M. K. Rodgers is superintendent of the mine.

Hedley, Oct. 7.

East Kootenay District.

The Sullivan mine, at Kimberley, is being prospected with a diamond drill.——The buildings at the upper end of the St. Eugene tramway were recently burned.

The big shaft house at the Lake Shore workings of the St. Eugene mine, near Moyie, was burned to the ground Oct. 6, and the loss will probably reach $30,000. The timbering in the shaft and in the main tunnel was partly burned. This is the second bad fire within ten days that the St. Eugene has had. The buildings will be rebuilt.

West Kootenay District.

(Special Correspondence).—Work has been started on the Silver Dollar mill on Mohawk creek, near Camborne. Water is to be used for power. The pipe, 18 inches in diameter, is of wooden staves, wound with galvanized iron wire and coated with pitch. —— The Mammoth group, above timber line on Goat mountain, near Camborne, is to be worked throughout the winter under the direction of M. McCollom. The ore is galena and gray copper, carrying high values in silver. It is handpicked at the mine and rawhided as soon as the trail is in condition.

Camborne, Oct. 6.

At the Mother Lode, at Poplar creek in the Trout Lake division, 600 feet of tunneling, shafting and upraising has been done. In the No. 1 tunnel the ledge has a width of 35 feet, with an ore shoot that varies in width from 7 to 8 feet. There is 18 inches of ore in the 7 or 8-foot shoot and the remainder is concentrating ore. Work has been started on No. 2 tunnel so as to prove the ledge at depth. This tunnel, when driven for 400 feet, will strike the ledge at a depth of 400 feet. The chief values in the ore are silver and lead, with some gold. It is a concentrating proposition, and ultimately a concentrator will have to be provided.——Chisholm & Simpson are developing the Calumet and Hecla, on Rapid creek, near Poplar. A shaft has been sunk to a depth of 35 feet on the ledge. It is a free gold proposition.——Marquis & Gilbert, the owners of the Gold Park group, which were the first claims staked in the Poplar camp, are closing a deal with a Minneapolis syndicate, which has ample means for development.

MADAGASCAR.

Consul Hunt of Tamatave writes that there are bright prospects of gold being found in very large quantities in Madagascar. He says that the exports of gold in 1903 and 1904 amounted to 4211 and 5423 pounds, respectively. Quite a number of persons are prospecting for gold, but most of them are men who have had little experience in prospecting. Gold dirt has been found that yields $34.70 per metric ton (2200 pounds). Gold-bearing reefs and alluvial deposits have been found in various parts of the island.

MEXICO.

A statement issued by the Mexican Treasury Department, covering the exportation of precious metals by that country in the eleven months from July, 1904, to May, 1905, inclusive, shows an increase of $2,551,020.07 of gold over the corresponding period of 1903-4 and a decrease in silver of $13,478,934.46. The silver decrease was the result of the adoption of the monetary reform, which discontinued the exportation of silver dollars. In the period mentioned (July, 1904, to May, 1905) there were exported:

Mexican gold coins	$85,911 00
Foreign gold coins	39,132 50
Gold in bars	11,307,354 80
Gold in other forms	921,393 49
Total gold exported	$12,353,781 79
Mexican silver coins	$1,892,071 27
Foreign silver coins	76,471 00
Silver in bars	47,385,298 92
Silver in other forms	9,982,433 32
Total silver exported	$59,336,274 51
Copper	$26,237,018 96
Lead	5,112,408 00
Other mineral products	1,049,206 39
Total	$32,398,633 35

The total exportation of gold, silver and other metals shows a decrease of $5,182,748.78 as compared with the corresponding eleven months of 1903-4.

PHILIPPINE ISLANDS.

According to a recent government report in Lepanto, in the copper district of Mancayan, on the Island of Luzon, forty claims, including the Santa Barbara and Sin Nombre pertenencias of the Spanish regime, all now located under the present mining laws, have been secured as an option by agents of a New York syndicate. The old Spanish workings have uncovered large bodies of high-grade copper ore on the Santa Barbara and the Sin Nombre claims. In Batangas Province work has been done in the Loboo Mountains upon a group of claims containing copper carbonate ores, two surface samples of which have assayed respectively 2.71% and 17.1% in copper, with a trace of gold in each.——In Rizal Province placer washing for gold has been carried on by the natives for many years, and this has led American prospectors to the search for the origin of the gold in the hills. No important discoveries have as yet been made, however, other than the discovery of platinum, identified in small quantity in placer sands from Rizal.

Personal.

A. A. BLOW is in New York.

EDWARD M. ROGERS is in Chile.

GEORGE A. SCHROTER is now in New York.

N. SAMWELL has returned to London from Mandalay.

R. S. BOTSFORD is in London, on his return from Borneo.

GEORGE W. MAYNARD has left New York on his way to Mexico.

FRANK WESTERN returned to Egypt at the end of September.

MARTIN SCHWERIN has returned to New York from Tennessee.

O. E. JACKSON is manager Big Giant M. Co., near Boise, Idaho.

C. B. KINGSTON left London on September 9th for South Africa.

BEN S. REVETT is going shortly to Colombia to examine placer ground.

MARTIN H. HELLER has returned to San Francisco, Cal., from New York.

W. C. HOWARD of San Francisco, Cal., has returned to his mines near Camp Mohave, Ariz.

G. E. ALEXANDER is manager Middle Yuba gravel mine, North Columbia, Nevada county, Cal.

ROGER TAYLOR has been appointed assistant superintendent Tacoma Smelting Co., Tacoma, Wash.

ERNEST RAMMELMEYER is superintendent Iron Springs M. Co., at Iron Springs, Washington county, Idaho.

E. L. DE LESTRY of St. Paul, Minn., manager Arizona & Eastern Con. M. Co., has been at the mines near Globe, Ariz.

E. H. COOK has resigned as manager Santa Francisca mine, Asientos, Aguascalientes, Mex., and is in Los Angeles, Cal.

F. A. HILL of Renton, Wash., has been appointed general manager Canadian Coal & Coke Co., Frank, Alberta, B. C.

FREDERICK GRUNDY has gone to the City of Mexico to make an extended trip examining properties in southern Mexico.

F. H. JOHNSON has succeeded G. W. Root as superintendent New York Grass Valley mine, Grass Valley, Nevada county, Cal.

W. J. BELCHER, superintendent White Bear mine, near Downieville, Cal., has been examining mines in Mohave county, Ariz.

NORMAN CARMICHAEL has resigned as manager Highland mine, Ainsworth, B. C., to take charge of some of the Arizona Copper Co.'s mines near Clifton, Ariz.

H. SCHIEFFLEIN, assistant manager mining and crushing machinery department Allis-Chalmers Co. of Milwaukee, Wis., is in San Francisco, Cal.

G. F. RENDALL, consulting engineer American Lead Corporation, with headquarters at 120 Liberty street, New York, is examining the Bullychoop mines, Shasta county, Cal.

IT is stated on good authority that W. J. Chalmers, who was until September 7th last the vice-president and treasurer, and also a director of Allis-Chalmers Co. since its organization, has resigned as director, and that he has sold all the shares of stock held by him, so that he is therefore no longer connected with the company.

W. F. WAGNER, general manager Wm. Jessop & Sons, Limited, in the United States, together with E. L. Hand, who represents them in Philadelphia; E. W. Salisbury of Warren Salisbury & Nightingale, their agents in Providence; R. B. Ridgley, their representative in Detroit, together with F. W. Babcock of the Standard Oil Co., resident of Providence, sailed on the Cunard steamer Caronia, October 3d, to attend the 282nd annual gathering of the Cutlers Co., at their banquet in Sheffield on October 12th. On this occasion S. J. Robinson, managing director of Wm. Jessop & Sons, Limited, will be installed as Master Cutler, a position of great honor and social and commercial influence.

Commercial Paragraphs.

THE Chas. C. Moore Co. of San Francisco, Cal., have a contract from the Tonopah M. Co. for a 100-stamp mill to be operated by electric power.

Trade Treatises.

A neat booklet on "Coal Mining Machinery," from the Ingersoll-Sergeant Drill Co. of 11 Broadway, New York City, illustrates and briefly describes the "New Ingersoll" and the "Radialaxe" coal cutters, the "Haeseler"

coal boring machine, the "Little Jap" hammer drill and air compressors.

Catalogue "C" of the C. H. Shaw Pneumatic Tool Co., 35th and Wazee Sts., Denver, Colo., describes the Shaw Eclipse air hammer rock drill and the Eclipse Pneumatic hammers. It contains valuable information on operating the drills, besides full description of their construction.

Books Received.

"Proceedings of the American Institute of Electrical Engineers," Vol. XXIV, No. 9, September, 1905.

"Preliminary List of Deep Borings in the United States," by N. H. Darton, forms Water Supply and Irrigation Paper No. 149 of the United States Geological Survey. It is arranged according to States and counties, and reports all wells and borings more than 400 feet in depth.

"Second Year Chemistry," by Edward Hart, a hand book for laboratory and class work in qualitative analysis of the commoner metals and non-metals, with a brief introduction to methods of quantitative work. This is an elementary treatise containing little to differentiate it from scores of similar manuals already written. It is published by the Chemical Publishing Co. of Easton, Pa., for $1.25, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS on receipt of price.

As extracts from "Mineral Resources of the United States for 1904," the United States Geological Survey has issued "Potassium Salts," by W. M. Courtis, containing a short sketch of the German potassium salts industry, and a discussion of the possibilities of finding potassium salts in the United States; "The Production of Aluminum and Bauxite in 1904," and "The Production of Cement in 1904," by L. L. Kimball, with notes on average characteristic tests of cement in the United States.

An ever-increasing demand for timeliness and for the concentration of information has been met in "Pyrite Smelting," edited by T. A. Rickard, from a series of discussions in the Engineering & Mining Journal. The volume is a revised reprint of these discussions thus brought together in more convenient form than afforded by the files of a journal. The contributions are essentially answers to a series of ten pertinent questions on the subject, submitted to a number of prominent metallurgists. These questions were: 1. What types of ore are suited to pyrite smelting? 2. Is hot blast advisable? 3. To what extent can fuel be eliminated? 4. What amount of copper is required for the collection of the precious metals? 5. What percentage of lime is necessary to a clean slag? 6. What percentage of zinc in the charge can be treated profitably? 7. What is the degree of sulphurization attainable? 8. What are the possibilities as to capacity of furnace? 9. What are the limitations of the process? 10. What is the relative economy as compared with rival processes? These questions were answered by L. S. Austin, E. P. Mathewson, Walter E. Koch, S. E. Bretherton, F. R. Carpenter, W. R. Ingalls, R. L. Lloyd, W. T. Keith, Herbert Lang, L. D. Godshall, William A. Heywood, G. F. Beardsley, Thomas T. Read, Henry W. Edwards, Charles H. Fulton, P. Wiseman, W. H. Nutting, W. H. Freeland, E. A. Weinberg, Amado Buen, Edward D. Peters, Hiram W. Hixon, S. Dillon-Mills, Lewis T. Wright, Charles S. Palmer, P. L. Marston, J. Parke Channing, W. Randolph Van Liew, George W. Metcalfe, James W. Neill and C. H. Doolittle. These contributions give the views of each smelterman on the questions submitted, and also on many other points of practical smelter running. The subject is important, and this book contains the latest and best information relative to it. It is eminently practical. It is current, not ancient, history, and being a live subject it is necessarily incomplete. The book is for sale by the MINING AND SCIENTIFIC PRESS for $2.

The Bimonthly Bulletin of the American Institute of Mining Engineers contains a number of technical papers. These may be roughly classified as relating to geology, metallurgy of gold and silver, iron treatment, coal mining, and miscellaneous subjects. Of the first class, J. E. Spurr's "Genetic Relations of Western Nevada Ores" has already appeared as reports of the United States Geological Survey. In "The Magmatic Origin of Vein Forming Waters in Southeastern Alaska" A. C. Spencer correlates the geology of Alaska with that of California, and discusses a theory of the vein formation that may be of value if borne out by further field work. Edward Hake, in discussing H. M. Chance's paper on the "Taviche Mining District," near Ocotlan, Oaxaca, Mexico, presents additional detail regarding the geology of this district. The precious metal metallurgy is confined to a theoretical paper by Herman Poole on "Kernal Roasting" and a discussion by T. K. Rose on H. O. Hofman's paper on "The Effect of Silver on the Chlorination and Bromination of Gold." J. E. Johnson contributes a paper, "Notes on the Physical Action of the Blast Furnace," H. R. Hall "The Use of a High Percentage of Fine Ores in a Charcoal Blast Furnace." Mansfield Merriam discusses H. H. Campbell's paper on "The Influence of Carbon, Phosphorus, Manganese and Sulphur on the Tensile Strength of Open Hearth Steel," and a number discuss J. P. Roe's paper on "The Manufacture and Characteristics of Wrought Iron." "The Classification of Coals" is discussed by M. R. Campbell, who concludes that carbon-hydrogen ratios form the most satisfactory basis for coal classification, being better than fuel ratios, calorific value or carbon. He also treats on "The Commercial Value of Coal Mine Sampling," giving some practical points as to how it should be done. S. B. Christy presents a paper on "Present Problems in the Training of Mining Engineers," upon which comment has already been made in these columns. "Geological Mine Maps and Sections" are shown by D. W. Brunton, who proposes that more use be made of the map in mining work. Biographical notices are given of Sir Lowthian Bell and B. W. Frazier Jr.

Latest Market Reports.

SAN FRANCISCO, October 13, 1905.

METALS

SILVER.—Per oz., Troy: London, 28⅜d (standard ounce, 925 fine); New York, bar silver, 61⅛c, refined (1000 fine); San Francisco, 61⅛c; Mexican dollars, 48c, San Francisco; 47c, New York.

COPPER.—New York: Standard, $16.37½; Lake, $16.37½@16.75; Electrolytic, $16.62½; Casting, $16.12½@16.37½. San Francisco: $16.50. Mill copper plates, $17.50; bars, 18@24c. London: £71 5s spot per ton.

Several weeks ago the report was sent out that a bear raid would be made, not only on copper mining stocks, but also on the metal. It was pointed out in these columns at that time that any attempt to depress the price of copper would have only temporary effect, if any at all, as the industrial condition of the country, the increasing demand for the metal, and the fact that the production barely keeps pace with the demand, all were against a slump in prices. The statement made at that time—September 9—has been proven to be correct. Copper is stronger to-day than at that time. The monthly reports of the large companies show no material increase, if any at all, in production, while the demand still holds good for the various grades of metal.

Following are the figures of German consumption of foreign copper for the months from January to August, 1905, as compared with the same period of time for 1904 and 1903:

	1905.	1904	1903.
Imports, tons	73,234	74,482	56,094
Exports, tons	8,254	5,610	6,964
Consumption, tons	64,980	68,872	49,130

LEAD.—New York, $4.95; St. Louis, $4.90; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £14 12s 6d ℔ long ton.

SPELTER.—New York, $6.10; St. Louis, $5.75; London, £28 ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $32.00@32.35; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔ lb., 40c. London, £147 2s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.25; gray forge, $14.75; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$24.00; open hearth billets, $23.00@$25.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10¼c; 10 oz. stearic, 40s, 9¼c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¾@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c; Lucol oil, boiled, bbl., 51c; cs., 56c; raw-bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 57½c; cs., 62½c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 57c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 350 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING SEPTEMBER 26, 1905.

800,534.—TELEPHONES—Andriano & Herbstritt, San Francisco.
800,260.—HORSE WEIGHT—T. Hellstedt, San Francisco.
800,539.—DRAFT EQUALIZER—M. H. Blanchard, Davisville, Cal.
800,356.—PUMPS—Briggs & Briggs, Yountville, Cal.
800,136.—LAWN SPRINKLER—B. Brown, Longbeach, Cal.
800,357.—VEHICLE TIRE—F. Burnham, Fresno, Cal.
800,263.—LOG RAFT—J. A. Campbell, Seattle, Wash.
800,264.—LOG CRADLE—J. A. Campbell, Seattle, Wash.
800,437.—RAIL CHAIR—R. H. Fray, Traver, Cal.
800,371.—FRUIT PICKER'S SACK—E. Harter, Riverside, Cal.
800,298.—FILTER—C. Heilrath, Sacramento, Cal.
800,374.—FOLDING BED—W. C. James, Los Angeles, Cal.
800,376.—AMALGAMATOR—H. L. Lightner, San Francisco.
800,379.—CONCENTRATOR—H. L. Lightner, San Francisco.
800,384.—BALING PRESS—C. L. Miller, Berkeley, Cal.
800 592.—CONNECTING ROD—Phillips & Walkley, Los Angeles, Cal.
800,398.—SPLASH PLATE—G. C. Richards, Oakland, Cal.
800 399.—PUMP HEAD—G C. Richards, Oakland, Cal.
800,509.—TIME BEATER—J P. Stanton, San Francisco.
800,335.—GATE—J. F. Stirton, Monroe, Wash.
800,518.—TROUSERS' STRETCHER—W. J. Wardwell, Redondo, Cal
800,252.—CONCRETE MIXER—G. W. Weller, Baker City, Or.
800,349.—TRIPLE VALVE CLAMP—O. L. Wright, Richmond, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

TRIPLE VALVE CLAMPS.—No. 800,349. Sept. 26, 1905. Ovid L. Wright, Richmond, Cal. This invention relates to a device which is especially designed for holding the triple valve of an air brake mechanism in place upon the inspecting and repair table. It is designed to provide a rapid, convenient, and secure holder for peculiarly shaped valve casings while the inspection or repairs are going on. It comprises a work bench or table having upon one side an upwardly projecting standard, said standard having a gasket against which a removed valve casing is fitted and having openings for pipe connections, a bent lever fulcrumed to the table standard, having one end forked to straddle the valve casing and having the opposite end extended over the table, and an air cylinder and piston for operating the lever.

DREDGER BUCKET.—No. 800,936. Oct. 3. 1905. T. O'Leary, Oakland, Cal., one-half assigned to R. S. Moore of San Francisco, Cal. The object of this invention is to provide certain improvements in dredger buckets and the connections thereof whereby the minimum of wear is effected with convenient and easy adjustment and compensation for such wear as may occur. It consists of dredger buckets having segmental shells, longitudinally disposed extensions upon one side and detachable reversible links secured thereto and forming coupling connections for the buckets; also means for relieving and distributing strains, said means comprising lips extending outwardly from one side, and links extending longitudinally upon each side and riveted to said lips, and other details of construction.

NAIL.—No. 800,912. Oct. 3, 1905. M. Hermelink, San Francisco, Cal. The object of this invention is to so construct the nail as to insure its driving properly into both the parts which are to be united, and this is effected by a novel construction of the point of the nail. The invention comprises a nail having a head at one end, a diagonally grooved channel extending from the edge upon one side of the entering end to the opposite side of the nail shank, said channel having transverse corrugations.

ANTISEPTIC TELEPHONE MOUTHPIECE.—No. 800,907. Oct. 3, 1905. W. B. Curtis, San Francisco, Cal. The object of this invention is to provide a simple, attractive, cheap and practical antiseptic mouthpiece or attachment therefor which will possess all the desired germ-destroying qualities without detracting from the appearance or the efficiency of the telephone. It consists of a telephone mouthpiece having means of attachment at one end to a telephone stand or the like, and provided with an annular flange proximate to said end, an absorbent filler inclosed by said flange, said mouthpiece having a perforated diaphragm and having ports connecting the filler chamber with a space upon each side of the diaphragm, and other details of construction.

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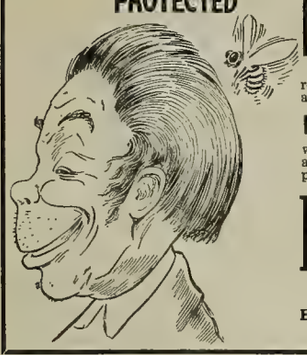

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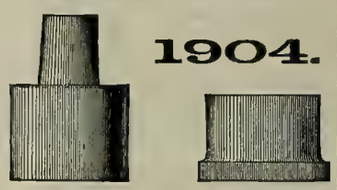

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MINING AND SCIENTIFIC PRESS.

Whole No. 2361.—VOLUME XCI. Number 17. SAN FRANCISCO, CAL., SATURDAY, OCTOBER 21, 1905. THREE DOLLARS PER ANNUM Single Copies, Ten Cents.

The Disadvantages of Prejudice.

In some old mining districts, new strikes are announced in unexpected places, the find in almost every instance having been made by those who were comparative strangers to the locality and unprejudiced as to formation and other geological conditions. Recently the Queen of the Hills Company, operating in Whistler gulch, near Deadwood, S. D., made a strike in a new shaft which promises important development. The company had previously spent considerable money in the vicinity searching for a payable ore body, but until this new strike was made had found little of consequence.

Whistler gulch is a tributary of the Whitewood creek from the eastward and on the hillsides outcrop both the old steeply dipping crystalline schists of the Algonkian, and the overlying nearly horizontal formation of the Cambrian. Both formations are intruded by dikes, and there is every geological evidence there of the possibility of ore in the rocks of both ages, but until now there seems to have been little inducement to prospect for ores in the immediate vicinity of Deadwood. On the east side of the town and within its corporate limits, the geological conditions are most favorable, and the little prospecting done there years ago proved the existence of ore, but it was not found in large quantities, and development work ceased. There is every probability that intelligent prospecting on the ridge between the city of Deadwood and Spruce gulch, a mile to the eastward, would result in the discovery of payable ore, but no one having made a valuable discovery in that immediate vicinity, the inducement to try seems small. The great mass of pyritic iron-copper ore in the Whizzers mine, half a mile above Deadwood, remained unknown for years until discovered through the intelligent and energetic prospecting of the present owner of that property.

Deadwood is not alone in this. It remained for the years 1904–'05 to chronicle the discovery of some of the most phenomenal ore bodies Leadville, Colo., has ever known, after nearly thirty years of the most active kind of mining operation in that district.

Miners the world over are too much influenced by tradition and the results of the past. Their prejudices are strong and their views are not easily changed, and generally they require some strong incentive to break away from cherished theories and practices. This accounts for some remarkable discoveries made by the so-called "tenderfeet," who, untrammelled by fallacious ideas of geology, or as to the various kinds of rocks that the miner considers favorable or unfavorable for mineral, tries everything that comes in his way. He innocently picks up flint from the limestone and finds on having it assayed that it is rich in gold, as was the case in the Ragged Top district in the Black Hills.

It was only in a moment of desperation that Stratton, of the Independence mine at Cripple Creek, Colo., had some samples of rotten granite assayed, and found that it was shipping ore. He had tried everything else in the vicinity without success, and reasoned against his own belief that possibly the granite dike might be gold-bearing.

From Goldfield, in southern Nevada, now comes soft, decayed, sandy porphyry, bearing hardly a trace of free quartz, and yet some of this unpromising appearing rock carries several hundred dollars per ton. A sandstone, apparently a volcanic tuff, is also rich in gold. Rhyolite, dense and silicified, is rich in gold in some claims. A fine grained, flint-like quartz assays into the hundreds of dollars. Every day produces new evidence in that district that the miners' axiom, "Gold is where you find it," is one which should be constantly in mind when prospecting.

Waverly, Nova Scotia, Looking Southwest. Low Area in Foreground is a Fault Valley. (See Page 273.)

Government Building, Halifax, Nova Scotia. (See Page 273.)

NEWFOUNDLAND has at last developed a payable gold mine. Archæan rocks are chiefly found in that region and considerable prospecting has been done on the island, but until recently without satisfactory result. The Goldenville Mining Company are the owners of the newly developed mine, which is at Mings, on that island.

Oxen Hauling Timber in Nova Scotia. (See Page 273.)

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Success in Mine Promotion.

Probably not less than nine out of ten mines, which are financed by the public, are placed on the market through the efforts of promoters. As a result, the promoter has come to be looked upon as being as essential to a successful flotation as the capitalist himself. It is rarely that the owner of a mine, no matter what its stage of development, successfully places his mine before individuals, or the general public, without assistance. The promoter seems almost inevitable. In some instances the promoter seeks a mine he may offer for sale direct, or that may be incorporated and its stock placed on the market, but as often the mine owner voluntarily seeks the aid of some one experienced in the art of raising the money necessary to develop and equip mining properties. These two, working together, form a strong combination, and the usual result is, if the property possesses merit, a successful flotation. Not infrequently the flotation is successful when the property has no evident value. In the latter case success—if raising money only can be considered as success—is due altogether to the pursuasiveness of the descriptive powers of the promoter. He pictures the possibilities of the venture in such glowing terms, and his assurances are so earnest and convincing, that the uninitiated investor finds himself unable to resist the desire to take a chance. Occasionally ventures of this class turn out satisfactorily, more often they do not. Some mines are floated with comparative ease, largely on the chances of encountering the ore bodies developed in neighboring property. It is not an uncommon thing for shoots of ore to pass into neighboring ground on their downward trend, and speculative promotions based on a contingency of this kind may be classed as legitimate risks. All undeveloped mines are risks, no matter what their surface showing may be. It is only the mine having large development with abundance of payable ore in sight that may be looked upon as possessing no hazard whatever. Ordinarily, however, the valuation placed on property of this description is so high that the element of risk is still great to the prospective investor. As soon as a mine is recognized as having passed the stage of speculative value, the demand for its stock is so great that the market value quickly becomes inflated, in which case the investor may about as well put his money in a less positive proposition, while standing a chance to realize handsomely on possible developments.

Where a promoter desires to make a business of raising money for mine development and equipment, he must become a conservative, for in this way only can he protect himself from the result of unfortunate investments. The individual or company which engages in the business of mine promotion can attain the greatest success by a careful and discriminating selection of the best properties from among the many offered. Having secured by option or purchase that which seems to afford the greatest security for investment, the property is vigorously developed, the extent and character of its ore bodies determined, and the proper machinery for the treatment of the ores installed. Success usually follows this conservative method of operation and the prospect develops into a "going concern," paying a monthly net profit; and if it possesses sufficient reserves for the future, the property can be sold at a large advance on the capital invested. The individual or firm who can do this is constantly besieged by would-be investors for mines. Having thus established a reputation for reliability, and more particularly for success, it will be found difficult to supply the demand for good mines. This was the policy pursued by a large firm of mine promoters, and with almost phenomenal success. These successes were numerous, and the failures—they were charged to "profit and loss," for they never floated a mine on the public which proved an absolute failure.

Here lies the road to the highest success in mine promotion, but the lack of capital and haste to realize on any venture undertaken result in the failure of a large number of undertakings, which possibly may have become successes were less haste made to make a turn. In this is not considered that class of promotions commonly known as "wild cats," for, as a rule, the promotions of this latter class have nothing whatever to recommend them other than the promoter—generally under such circumstances a questionable endorsement.

HOW often one sees in connection with what are evidently exaggerated statements concerning mines of no great development, that "Mr. Blank, the noted mining engineer, has made the report and on its accuracy is willing to stake his professional reputation," etc. Usually the "well-known mining engineer" is neither well known nor an engineer, and has no reputation to lose. Conservative and experienced engineers are not so ready to stake their reputations upon unknown conditions in mines, for a long experience with the uncertainties of ore deposits, and the vagaries of geology, has taught them caution, and mine reports which contain these reckless risks of reputation at the expense of other people's money may usually be looked upon with some suspicion, for the chances are that the reputation at stake is but little better, if as good, as the mine itself.

A bulletin of the United States Geological Survey, on the production of aluminum and bauxite in the United States in 1904, says that aluminum is being more widely used each year for other purposes than as electrical conductors, and that usually from two to five ounces of the metal are employed in making each ton of open-hearth steel, and from six to eight ounces per ton of Bessemer steel, the object in adding the aluminum being to reduce the slag or oxide formed during the pouring of the molten steel, and had every ton of steel manufactured in 1904 been subjected to this treatment, there would have been consumed about 5,000,000 pounds of aluminum. A great many other uses are being found for the metal, and its production is likely to increase, if suitable material can be found from which it can be made at not too great a cost.

The Unsophisticated Director.

One of the most serious drawbacks to the proper and successful management of many mining properties is undoubtedly the lack of knowledge of the business on the part of the directors who usually control the destinies of the enterprise. Men are selected for the responsible position of director for various reasons, one of them being that his name may give good standing to the concern when it is desired to sell stock. Another, and more legitimate reason, is that he is chosen to represent investors, who, having every confidence in his integrity and business experience, feel that their interests will be protected. In other cases, the buyer of a large block of stock stipulates that in consideration of his election as a director he will take the stock, and the trade is made. There is always this desire to control, natural enough, too, but the men who thus seek to control should have some knowledge of mining and metallurgy, or they are of no particular value in the directorate, while their presence there may operate to the disadvantage of the enterprise. A managing director of a European mining company visited the company's property in the West some years since, and while at the mine asked the most absurd questions, showing that he knew nothing of even the rudiments of mining, and yet this concern was placed wholly in his hands, and as may be expected under such circumstances, it was a dismal failure. He had been responsible for the purchase of the property in the first place, and, too late, discovered there was not enough ore available to keep the mill employed. In another instance, the president of a mining company, and also a director, visited his mine and remained a week or more, a close observer of everything. One day he said to the superintendent, "I see you don't hoist the same amount of ore every day—sometimes 100 tons, and sometimes over 200 tons. How much can that engine hoist in 24 hours?" On being informed that it could easily handle 1000 tons daily, he gave orders to hoist no less than that amount as long as the engine could do it, and when it failed the company would supply another. These things seem amusing, but they have another than a humorous side. If men of this stamp have the business sagacity and experience usually attributed to them, they should realize that they know nothing about the business, and should be contented to learn before presuming to dictate the policy of the management. Mining is a business requiring years of study and experience. It cannot be learned in a day any more than can the law or medicine, or steel making, or any other great business or profession. It has more phases, and more changing features, than any other business in the world. The condition of the mine changes daily; the ore changes more or less from level to level; the metallurgical methods usually undergo many changes during the life of the mine, and the whole proposition presents a multitude of ever shifting conditions which only knowledge, gained by experience, can master; and yet the unsophisticated director very frequently is a dominating factor in it all.

THE "lateral secretion" theory of ore deposition still has its advocates—mostly among the older members of the mining fraternity. One strong argument in support of this theory is that the evidence of the mineral in the vein having been derived from the adjacent walls is in the sulphide minerals found in the wall rocks. Those who favor the theory which attributes the filling of veins, zones and other forms of ore deposit to ascending solutions, argue that the sulphide minerals in the wall rocks were deposited therein from the same solutions as those which produced the ore deposit itself. Assays made of country rock in a mineralized region usually give small returns in the precious metals, as well as often in iron, copper, zinc and lead sulphides, and in some instances these values increase as the walls of the deposit are approached. The advocates of both theories point to the same deposits to prove the soundness of their judgment.

Mining Laws in Alaska.

The extensive location of mining ground in groups of claims in Alaska has been the cause of much litigation up to the present time. An important question which arose in the progress of this litigation was: "What constitutes a valid discovery?" Another matter which came up for judicial determination was: "Is a single discovery sufficient to base a group-claim of eight locations upon?" Some of the locations were made upon the discovery of fine colors of gold in the surface alluvial and moss, and all of the group locations, as far as known, were predicated upon a single discovery. The Alaska court instructed the jury that a discovery should be of such a nature as to justify a reasonable man to perform work upon the claim, and also instructed them that a single discovery on a tract of 160 acres was insufficient—that a discovery must be made on each of the 20-acre tracts constituting the group claim. Concerning this important matter, "Lindley on Mines" says, Sec. 438: "Where more than one person (not exceeding eight) participate, an area equivalent to twenty acres to each is permitted; but they locate the whole area jointly, becoming tenants in common thereof, and are not, according to the practice, required to each locate a particular specified 20-acre tract. Such being the case, the question has arisen as to whether one discovery within the limits of the entire area appropriated by an association of persons would be sufficient upon which to base a location as to such area, or whether a discovery is necessary upon each 20-acre tract, or unit of location. In case of lode locations, where an appropriation in excess of the statutory limit of a single location is desired, a separate discovery and separate location are necessary.

"In applying the law to this class of cases (placers), the land department follows the rule that only one discovery is required where a location is made by an association of persons; this, however, has not always been the ruling of the department in such cases; but it is now the settled law, so far as the department is concerned, and there is little reason to apprehend any change. The Supreme Court of Montana was committed to this view even before the land department reversed its older rulings. * * * * * The department holds that one discovery is a sufficient prima facie showing of the character of the entire tract; but it is not conclusive, and the character of the remainder of the tract may be investigated. The wisdom of this rule is peculiarly manifest when we consider the difficulties which would otherwise be found in the locating of deep placers and petroleum lands. * * * * * Ground selected as placer must be mineral land, non-mineral surface not being permitted as an incident to a placer claim."

The above is in accordance with the rulings of the land department at Washington and is not a Supreme Court decision. The last paragraph is important in that it does not discriminate between ordinary placers, where the entire mass of material from surface consists of "wash"—that is, the sand, gravel, cobbles and boulders, characteristic of ordinary placer deposits, and those not having these typical features. As gold is found in superficial detritus that is not at all rounded, and yet where the gold has been derived directly from veins or pockets in the rocks of the vicinity, and situated at some higher point, and as most placer deposits have a covering of loam and soil, on which is usually a growth of vegetation, surface discovery is not always possible. In some instances several feet of this non-auriferous material must be passed through before a color of gold can be found. The deep ancient rivers of California are in many places buried beneath lava flows sometimes 1500 feet or more. No surface discovery is possible in such cases. The law, while applying to the majority of instances, makes no provision for these particular and unusual ones.

The question has also arisen in Alaska: "What constitutes a sufficient discovery?" This is directly in line with the foregoing and formed an important feature of the suits recently tried in the far North. The Alaska court, like those of the United States, has failed to arbitrarily fix this point, contenting itself with saying practically that the amount of mineral found at discovery should be sufficient to justify a reasonable man in following it up by development work. The personal equation is here a very large one. One man may place a very different estimate on the value of his discovery from that made by another person at the same place. One may see in the discovery so little evidence of commercial success that he passes on and seeks a more promising place, while another man is perfectly satisfied to take his chances with the discovery and proceeds to locate according to law. The courts have never held that mineral in paying quantities must be found in order to make a valid location. Such a theory, if carried out, would make most mining locations legally impossible. In this matter Judge Hawley said: "It would prohibit a miner from making any valid location until he had fully demonstrated that the vein or lode of quartz or other rock in place bearing gold or silver, which he had discovered, would pay all the expenses of removing, extracting, crushing and reducing the ore and leave a profit to the owner. If this view should be sustained, it would lead to absurd, injurious and unjust results."

The principal difficulty, apparently, in Alaska has been that the locators of large tracts have failed to work their claims, beyond the making of a discovery and setting their stakes or monuments, holding the ground evidently for speculative purposes. Those arriving later, and, finding long stretches of the creeks located and no work in progress, naturally set new stakes and began mining operations in earnest, which resulted in much litigation, the most of which still remains unsettled. The Federal mining laws are such that these original locators may legally do just what has been done in Alaska, thus retarding the development of the country. What the mining districts of Alaska should do to remedy this evil is to pass local laws or rules requiring a stipulated amount of work to be done on each claim as a part of the act of location. The several States have the legal right to make legislation of this character, and the several mining districts of the States and of Alaska may do the same, and so long as these laws or rules are within the bounds of reasonable requirement, there is little doubt the courts would sustain the rules of a properly organized mining district.

FOR fifteen years the once noted Long and Derry mine, on Long and Derry hill, at Leadville, Colo., has been closed by litigation. The difficulties have been settled and the property is once more to go into active operation. Considering the losses to both sides in lawsuits of this kind, and they are not at all uncommon, it seems strange that the contestants do not more frequently meet on a common ground and compromise their differences. In most instances such course would be to the advantage of both sides to the controversy, but compromise is seldom a feature of these conflicts. Nearly every important mining district of the West has seen the effect of almost interminable litigation, and in many cases the conditions were so perplexing that it made impartial decision of the questions involved nearly impossible. The natural result has been the creation of a vast amount of legal precedent, not in the statutes, and commonly known as judicial legislation. The differences of opinion between noted engineers when on the witness stand in these cases was naively summarized by a prominent engineer as "probably representing the large financial interests at stake." In at least one mining district of the Southwest the owners of adjoining large and valuable properties have forestalled the expenses and difficulties arising from the extralateral right by drawing arbitrary lines between their properties, neither claiming the right to follow their ore bodies beyond the boundaries of their claims.

IN the concentration of ores of any particular kind the same methods cannot always be arbitrarily pursued with success at different mines. Take, for instance, a quartzose gold ore, in which there is but 1% to 3% sulphides. These are comparatively rich and must be recovered by concentration, after having been reduced to pulp by stamping or otherwise. These sulphides are not always similar in different mines, and there is often a vast difference in them from different parts of the same mine. Some sulphides crush in granules and are saved without great difficulty. Other kinds break up in thin, flaky plates, and these latter—though of approximately the same specific gravity—are far more difficult to handle on concentrating machines unless hydraulic classification be first resorted to. It is a physical impossibility to separate from the gangue both granular and micaceous sulphides by a single operation on any kind of a concentrating machine. The mechanical movements, grade of machine and volume of water which will permit a saving of one will result in the loss of the other. The hydraulic classifier effects a separation of these various kinds of sulphides, and the subsequent treatment is greatly simplified. The classification may be carried out to any desired length, by arranging the classifiers in series, the products from the several classifiers going to different machines. The result is usually satisfactory, if the plant is properly designed and in charge of an experienced operator.

THAT the design of stamp and concentrating mills should, by this time, have been reduced to an exact science, all will doubtless agree, but judging from the constructive features of a large number of so-called modern mills it has not, as yet, reached this happy stage, or, if it has, the average constructing engineer or millwright has not become aware of the fact. One would naturally think that after more than half a century of experience in every corner of the world where mining is done that certain underlying principles in mill design would have long since been recognized and adopted generally as the best practice, but such appears not to be the case. The same kind of mistakes are daily made that were made thirty years ago. The average mill builder seems to pride himself upon the individuality of his own ideas, and seeks no further than the horizon of his own experience for suggestions as to what is best for each individual case. The result is that one must seek far to find the model mill. Variations in the character of ores require that they be subjected to somewhat different treatment, but in the mechanical design, the handling of material, etc., there continues to be a great divergence of opinion as to what is the best practice. Some mills are far superior to others in this respect, but one has not to look far in the mining regions to find monuments of stupidity that are astonishing.

THE gold fields of Nova Scotia have attracted more or less attention for a half century past, and a great deal of gold has been produced from the veins of that region, much of it in a primitive manner. The geology of that gold region is particularly interesting and has been the subject of professional investigation by a number of geologists and engineers. The latest to give attention to these fields is T. A. Rickard, who elsewhere herein begins a series of papers descriptive of that section. In the earlier days of mining in Nova Scotia a great deal of gold was taken from the rich small veins by men having no better tools than hammers and rocks. The quartz, rich in free coarse gold, was broken off from the ledge and pounded with a hammer on hard boulders, thus freeing the gold from the matrix.

THE possibilities of electrical power development of Victoria falls on the Zambesi river, in South Africa, continue to attract attention, and a commission of engineers has been appointed to visit the great plants at Niagara Falls to study the methods and installations there with a view to duplicating these methods of application. The falls of the Zambesi are about 400 feet in height, and a large volume of water is passing in the driest season, but the amount in the wet season is many times greater than that at Niagara. The power, consequently, which may be developed there is tremendous, and long distance installations are possible, which may equal, if not surpass, any similar installations in either Europe or America.

THE province of Ontario, Canada, contemplates a revision of its mining laws at the coming legislative session, and it has been suggested by some of the leading mining men of that province that a stipulated working condition should be required of all locators of mining lands, and that it be strictly enforced, while idle mining property be taxed heavily. It is thought laws of this kind, if passed, will have a tendency to develop the mineral resources of the province more rapidly than under the existing laws.

CONCENTRATES.

A SALT, in chemistry, is any acid in which one or more atoms of hydrogen have been replaced by metallic atoms or basic radicals.

TIN occurs chiefly as the oxide (cassiterite) and as the sulphide (stannite). It also occurs in small amount associated and in combination with other minerals, such as copper.

THE amount of water usually fed to a 5-stamp, rapid drop battery is about 1.5 cubic feet per minute. In some mills more than this amount is used and in others less, depending on the character of the ore.

THE air pressure employed in copper blast furnaces varies from 36 to 40 ounces at the blowers and from 30 to 34 ounces at the furnaces, the difference being due to frictional loss in the pipes and furnace connections.

FLAT HOISTING ROPES possess one advantage over round ropes of having every strand visible, and broken wires or other defects are therefore more easily detected in flat than in round ropes, but round ropes are preferable in other respects.

MATTE SMELTING is defined by Lang as "the smelting of natural sulphides, with the design of collecting their valuable parts in a quantity of artificial sulphides." There are various kinds of matte—iron matte, copper matte, lead matte, silver matte, etc.

ALL mines producing black or gray sands should be tested for the minerals they may possibly contain. Streams heading or running through basaltic rocks or dark colored greenstones, serpentine, and other basic rocks will contain an unusual amount of magnetite, but these same sands may also contain chromic iron, and more rare and valuable minerals.

THE "market for burros" in any particular locality is a matter upon which no exact information can be given. On general principles, it may be assumed that in a district where much prospecting is in progress there would be a demand for these useful animals, particularly on the desert, where they can subsist on less than almost any other beast of burden. Southern Nevada should afford at present a good field for the burro stockman.

STATISTICAL information concerning the yield of the Eureka mine at Sutter creek, Cal., are not available, but it is known that over 30,000 tons treated about 1868 returned gold at the rate of about $20 per ton. The cost of mining at that time was $4 to $5.25, and the cost of milling $2.15 per ton. The average pulp assay was said to have been $27 per ton. The tailings, consequently, contained an average of $7 per ton. The total output of this mine is said to have been $18,000,000.

NEARLY all if not all of the ores of copper are derived by alteration from chalcopyrite, in a more or less direct manner. Chalcopyrite is the normal ore and, in deep mines producing sulphide ores only, chalcopyrite is practically the only copper-bearing mineral present. There is a great variety of copper-bearing minerals, including oxides, carbonates, silicates, sulphides, and more complex compounds of copper with lead, zinc, arsenic, iron, antimony, etc. With these latter it is not uncommon to also find gold and silver.

THE knowledge of the average cost of gold milling in California is not imformation of any particular usefulness, for at each mine the conditions and character of the ore vary more or less. On the Mother Lode, in El Dorado, Amador, Calaveras, Tuolumne and Mariposa counties the average cost is about 40 cents per ton. In the Grass Valley and Nevada City region and on the East Lode the expense is somewhat greater, in some instances reaching $1.50 owing to character of ore, character and scope of operations and local conditions.

SKIPS possess the advantage over cages of taking on the load immediately upon the arrival of the skip at the loading pocket, no waiting for the arrival of cars being necessary, as is not infrequently the case where cages are employed. On reaching the surface the skip dumps automatically into a bin provided for the purpose, and may be sent immediately back into the mine if desired, without intervention of workmen other than the engineer. This effects a saving of labor on the surface. At some mines the skips are loaded as well as dumped automatically.

THE solid residues of gummy and tarry appearance, which result from the evaporation of crude petroleum, are all soluble in alcohol and ether, but insoluble in water, therefore, any gummy substance found in the rocks, which is soluble in water, is not one of the products of the natural evaporation of petroleum. There are numerous organic substances which have much the same appearance as the residual products of evaporated petroleum, among them being the excretions of rhodents and other animals deposited in caves and in fissures in the rocks.

IT is better to have abundant plate surface in a gold mill. Too much is better than too little. The stream should be spread out in a thin sheet, with not too heavy a grade—just enough to keep the sands from banking upon the plate. Too much water should be avoided on the plates. If there are still considerable values in the coarse quartz grains, the rock should be crushed finer to free this gold.

A "DAP," in the mine timber framer's vocabulary, is the name given to the shallow cut made entirely across a shaft plate to receive the posts at the corners, and sometimes between the corners on the wall plates. In some cases where the posts are smaller than the plates, the daps, being cut the size of the posts, may be likened to shallow mortises. They are cut on both the upper and lower sides of the plates and serve to keep the posts from shifting.

IN sampling faces of ore in the oxidized zone of a gold mine, it not infrequently occurs that the fine material contains much more gold than the hard, firm ore. The sampler must guard against being salted by this kind of material. Usually the soft, fine portion of the ore disappears with shallow depth and only the hard, normal ore remains. It is necessary to get samples representing normal, and not enriched, conditions. Many who make mine examinations are deceived by the fine prospects found in the oxidized zone, being unable to duplicate them in the deeper part of the mine.

ELECTRO-MAGNETIC separators work continuously, and by an ingenious arrangement of electric currents of varying intensity on the several magnets, a differential separation of the various minerals in black sands from beaches and river beds can be effected. Among the minerals separated from the sands containing them are magnetite, chromite, zircons, hematite, monazite, garnets, quartz, etc. The non-magnetic minerals of comparatively low specific gravity can be easily separated from the heavier minerals by hydraulic classification and by wet concentration on various machines.

THE nearest railroad point to the Panamint range in Inyo county, Cal., and probably the best outfitting point for a prospector intending to go into Panamint, is Johannesburg, in Kern county, Cal. In former years many prospectors going to Panamint and Death Valley, Resting Springs, and that section of the desert, went in from the vicinity of Daggett, crossing the Mojave river at Fish Ponds, 4 miles above the present site of Daggett. From Daggett to Ballarat on the west side of Panamint range is nearly 100 miles. From Johannesburg to Ballarat is about 60 miles in a direct line, and somewhat farther by the Searles Borax Works.

SPLIT lagging is usually made of spruce, where obtainable, and is from 5 feet to 7 feet in length, depending on the place and the conditions under which it is used, and from 4 to 8 inches in width. The thickness is usually from 2½ to 3 inches, but for special purposes may be thicker. The cost of lagging varies greatly in the various mining districts, being about 4 to 6 cents each where the timber is abundant and easily obtainable, to 10 or 12 cents each in districts where no suitable lagging can be cut. Under some conditions lagging costs delivered at the mine much more than the highest figure here given, owing to the cost of transportation.

BISMUTH is a hard, brittle metal, with a reddish-white color and metallic luster. It looks much like antimony, but is readily distinguished from the latter by its reddish tinge of color. When heated to redness it burns with a bluish flame, forming the yellow oxide of bismuth. It is not very abundant in nature. The most important ores of bismuth are the oxide and sulphide. Its chief use is in pharmacy, and the metal must be free from impurities, particularly arsenic. Bismuth ores are roasted, after which various methods of treatment are employed, according to the ore. When arsenic is present the last traces of it may be removed by melting the metal with niter. Hydrochloric acid has little effect on metallic bismuth; strong sulphuric acid forms bismuth sulphate, and when treated with nitric acid bismuth nitrate results. Bismuth is not known to form any combinations with hydrogen. One of the producing mines of bismuth ores in quantity is the Ballard at Leadville, Colo. Bismuth ores also occur near Tucson, Ariz. Bismuth ores were reported from the vicinity of Ouray, Colo., some years since. Bismuth, or some of its ores, were reported found in placer sluices on Big Pine creek, Inyo county, Cal., some years since.

IN shaft sets it is not good practice to use corner posts of too small dimensions. Scantling (2x4-inch) would be of no practical usefulness. The posts should be equal in size to the timbers of the main set, if these are as small as 6x8, or smaller; but where larger timbers are used for wall plates (8x10 and larger), the posts should be nearly equal to the plates in cross-sectional area. In very heavy ground, or where there is likely to be any shifting of the timbers, then the posts should be the full size of the plates. No lagging is required at the corners where the posts are flush with the outside of the set. Daps should be cut in the wall plates at each corner of the shaft, about ½ inch deep, to receive the ends of the posts, both top and bottom. In instances where it is not necessary to use a "bridge" and to drive the lagging, a cleat 1½x1½ inch should be nailed to the outside of each of the wall plates, and on these the lagging may be set, extending upward to catch the lower half of the plate in the set above. After placing a lagging, it may be held in place by dropping a block of wood, or a rock between the lagging and the rock wall. In some places the wall will be found close enough to admit of using a wedge only, no other blocking being required. When figuring on sinking a shaft several hundred feet, it is a good idea to include a large amount of miscellaneous blocks, ends of planks, etc., the waste of lumber mills. These answer every purpose and take the place of the more expensive wall plate timbers, which otherwise must be used.

SALT is mineral and is subject to entry under the mining laws. The law of January 31, 1901, is as follows: "That all unoccupied lands of the United States containing salt springs, or deposits of salt in any form, and chiefly valuable therefor, are hereby declared to be subject to location and purchase under the provisions of the law relating to placer mining claims; providing that the same person shall not locate more than one claim hereunder." Prior to the passage of the above law in 1901, salt lands were classed by themselves, and were not subject to entry under any law operative throughout the public land States. Under the act of January 12, 1877, salt lands were disposed of at auction at not less than $1.25 per acre, or at private sale at the same minimum rate, in the event that the sales were not effected at auction. The operation of this act was confined to States which have had grants of salines and which have been fully satisfied. The act did not apply to the territories, nor to the States of Mississippi, Louisiana, California, Nevada, North and South Dakota, Montana, Washington, Idaho, Utah or Wyoming, none of which received grants of such lands. Under existing laws a salt claim consists of 20 acres and only one claim can be taken. Any citizen of the United States, male or female, adult or minor, is permitted to make such location.

THE several simple and primitive devices employed in separating gold from the auriferous sands or the pulverized rock containing it are the hornspoon, made from the horn of a cow or ox; the batea, of wood; the gold pan of the early California miner, and the shovel used for this purpose. In the use of either of these implements an operator, by practice, can become very expert. The hornspoon is used largely in Spanish American countries, and in the southwestern part of the United States where water is scarce. The batea is a flat, bowl-like piece of wood, circular in shape and having the appearance of a very flat cone, the slope being in a true plane from rim to center, and not curved as in crockery dishes. The gold pan is usually of sheet steel pressed from a single piece, having sides sloping at an angle of about 40°. The diameter at the top is about 17 inches, the depth 3 inches and the flat area of the bottom about 10 inches in diameter—these dimensions vary slightly. The pan is the most useful of these several implements, but the batea can also be used with good effect, and with speed in experienced hands. The knack of vanning successfully on a flat shovel is more difficult to acquire than dexterity with any of the other tools mentioned. Cornish concentration men in the tin districts become expert in the manipulation of the shovel, and can easily separate the cassiterite, copper sulphide and galena from each other by this means. The pan is so much more convenient for general hand concentrating operations that it has largely replaced all of the others in the United States.

WHEN in shaft sinking it is desired to use a crosshead there are two things absolutely essential to success and safety. First, a clip must be securely fastened to the hoisting rope, which will arrest the fall of the crosshead should it become jammed in the shaft when going down, and then, becoming released, falling. This clip must be placed so high above the bucket as to be out of reach of the men riding on the chime of the bucket or on the bail. Second, to insure further safety and to lessen the liability of the crosshead to become jammed when running in the guides, the frame should be made at least twice as high as the distance between the guides, and the shoes should be so constructed that the crosshead will have perfect freedom of motion and not be caught by any small projection or irregularity in the guides. Another matter too often neglected is the daily inspection of the guides, and of the crosshead itself, to see that they are in proper working condition. Serious accidents have occurred from failure to give the several matters here mentioned the necessary attention. The crosshead is so arranged as to move freely upon the rope down to the clip above mentioned. This can be made more secure by either turning the rope up the necessary distance above the eye to which the hook is attached, or by clamping to the hoisting rope a piece of old rope of the necessary length to take at least four clips. This, if secured at the proper height, will hold the crosshead. It is also a good idea to have a good sized cast iron washer resting on this obstruction to reduce the liability of the crosshead splitting and breaking should it fall. The crosshead being free to move when the bottom of the guides are reached, blocks placed there will hold the crosshead while the bucket continues to the bottom of the shaft. On hoisting, the clip on the rope picks up the crosshead, and the swaying of the bucket is reduced to a minimum. The blocks at the lower end of the guides should be separate from the guides, being merely pieces of timber larger than the guides themselves, spiked to the last set of timbers.

In Nova Scotia.—I.

Written for the MINING AND SCIENTIFIC PRESS by T. A. RICKARD.

Any one who is told to "go to Halifax" is apt to regard such consignment as anything but kindly. I found it far otherwise. Whence then comes this curious saying? It appears that in the days of the American Revolution, when many New Englanders remained loyal to the old country, there was a migration of families across the line into Canada. Many of these went to Nova Scotia, by way of the port of Halifax. Any American not whole-hearted in the cause of liberty was apt to be invited to follow the loyalists and get out of the country; it was meant as bitter sarcasm to be told to "go to Halifax." But all that is changed now, the American patriot and the loyal Britisher alike followed the call of their manhood and became the founders of progressive communities. Halifax has lost its stinging suggestiveness and we know it as a picturesque military and naval station, a charming city, and the gateway of a continent.

It may be said of Halifax that no other great seaport has gold mines so near to it.* Within 10 to 15 miles are the goldfields of Montague and Waverley. They were the first that I visited and they were the scene of the earliest activities. Just as Hargreaves made the discovery of gold in Australia (at Moonee Ponds on February 12, 1851), through the knowledge acquired concerning conditions in California, so also the first diggers in Nova Scotia were prompted to prospect. The farmers and fishermen on the east coast had heard of gold being found in California and Victoria within rocks resembling the slate and sandstone of Nova Scotia; they began to investigate the quartz which outcropped plentifully in their own vicinity. To John G. Pulsiver, of Musquodoboit, is given the renown of the first find; it was in the summer of 1860 and the locality was Mooseland, near Tangier Harbor. In the early reports of the Mines Department it is recorded how other finds were made successively in adjoining districts; they were made in the same way, by men who had become attracted in the search for gold by the stories blown across the world from the great diggings on the Pacific coast and in Australia, and who had become personally acquainted with the look of gold-bearing quartz by seeing it at Tangier and in the surrounding region.

From 1862 to 1904, inclusive, the total output of gold has amounted to 819,152 ounces, valued at $15,563,900, the average yield being 10 dwt. 3 gr. per ton. The largest return was 31,104 oz. in 1898; in 1904 it was only 14,279 oz., with an average yield of 4 dwt. 13 gr. per ton. It is evident, therefore, that at no time has the industry assumed proportions comparable to that of the greater goldfields of the world, and it is apparent that at this time there is less productive activity than in any year since the initial discoveries. Nevertheless, the stimulus given to the development of Nova Scotia by the men who have been, and are now, engaged in gold mining is not to be measured only by the statistics which I have quoted. The exploitation of the gold lodes has been overshadowed by that of the coal measures, which is destined to give Nova Scotia a high rank among industrial communities. The production of coal in 1904 was 5,247,135 tons, having a value of about $15,000,000 at the pit's mouth. This is only a beginning.

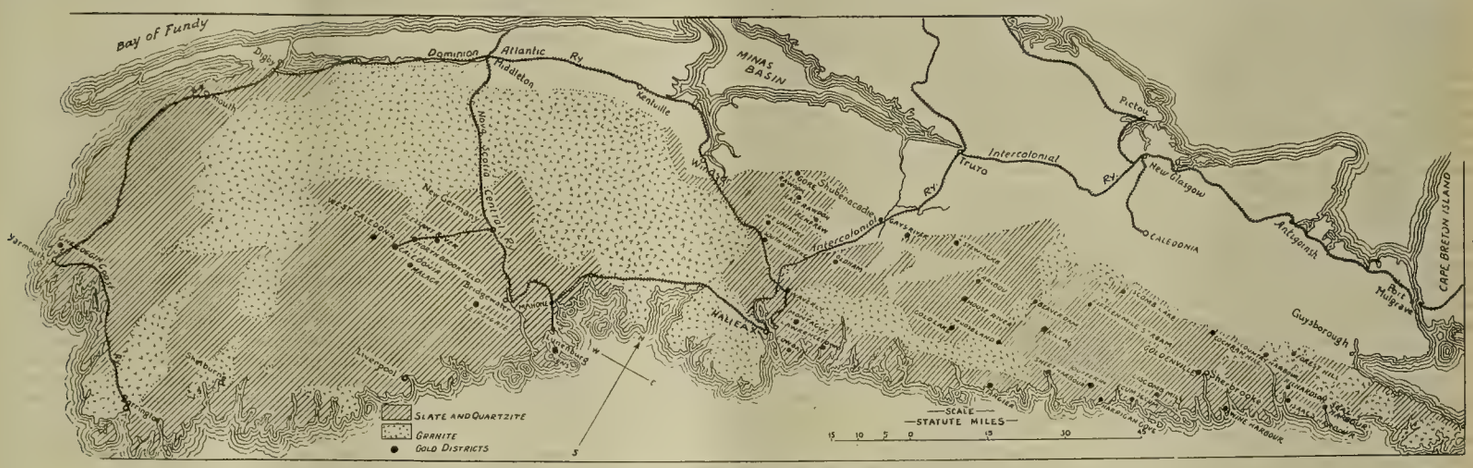
The accompanying map shows the relative position of the principal gold-mining centers. With the exception of Brookfield and Leipsigate they are east of Halifax. Mt. Uniake is due north. Most of the settlements are off the line of railway, many being situated close to the shore of the estuaries that indent the eastern coast of the province. But all of them are pleasantly accessible, the roads generally being good. Occasionally the bush is allowed to encroach, so as not only to impede a vehicle, but also to keep the track in shadow and prevent drying after rain. A mechanical scraper is employed in road making; it is expeditious and does good work. This machine scrapes the sides toward the center so as to form a crown and leave a wide gutter on each side. Broken slate packs well and makes an excellent road bed; so does granite, the feldspar of which decomposes to a cement. Near the estuaries a topping of gravel is obtained from the beach. Owing to the absence of mountainous declivities and great extremes of temperature, the roads wear well.

Decent accommodation is readily obtainable, the country folk are kindly and clean, so that no real roughing need be experienced. Simple fare is the rule, the monstrous overfeeding of our western mining camps being unknown. Fresh codfish and blueberries are important articles of diet during summer. Excellent lamb is served occasionally, but the beef is tough, for reasons suggested by the accompanying photograph, which shows that oxen are used for draught. Tea is the universal beverage; it is boiled to bitterness; real coffee is practically unknown; bread is served in a great variety of ways, as in New England. By reason of a law known as the Scott Act, it is illegal to sell intoxicating beverages of any kind, even those containing a minimum of alcohol, such as light beer or hard cider. This does not prevent the sale of intoxicants, but it does stimulate trade in cheap concoctions of an injurious kind. Drunkenness is infrequent. On the whole, I got the impression of a steady, thrifty, hard-working people, making the best of an ungenerous soil and a rigorous climate.

I am speaking of the region where they mine for gold; this is not on the trail of the tourist who knows Nova Scotia as "the land of Evangeline." The tourist goes to the Annapolis valley, a splendid tract of meadow guarded by ridges that cut off the fogs from the Bay of Funday and obstruct the cold east winds of the Atlantic. This valley, famous for its picturesque beauty and its historic associations, extends 100 miles, from Windsor to Annapolis. It is the old Acadie, the country settled by French colonists too patriotic and too much out of the world to recognize English authority after France lost dominion in North America, 150 years ago. The forcible deportation of these peasants to New England and the South, the romance of their subsequent pilgrimage and, in many cases, eventual return to Nova Scotia, have served as good material for many a writer.

But the valley of Annapolis is not typical of Nova Scotia; it is a happy vale consecrated to apples and poetry, to Parkman and to Longfellow. I saw it after four weeks of travel among the severe and monotonous scenery of a region swept of all distinction or beauty by the ruthless hand of that ice monster to whom we assign the glacial period. Partly because it is cut out of softer rock (Devonian slate and Permian sandstone) and largely by reason of the two hill ranges that flank it on the north and south, the valley of Annapolis is especially favored. The tidal rivers find a winding way deep into the pasture; the dykes, first built by the Brittany peasants, protect the interval land from the encroaching wave; the wide orchards bask in sunshine, the quiet villages sleep peacefully under gray church steeples; and on either side the hill slopes, checkered with cultivation and crested with dark forest, look down protectingly, while a wreath of fog halting over Blomidon suggests the stress and disquiet of a cold world that lies beyond this dreamland.

*The writer recently investigated the geological occurrence of gold in Nova Scotia, in behalf of the Provincial Government, but as his report has not been published he confines himself in this article, and those that follow, to the merely superficial aspects of the gold mining country of Nova Scotia.—T. A. R.



Map of the Gold Region of Nova Scotia.

It is not uncommon to find pyrite in deep gravel mines—undoubtedly formed in the bed of the stream since the deposition of the gravel. So far as known, the pyrite thus formed contains little or no gold.

Common Sense Mining.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

In 1878, M. D. Rochford and some others discovered the Standby and other gold-bearing deposits in the vicinity of Little Rapid creek, about 18 miles southeasterly from Deadwood, in Pennington county, South Dakota. These discoveries were followed by numerous others in the neighborhood, on the tributaries of Rapid creek, among them being the Paul Jones and Minnesota mines on Silver creek, the California mine on Smith's gulch, the Montezuma on Irish gulch, the Montana mine, near the head of Irish gulch, near Rochford, and the Jenny Lind and other claims at what was afterwards named Meyersville. Each of the mines above mentioned has an interesting history, and each has good prospects for making a mine. The best known of these several properties, perhaps, is the Standby, being the initial discovery of the district and the first to be equipped with a mill. On this property active development was undertaken in 1879, when a 40-stamp mill was built, power being supplied by Pelton wheels under about 150 feet pressure, the water being taken from Little Rapid creek about 2 miles above the mine, to which it was conveyed by ditch and flumes. This was a notable installation, as it was the first power equipment of the kind in the Black Hills, and for many years remained the only power plant of its kind in that region. The first superintendent, A. J. Simmons, being a California miner and familiar with the uses and advantages of water power, did not hesitate to adapt California practice to the conditions of the Hills. The Standby mine at first gave little trouble, but with depth the free gold largely gave place to auriferous sulphides. The mine was half a mile or more from the mill, and the situation was such that without a long tunnel it was necessary to handle the ore several times between mine and mill. The expense was thus unusually heavy, and the mine appeared to never run long enough at one time to permit of systematic development and operation—always working under some disadvantage. The tailings losses were high; there was not a concentrator in the Black Hills at that time and the cyanide process was not dreamed of. Since those early days the Standby has run spasmodically, with a greater or less success, under many managers. Within recent years a tunnel 1400 feet in length has been driven into the hill on a level with the upper floor of the mill and connections made with upper workings. This will greatly facilitate the operation of the mine and cheapen the cost of handling ore. The mill is being overhauled and once more gotten into running shape, and these operations will give the mine another lease of life.

The Standby, like many other mines of the central Black Hills, is low grade, and now, more than ever, requires a conservative and competent management—neither extravagance nor parsimony being possible where success is to be attained.

The Minnesota and Paul Jones mines on Silver creek had much the same sort of experience. The surface ores paid well, but with depth the sulphides so reduced the output of free gold that operations were discontinued. The California mine on Smith's gulch never reached the mill-building stage, though the mine at one time was considered one of the best in that section, and produced considerable specimen rock. The Montana mine has never had a mill, but has developed a large body of low-grade ore. The Montezuma is also in the development stage, though equipped with an experimental mill, which is not at all adapted to the treatment of the ore.

The Jenny Lind and adjoining claims at Meyersville later attracted as much attention as either of the mines above mentioned, and in 1880 a group of these claims passed into the hands of Iowa people, known as the Alta-Lodi M. Co., which proceeded to

develop the mines superficially while building a 40-stamp mill. Among other engineering exploits at this mine was the driving of a 500-foot tunnel to get 80 feet of backs, the tunnel then being extended several hundred feet beyond the highest point on its line. Several open cuts were opened on what was presumed to be the vein, and the mill was started. The water supply was too limited to admit of large and continuous milling operations, which was a detriment, in that it resulted in the cost of milling being higher than it should be. One of the most important, as well as most unfortunate features of mining at this property, lay in the fact that the management evidently conceived the idea that this mine was similar to the Homestake, and that the entire ridge on which the mine was situated would pay to mine and mill for the gold it contained. This is plainly evidenced by the several great open cuts in the hillside. The mine did not pay and was closed down permanently after several spasmodic but ineffectual attempts to overcome the difficulties of the situation.

The chief difficulty in the way of success lay in the fact that the entire mass of red and brown schist did not contain sufficient gold to pay (though assays are obtainable almost anywhere on the hill over a width of 200 feet or more). As in mines everywhere else, the gold at Meyersville occurs in shoots, or zones, which are more or less sharply defined, if not physically, at least, by relative value of the rock.

The formation is hornblende schist, through which are many lenses and veins of quartz. This quartz is of two kinds. Lens-shaped masses and stringers of granular appearance, either white or bluish in color, and vein quartz of crystalline structure — the granular appearance being entirely absent. Each of these varieties of quartz is gold bearing and each also contains iron sulphides. The color of the schists is due partly to decomposition of iron sulphides, but more largely to the oxidation of the iron minerals in the hornblende. Certain zones of the schist are so much decomposed as to have lost wholly, or nearly so, all traces of schistosity, and resemble much decayed dikes, which possibly they may be. Some of the zones of this description contain gold in payable quantities, but the values are generally scattered erratically. One place will show no gold at all on panning, when another prospect from the same streak, taken a foot higher or lower, will indicate the presence of gold to the extent of $5 to $20 per ton. The principal gold-bearing rock, however, is the schistose formation in which are numerous stringers and lenses of quartz, the exposed face in cut or drift presenting a banded appearance.

Careful sampling demonstrated that the appearance of this rock could not be trusted as a true index of value, and it is this fact, no doubt, that misled the early operators on this mine—they neglected to keep informed of values by taking the proper samples, assuming that the rock was all payable because it all looked much the same. One large cut, from which thousands of tons of ore were milled, did not pay for the mining expense, and yet, just south, and but a few feet distant, the ore was found subsequently to be not only payable, but rich. Still there was little, if any, difference in the appearance of the bodies of rock.

After several years of desultory operations the Alta-Lodi Co. permanently discontinued operations, and in 1884 the mill was removed to the Lookout mine on Castle creek, several miles to the southward. The Jenny Lind and other claims of the group remained idle for years, but eventually came into the possession of James Cochran, who still owns them. Being a practical miner, and appreciating the difference between a small vein of rich rock and a mountain mass, throughout which a little gold could be obtained at any place, the new owner spent months in prospecting the various claims. This careful inquiry into existing conditions demonstrated the fact that there were a number of places on the property where pay ore could be obtained in considerable amount. Having satisfied himself that pay ore actually existed on the property, and in sufficient amount to justify a mill, Mr. Cochran, whose means were limited at that time, put up a small Huntington mill, boiler and engine. A concentrator he thought he had no particular use for, as the rock was free milling. At first this practical, common-sense miner chose his rock with care, mined it himself, hauled it with wagon and team to his mill 1000 feet distant, and when he had accumulated sufficient ore to warrant starting up the mill, he became his own fireman, millman, superintendent and master mechanic. He supplied all the wood necessary, cutting it on the neighboring hills and hauling it to the mill. In this small way he began operations, nor has he enlarged upon them very materially. For years he has continued to work his mine during the summer months, employing such help in mine and mill as was required, and he has made a fortune from these operations. He still owns and works the mine in his own fashion, but he does it in a methodical and practical manner. Experience has taught him that because a face of ore is largely profitable, he cannot assume that after a round of holes have been blasted he can depend upon equally good results in the new face, for this has been found to be an uncertainty.

The ore shoots occur in the hornblende schist throughout a zone known to be more than 100 feet wide and several hundred feet long, and the indications are that there are other shoots in the hanging wall side which have not been developed as yet. The strike of the country generally in the vicinity is about N. 15° W., and the dip about 80° to the eastward. It has been found that the best ore in this mine occurs in the schists at places where there has been noticeable torsion of the rocks. Small displacements have taken place, and the stress causing these faults has also resulted in twisting the schists to a small but noticeable extent, together with a certain amount of crushing. Where the disturbance is most pronounced the richest ore has generally accumulated. The disturbance of the schists, as it is here called, consists of a slight foliation of the rocks, together with a more or less marked change in strike, up to 15° or 20°.

What has thus far been considered the main shoot is about 60 feet in length, and from 15 to 20 feet or more, in places, in width. Lying to the westward, and separated by about 20 feet of very low grade rock, is a second shoot. This is from 3 feet to 15 feet wide and about 160 feet in length. This latter has been opened by a surface cut almost its entire known length to a depth of 20 to 30 feet. A shaft has been sunk about 100 feet and a level run at 30 feet and another at about 60 feet from the surface. The shoot previously mentioned has been worked by open cut and shaft connected with a tunnel about 30 feet below the surface, and has produced thousands of dollars, the rock averaging $15 per ton.

A shaft was sunk to a depth of 125 feet in the main cut, but the one on which this was started dipped out of the shaft with depth, and no attempt has been made to develop the shoot at this level. East of the main shoot and branching out from the principal cut is another and smaller vein, in which good values have been found, but work has not been continued far enough to determine its relation to the ground lying beyond. On the surface considerable prospecting has been done, resulting in the discovery of several places where rich ore exists, and the indications are that all of these occurrences have something in common — in fact, all apparently belong to a system of ore deposits which in depth may be found to unite into a single large ore body. This has been proven to be the case at the Homestake, and the conditions at the Cochran mine are not very dissimilar from those at Lead, though the mineralization occurs on a much inferior scale. The most noticeable difference in the geology of the two mines, aside from their comparative magnitude, is in the lack of igneous intrusions at the Cochran mine. At the Homestake, in the upper levels, the dikes of rhyolite are a most pronounced feature, though in the lower workings they form a comparatively inconspicuous factor, but it is well known that the hornblende schists of that mine were gold bearing ages before the date of the intrusions of rhyolite. The disposition of the ore shoots at the Cochran mine is similar to that at the Homestake, and the country rock is almost identical, the chief difference being in the extent of mineralization at the two places. This difference is, of course, a most important one, but it is interesting to note how much alike the two occurrences are otherwise.

At this time the Cochran mine lacks extensive and systematic development, and consequently little is known of the existing conditions below 50 feet from the surface, but the property stands as an object lesson in what may be aptly termed common sense mining — an instance where a practical miner has made a paying proposition of a mine which, worked with elaborate equipment and large means, but inexperienced management, was a disastrous failure. The mine possessed the elements of success, these elements were discovered by the present owner by searching for them in a practical, common sense manner, and the subsequent working of the property, though almost primitive in its character, has demonstrated the unwisdom of the large equipment and extravagant operation of a mine which did not justify such outlay, but which, when properly handled, became largely profitable.

HEMATITE is frequently known to occur as a gangue mineral and associated with iron and other sulphides. In these instances the hematite is considered as of secondary importance and is not looked upon as an ore, though technically hematite is always an ore of iron. Hematite may be produced in nature from ferric iron by the action of certain carbonates and alkaline carbonates without oxidation.

Hand Sampling in Small Stamp Mills.*

Written by A. W. WARWICK.

The question of sampling is one which should receive a thorough discussion by the members of the Association. The effects of slovenly sampling methods are profound. The first and most apparent effect is that, without careful sampling, it is impossible for the metallurgist to know where the losses occur; the second effect is that incorrect methods may even point in the wrong direction; the third is that a suspicion of the samples leads to lax work on the part of every one working in the mill. The third point made might be discussed at great length with profit since, after all, laxity on the part of the mill attendants is really the source of much of the avoidable losses. The millmen, knowing that the samples cannot be used as a check against their work, naturally become somewhat careless. Nor does the effect stop at the millmen. The assayer, knowing that the samples are practically worthless, pays very little attention to their assaying. "What is the use," he says, "of carefully assaying pulps which represent little or nothing?" The result is that the mill assayer's work has become to be a reproach not only to himself but to the profession at large. Remove this suspicion as to the samples and work all along the line will be improved. And certainly millwork needs improving.

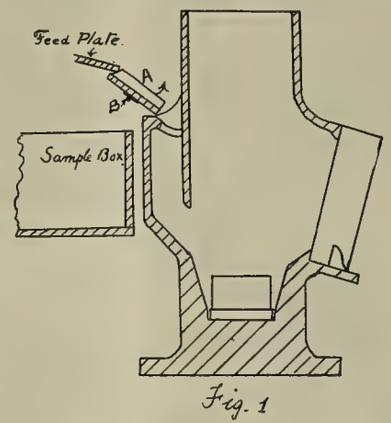


Fig. 1

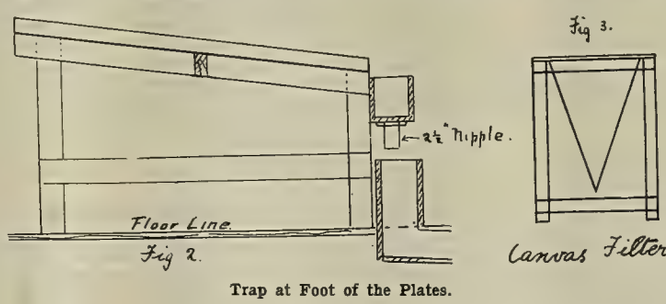
Arrangement of Feed to Facilitate Sampling.

The fact is that accurate assaying is worthless without accurate sampling, and commercially one cannot be obtained without the other.

While it is true that in large mills some effort is made to check up the work by systematic sampling, yet in most smaller mills practically no provision is made for this very important work. Where it is attempted the mill is usually so awkwardly arranged that it is practically impossible to get a correct sample. Automatic sampling is out of the question in small works, owing to the expense of installation. Hand sampling must be resorted to.

It is commonly stated that hand samples are of no value. As generally taken we must admit this current condemnation. Yet there is no reason why hand samples cannot be relied upon if, when designing the mill, provision is made for convenient and accurate sampling. The average design never takes cognizance of the question of sampling. A couple of features in the design of an amalgamation mill recently devised by the writer may be of interest. They work with perfect satisfaction and the cost is practically nothing.

It is essential to sample the ore before it goes through the mortar, owing to the general practice of employing inside amalgamation. The ore is crushed to pass a 1½-inch gauge, giving pieces ranging from 1½x4 inches down to dust infinitesimally fine. The usual practice is either to take a few pieces off the feed plate of the automatic feeder or to take out a scoopful between the ore bin and feeder, say, every half an hour. The sample thus obtained is usually



Trap at Foot of the Plates.

*Western Chemist and Metallurgist.

too low, owing to getting insufficient fines. The device for taking a hand sample is to provide a hinged flap between the feed plate and mortar. By raising the feed plate 4 inches and putting it back about 6 inches ample room will be provided. To take a sample the hinged feed spout is turned over for one-quarter of a minute and the feed is directed to a sample box, as shown in Fig. 1. By taking a sample every half hour and directing the feed for about one-quarter of a minute, about sixty pounds will be collected in every twenty-four hours from each feeder. This will give a sample the average of which in each two weeks' run (between cleanups) is quite reliable. A small crusher, set to crush to ½-inch and driven from the battery countershaft, will facilitate cutting down the samples. A riffle sampler is also very convenient.

To sample tails the ordinary practice is to run a cup along the end of the table and collect a certain amount of the pulp. The sample so collected is often ridiculously small and is rarely to be trusted; not only is there danger of vitiating the sample by the liquid pulp overflowing the cup, but particles of amalgam may be scraped off the plates. There is, therefore, danger that the tailings sample may often run higher than the headings, and indeed this often occurs.

A simple device for taking a tailing sample is to put in the bottom of the collecting launder at the end of the plate a 2½-inch nipple, so arranged that a small sheet iron spout can be put under and the whole supply of tailings diverted into a five-gallon coal oil can. (See Fig. 2.) A sample collected for about a quarter of a minute every half an hour will give a sixty-pound sample in twenty-four hours. The pulp is allowed to settle as long as possible in the sample can and the muddy water is poured off into a cloth filter, which is 12 inches in diameter at the base and 18 inches deep. The filter cloth is carried on an iron ring and supported in a wood frame, as shown in Fig. 3.

The discussions of hand sampling in connection with ore buying have conclusively demonstrated that automatic sampling is by far preferable for custom work, not only on the score of economy, but also on account of accuracy. It is here submitted that these considerations do not apply in mill work, provided that suitable arrangements are made so that hand samples can be taken with convenience. The conditions are quite different in the two cases. In custom work it is a sine qua non that the sample on each lot must represent the true value of that lot. According to the law of averages, providing no constant error is made, the buyer stands no risk even if he pays a little too much for one lot, for on the next he may even matters up by paying a little less than the ore is worth. This, however, is not satisfactory to the seller, who may only ship occasionally, and to whom the law of average does not apply.

In a mill where the grade of ore does not fluctuate between very wide limits samples taken daily will average up during a run spread over a month or two weeks, always provided, of course, that no constant error occurs. The errors in sampling will be more or less compensating. Yet the errors in milling ore, even when hand sampling, need be very small. In a characteristic case, which may be cited, we can see that the ore is pretty well mixed by the time the ore reaches the automatic feeder. In this case the ore, after being delivered at surface, goes to a sorting shed, where the ore is mixed and assorted to a very considerable extent. The ore is then trammed to the mill, where it is again mixed in the coarse ore bin. From the bin it goes to a rock breaker, from which it is spread in two streams feeding two automatic feeders of a 10-stamp mill. Each stream of ore is sampled. Thus we see that the possibility of a single car of ore being able to get through to the feeder without being at least partially mixed with other ore is quite remote. Then by taking a sample every half hour from two streams of ore it is practically impossible that a single ton can get through without having a cut or even two taken out of it. The errors of weighing and moisture determination are certainly greater than the sampling, if the samples are taken with any degree of care.

So far as the assaying is concerned it must be apparent that the samples should be regarded the same as controls and assayed in triplicate. In the case of very high single assays in amalgamation tailings, either the very high result should be rejected, or another set of assays made so as to have enough to strike a fair average. The very high result is due in most cases to a small piece of amalgam getting into the assay sample. Should the results be very irregular from day to day, either the mill work requires looking to or the sampler should be properly instructed in his work.

THE diamond bearing rock of South Africa resembles the dark green serpentine commonly found throughout the Pacific Coast region from Alaska to Southern California. In some of the pipes it presents a granular appearance, in others it is solid and massive. The source of diamonds in California still remains unknown, though most of the diamonds found in that State, if not all of them, come from a region east of any known serpentine or other peridotite rocks.

Latest Electrical Equipment of the Karawanken Tunnel.

Written for the MINING AND SCIENTIFIC PRESS by F. C. PERKINS.

The total length of the Karawanken tunnel, in Austria-Hungary, at the north end, completed up to May 17, was 4.892 kilometers. During the last 892 meters of this excavation, a considerable amount of water was encountered. Four electrically operated centrifugal pumps were installed, after a distance of 4 kilometers had been excavated, and these electrically driven pumps were increased in number to eight, and finally to ten, in order to keep the tunnel free from water while the construction work was in progress.

For the construction of the Karawanken tunnel, one of the most interesting electrical power transmission plants and equipments has been utilized. The tunnel begins at Rosenbachthal, South Valden, on the Worthersee. The south end of the tunnel is located at Birnbaun, on the State railroad, in the valley of Wurzener Saye. The construction of the tunnel was started at both ends and met in the center at a height of 630 meters above sea level. The fall to the south was 6%, while the grade on the north was 3%. In the construction of the tunnel there were 1700 workmen at the northern end, 1100 of whom worked in the tunnel itself, while on the south side there were 2200 workmen, 1200 working in the tunnel, which was constructed with a minimum height of 3 meters and a minimum width of 2½ meters.

The necessary power is supplied by an electrical power transmission plant, installed in Rothweinbach, a distance of 6 miles from the south tunnel portal, and another at Rosenbach, a distance of 1½ mile from the northern tunnel portal. The line voltage is 5000. The water power available at Roweinbach was equivalent to 900 H. P., with a fall of 28.4 meters and a discharge rate of 3 cubic meters per second. The power house at Rothweinbach was equipped with three turbines of 450 H. P. each, a three-phase alternator of 400 kilowatts capacity being directly coupled to each turbine, the speed being 750 revolutions per minute. Two of these three electrical generators were usually employed, the third being held in reserve. These machines supplied three-phase currents, with a frequency of 50 periods per second and a pressure of 5500 volts. The turbine wheels at the plant are equipped with automatic regulators, which control the speed very accurately. The switchboard consists of three marble panels for the measuring instruments, regulating apparatus and switches, which control the high-tension, three-phase transmission line, which connects the power house with the tunnel entrance. Highly insulated, iron-armored cables are used within the tunnel.

This power house was extremely difficult to construct, on account of the trouble of transporting the building material and machines to the site of the plant, and a new bridge had to be constructed for aiding in the work of transportation. The hydraulic installation was undertaken by Madile & Co. of Klagenurt, the mechanical equipment being installed by the Maschinenfabrik Andrits Aktiengesellschaft of Andritz, and the electrical equipment by Siemens & Halske of Vienna. The power transmission line consisted of three bare copper wires, each 8 millimeters in diameter. The total length of the high-tension power transmission line is about 6 miles, which includes an underground section of armored high-tension cable, of the three-phase type, having a copper section of 3x50 square millimeters. The entire loss on the transmission line is from the central station to the tunnel—10%.

The Karawanken tunnel is provided with a ventilator plant, the current being received from the Rothweinbach power house, and consists of two groups, with three centrifugal ventilators in each group. Each group of three ventilators is directly coupled to a high-tension, three-phase a. c. motor of 180 H. P. At a speed of 1450 revolutions a minute the ventilators supply 350 cubic meters per minute to the tunnel, making the atmosphere therein satisfactory for the workmen. These motors may be operated with short circuited windings and also with slip rings and brushes.

Each of the two motors with its group of three ventilators is operated for three days of twenty-four hours each, and at times for a longer period, after which the second group is placed in circuit while the first group is inspected. The ventilating pipe is 600 millimeters in diameter, a water-cooling system being provided, so that the air forced into the tunnel in summer is of a moderate temperature.

For this tunnel, Siemens & Halske supplied the railway locomotives. These electric locomotives were required to handle ten loaded cars of material, each 4200 kg., or together, 42,000 kg., the smallest curve having a radius of 75 meters. Or they are required to handle a train of fifteen empty cars, each weighing 1.2 ton, or together 18 ton, with the same minimum curve. The maximum drawbar pull of the locomotive is 2900 kilograms. Two of these electric locomotives are coupled together, forming a double locomotive with single control. Each axle is connected to a direct-current railway motor of 25 H. P. capacity. The normal speed of these locomotives is 10 kilometers per hour. Three of the double electric locomotives were operated on the south side of the tunnel, the total length of the trips being 7½ kilometers.

The current for operating the electric locomotives was supplied from a sub-station which was connected with the Rothweinbach power station transmission line and equipped with step-down transformers and a 250-kilowatt rotary converter. The sub-station received current from the transmission line at 5000 volts, and two stationary step-down transformers of 230 kilowatts each were provided for lowering the pressure to 350 volts, which the rotary raised to 560 volts direct current. The rotary converter has eight poles, and operates at a speed of 750 revolutions per minute. It is provided with a six-pole synchronous motor of small size for driving the rotary up to synchronizing speed.

The electric railway overhead working line consists of a bare copper wire of 80 millimeters cross section. The loss of pressure was about 10% at the greatest distance from the sub-station.

Twenty-six arc lamps of 1500 candle power each supply the outside lighting, while the inside lighting is provided by 618 incandescent lamps of 16 candle power each. The lighting current is supplied from transformers of 60 kilowatts capacity, the pressure being 190 volts for the arc lamps and 110 volts for the incandescent lamps.

There is also supplied from the Rothweinbach central power station the current for operating the two electrically driven compressors, each requiring 200 H. P., and has a workshop in the same building, the total power used being 438 H. P. The air compressors each supply 25 cubic meters of air per minute at a pressure of seven atmospheres, for operating the six pneumatic boring machines. The ventilating plant and the power station, as well as other points, are connected with a telephone system, the conductors used being 1½ millimeter in diameter and mounted on the high-pressure transmission line poles, two meters below the power conductors. The total length of the telephone conductors is 40,000 meters.

The power station on the north side of the Karawanken tunnel, located at Rosenbach, takes water from the Drau river, a small stream which supplies a minimum of 600 liters per second and a normal supply of 1000 liters of water per second under a head of 72 meters. The water pipe is of wrought iron 800 millimeters in diameter and 1850 millimeters long. This plant is supplied with three turbines of 3 H. P. each, operating at a speed of 500 revolutions per minute, with a water consumption of 510 liters per second under a head of 58 meters. Each of these turbines is directly coupled to a three-phase alternator, constructed by the Oesterreichischen Schuckert Werke, with a capacity of 270 kilowatts as a maximum load, or an output of 216 kilowatts, with a power factor of eight-tenths and a pressure of 5200 volts. This central station is connected by a transmission line 2300 meters long to the electric ventilator plant at the north tunnel entrance. This transmission line consists of three bare copper wires, each five millimeters in diameter mounted upon high-tension insulators on wooden poles. This ventilator plant includes two three-phase motors of 180 H. P. capacity, constructed by the Oesterreicheischen Schuckert Werke, directly coupled to two groups of three ventilators each, similar to those on the south side of the tunnel, supplying 350 cubic meters of air when operating at a speed of 1450 revolutions per minute. The double electric locomotive and electric railway equipment, as well as the lighting installation and telephone systems, at this side of the tunnel are very similar to those of the south side.

The use of electric boring machines is an interesting feature connected with the construction of the Karawanken tunnel. These boring tools are each provided with 2 H. P. motors operating the drills. The electric boring machines consist of a car provided with a cable drum and several electric drills mounted on an adjustable frame. Both direct current and alternating current motors have been utilized in the operation of these machines.

The current from the high-tension power transmission line, which is a 5000 volt three-phase current, is conducted through a three conductor, iron-armored high-tension cable of 3x6 square millimeters copper cross section to a transformer of 25 kilowatts capacity, which is used for transforming the pressure to 250 volts. The low-pressure cables are also iron-armored and lead-covered, with three conductors each of 35 square millimeters cross section. These cables connect with the boring machines, which are provided with drums holding about 200 feet of cable.

IT is generally acknowledged by those competent to judge of such matters that sulphides are deposited in veins and zones of fracture from ascending solutions containing them. It is also thought that under certain conditions in the upper portion of veins that these sulphides may be oxidized to sulphates and reprecipitated as sulphides numerous times, but the original source of the sulphur appears to have been the deep-seated sulphides of the original crystallized rocks and of magmas.

Placer Mining in Alaska.*

NUMBER X.

SLUICES AND GOLD-SAVING APPLIANCES, EXCLUDING HYDRAULIC OPERATIONS. — Creek miners in the Klondike and Alaska placer fields have met, with extraordinary vigor and a considerable amount of success, the peculiarly difficult conditions attendant on mining operations in the Northwest. Inventive genius has been called largely into play, since, except in parts of Seward Peninsula, hydraulic mining in working the creek deposits is not practiced. It is evident, however, to one who visits the Klondike district that the methods there in vogue for working the rich creek deposits have been developed with special attention to the economical mining and conveying of the material to the sluice, while the washing of the gravel in the sluice is not, as a rule, conducted with a view to the saving of the greatest economic amount of the gold. Whereas in the hydraulic-sluicing methods the benefit of long experience has resulted in generally commendable practice, the smaller hand and mechanical creek operations frequently exhibit gross carelessness in the matter of gold-saving appliances.

The method of shoveling by hand into a string of sluice boxes is naturally the one first tried by the miner in a remote district, working in shallow ground, after he has passed the panning and rocking stage. In these operations the cost, even under present northern conditions, varies from $1.25 to $2 50 per cubic yard (averaging $1.63), the capacity per man per shift averaging 5½ cubic yards. The most primitive appliances are the most economical. From three to six boxes, 12 or 14 inches in width by 12 inches deep by 12 feet long, on a grade of 6 or 7 inches to the box length, fitted with 6-foot 3-inch pole riffles made of saplings, form the customary rig in the interior where timber is at hand. From 30 to 60 miner's inches of water are used. Operations of this kind, where from three to twenty men shovel in, are to be found on all the gold-bearing creeks exploited in Alaska, though in the Klondike they have been largely supplemented by methods employing less hand labor. As none but rich gravel can be so worked, exigency permits a loss of fine gold. It is rare that placer miners will admit that they are losing gold; but it is safe to estimate that in the interior, where two to five boxes are in use for saving, and where drop-offs are not used, or are only such as are caused by the telescope connection of the boxes, from 10% to 20% of the gold lifted into the boxes is allowed to return to the creek bed.

It would seem that heavy losses would occur in connection with the sluicing of the winter dumps taken out in drifting operations. The strings of sluice boxes are erected at as small an elevation as possible, in order that the greater proportion of the material will not have to be rehandled when the spring sluicing is done. Boards are laid over the sluices, and when sluicing is resumed the water is turned through the sluice, and, beginning at the lower end, the boards are successively removed. As much of the gravel as possible is caved in, sometimes with the assistance of a nozzle, and the remainder is shoveled, wheeled to and dumped into the sluice. Small bunkers or hoppers are sometimes built over the sluices; but no hoppers of large capacity, like those in use in Plumas county, Cal., were seen in the north. On Anvil creek, in Seward Peninsula, a large winter dump was handled in this way, with the exception that those portions which could not be caved to the sluices were conveyed to it and dumped in by means of horse scrapers. Though loss of gold may be permissible in primitive operations of small capacity, it should become proportionally less when larger mechanical installations are made and the capacity of the plant is increased.

One of the early difficulties which the miner in the interior encountered was the presence of sticky clay and mud in the rich pay dirt. The difficulty was partly overcome by the introduction of the mud box, or puddling box, which was set in the middle or at the upper end of the string. Into this the men shoveled, or a bucket or car dumped. Fig. 17 shows the form of the mud box used in the Klondike and its position in the line of boxes. Its grade is generally made steeper than that of the rest of the string; 12 inches is common. The services of an extra man as stirrer, who also forks out the large stones, are required.

Where men shovel into boxes, the mud box is used merely as a wide part of the sluice. In larger plants, where buckets, cars or derrick skips dump into the mud box, a platform, inclined at an angle of about 50°, 9 feet square, and built up of timber floored with rough scantling, is erected on the side of the box for the gravel to fall on.

Typical Scene in Placer Mines—A String of Sluices Showing Mud Box.

The capacity of the sluice is cut down rather than increased by the use of the mud box, and the expense is increased by the cost of the man. A greater saving of gold is made; but at best the operation is expensive and of small and variable efficiency. In some shoveling-in operations the use of the mud box is advisable; but where mechanical self-dumping buckets are used, it is possible that some other form of agitator might be advantageously employed.

The developments of the open-cut and drifting methods of gravel mining have necessitated an enlarging of the sluicing capacity. With the enlarging of the capacity, however, there has not been a proportionate improvement in the construction of the gold-saving appliances. In other words, instead of drawing on the experience of the hydraulic miner and the dredger miner for the adoption of gold-saving methods, the creek miners of the Klondike have continued the method of the long, narrow sluice used for shoveling-in operations, amplifying its error and suffering the inevitable losses of fine gold which its use entails.

The average capacity of a small placer operation where hand labor is employed is 40 cubic yards in a day of ten hours. Grant that the narrow sluice of 36 feet in length with pole riffles is most economical for the needs of such a man. Now take an average summer drifting plant, where the gravel is dumped into the mud box by means of the cable tram and self-dumping carrier. The capacity is 175 cubic yards in twenty-four hours and the cost is approximately $1.50 per yard. After it is hoisted from the shaft the material is elevated to a height of 25 feet above the surface of the ground. Water is pumped to this height for sluicing. The sluice consists of a mud box 16 feet long and 30 inches wide, on a 12-inch grade, tapering to the 14-inch sluice boxes which follow. There are eight of these, set on a grade of 10 inches to 12 feet, furnished with pole riffles, which last three weeks only and cost $3 per box length to renew. The man forking in the mud box costs $6.50 a day of ten hours. At this plant the gold is in part very finely divided, and it is impossible to believe that the sluice in use is operating with economy.

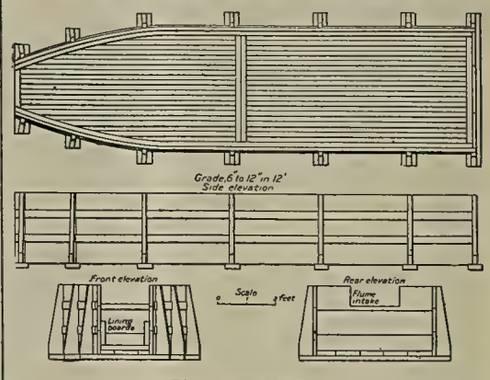


Fig. 17.—Mud Box.

Proof of the losses now going on in the Klondike was seen on a neighboring creek. At a plant somewhat larger than the one above described, where 240 cubic yards a day were handled at a cost of $1 a cubic yard, a small undercurrent had been installed at the end of ten 16-inch boxes, 12-inch grade, pole riffles. The undercurrent was fed through a small iron grizzly and consisted merely of one 16-inch sluice box, 12 feet in length, with a riffle of cocoa matting and expanded metal. It cost $20 to construct this device, which was saving an average of 5% of the product each day. A sample of the gold was taken, and although some of it is too fine for handling, such particles as could be weighed and counted gave a result of 280 colors to the cent, the gold being worth $15.60 per ounce. Gold of finely divided but never flaky character was seen in all the large producing creeks of the Klondike, and at the new Fairbanks district of Alaska.

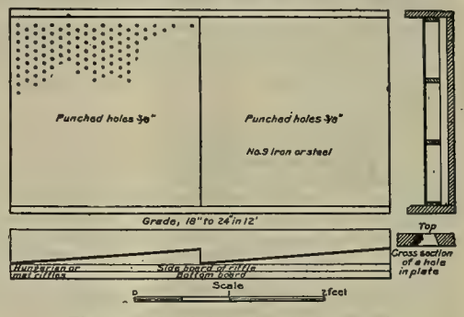


Fig. 18.—Modified Caribou Undercurrent.

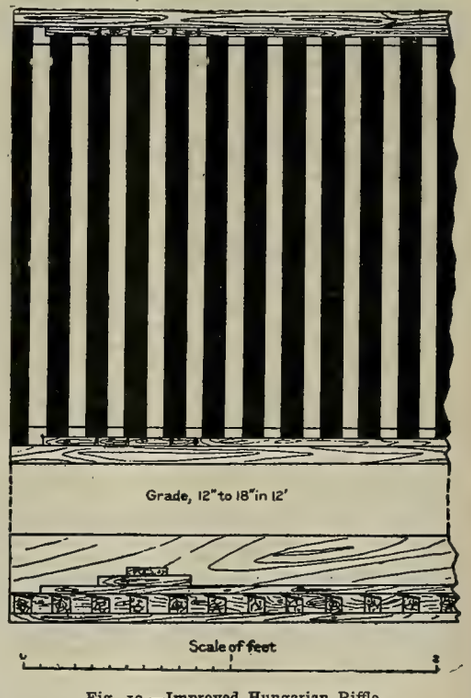


Fig. 19.—Improved Hungarian Riffle.

The plants above referred to represent the average capacity of the creek mines of the interior of Alaska,

*Bulletin 263 U. S. Geological Survey.

where the hoisting of material and frequently the pumping of sluice water are necessary. It costs from $3000 to $5000 to rig up such plants, which are used for three seasons or longer. To install a washing plant in such a case as the above would add little to the first cost, and the additional expense would probably be justified by the results.

Before entering on suggestions as to the use of washing plants, I wish to emphasize the fact that the methods of sluicing in use in Alaska, especially in the Birch Creek, Forty-mile and Fairbanks districts, and, to a certain extent, in Seward Peninsula, have been and will continue to be influenced by the Klondike developments. Though many of the methods developed in the Klondike are excellent and are worthy of imitation in any country where conditions are similar, at the same time the Alaskan miners should note the wrong principle of the primitive sluice box which has been continued there. The entire absence of screening or use of grizzlies, other than the rough, expensive hand method employed, renders valueless much ground which could be worked. A plant costing $5000, designed to thaw, excavate, hoist, convey and wash 150 cubic yards a day at a cost of $1 a yard, could by an addition of from $500 to $2000 to the first cost of the plant and an addition of 10 cents per yard to the cost of washing, recover at least 10% more value in gold from a cubic yard of material.

It may be said that the fine gold found in the Klondike does not occur in the Alaska creeks. This is disproved by experiments made on small parcels taken from pannings on the various creeks. Fine gold from Fairbanks creek, in the Tanana district, runs 500 colors to the cent, the gold being worth $17.70 an ounce. A small proportion of gold from Ophir creek, in Seward Peninsula, was found to run 170 colors to the cent, the gold being worth $18.50 an ounce. No means of knowing the proportionate amount of this gold is possible, as with the methods at present employed very little of it is recovered. Five per cent is considered a fair average of the total gold represented by the above fineness of division. This gold, which is not flaky in spite of its fine character, could easily be saved with the proper appliances, and there is no doubt that much coarser gold is lost.

The question will be asked: Can a cheap and efficient washing plant be installed, where gravel must be elevated by power, which will not add greatly to the cost, and the parts of which can be easily and quickly made with the materials at hand?

On the principle that gold is best saved in the thinnest sheet of water which will carry the tailings away, it is evident that for fine gravel a wide sluice is better than a narrow one. In the narrow sluice boxes, full or nearly full of running water with great velocity, fine gold will be carried along. Lengthening the sluice will not help matters. In fact, a short sluice with drops or undercurrent attachment is frequently more effective than a long sluice without it.

In a given case assume that the ordinary 14-inch boxes are widened to 24 inches, and that five boxes with a grade of 9 inches to the box, fitted with the ordinary sapling-pole riffles, as at present, are succeeded by three boxes with the form of screen represented in Fig. 18, the grade being made adjustable by means of blocking. An addition of 19½ inches to each of the three boxes would compensate for the loss of grade consequent on the uptilting of the screens. The whole drop in the string of boxes would be 103.5 inches, as against 108 inches were twelve boxes used with a 9-inch grade. Under the punched iron plates riffles of one or more kinds, as described below, charged with quicksilver, should be used. The riffle shown in Fig. 19 will be found satisfactory. Mats, plush or blankets may under certain conditions be found more economical. A short transverse table following the last box, arranged under a grizzly from which the large material is discharged to the dump, will enable the operator to determine whether losses are occurring in the main sluice and screening boxes.

The above installation is in principle a series of undercurrents combined in the main sluice. Its advantages of cheapness, adaptability to conditions and simplicity recommend it. No extra power or water is required. On the other hand, the use of the mud box is not obviated.

(TO BE CONTINUED.)

The Pioneers of the Desert.

The desert of southern Nevada continues to attract much attention from the mining world generally by reason of the repeated announcement of rich strikes in districts both old and new. The discovery at Tonopah by Butler five years ago has been like a pebble dropped in the mill pond—the waves have radiated outward from the center for miles in every direction—and numerous discoveries have been made as the direct result of the impetus which Tonopah gave to mining in the Great Basin.

Old districts, practically abandoned for years, have again come into prominence, and in the unknown territory lying between these old-time camps new districts have been founded and towns have grown up there almost in a day. As a matter of course, no ordinary mine can long exist in that region, remote from the source of all supplies—nothing but the high-grade mine survives. The freighter found profitable employment at first in hauling the rich ore from Tonopah to the railroad. As the prospectors pushed out, Lone Mountain, Gold Mountain and then Goldfield came into prominence. Later Bullfrog and Kawich made demands on the teamster and his outfit of wagons and mules.

The railroad has penetrated to Tonopah and Goldfield, but there still remain other outlying districts; so that the freighter is not without occupation, nor is he likely to be for a long time to come in that section.

The accompanying illustration is typical of a desert ore-hauling outfit, such as may be seen now any day on the sage-covered plains and hills of southern Nevada. The summer season has drawn to a close in that region, and with it the most menacing of the dangers which beset the prospector on the desert. Water is not more abundant, generally speaking; but both days and nights are cooler now and the risks are noticeably lessened. This means a revival of active search for new bonanzas, and the prospectors are already setting out in quest of new districts—north, south, east and west from each of the several centers of supply that have been established within the past four or five years—and it is safe to predict that the coming fall and winter season will see new and, at this time, unheard of camps spring into existence, and in these will be re-enacted the scenes so familiar in the older camps. The entire populace of that region is on the qui vive and ever ready at the first announcement of a new strike to swoop down upon the district almost en masse. A few are successful; the remainder linger disappointedly about, waiting no less eagerly for the next stampede, confident that luck will favor them at the next turn of fortune's wheel. It is this feeling of optimism that aids largely in sustaining these new camps, where there is little comfort in human existence; but it is the nature of the prospector—he is "built that way"—and to him and his brother, the freighter, is due almost entirely the tremendous development of that desert region known as the Great Basin.

Hauling Ore From Surface Workings at Goldfield, Nevada.

A COAL HOISTING FEAT was performed at the Maxwell No. 20 shaft, in Luzerne county, Pa., a few days ago, says the American Manufacturer. Because of a scarcity of cars the full capacity of this breaker had never been tested. But last week there seemed to be no limit to the supply of cars, and in nine hours 1285 were hoisted—an accomplishment considered remarkable in a district where mining machinery is thought to have reached its greatest development.

History of Pyritic Smelting.*

NUMBER II.

By ROBERT C. STICHT.

In 1878 John Hollway took steps to test by actual experiment his expectations on the subject, and made a decisive attempt to apply the principle of rapid oxidation to pyritic ores. For a beginning he had the great advantage, over the past, of the important theoretical aids now offered by thermochemistry, and by consulting their testimony before embarking on experiments on a large scale he marked, more clearly than by any other undertaking, the immense strides by which the science of metallurgy had advanced, chiefly in the preceding three-quarters of a century.

But the thing was to put the idea to practical test. This followed in due course, first on a small scale, and then with the aid of the full complement of the colossal plant of the steel works, in all cases with equally significant success, fully substantiating the pre-established theoretical results. In the spring of 1878 Mr. Hollway began by forcing a current of oxygen gas through molten iron sulphide in a clay crucible. Then air was blown through cupriferous iron pyrites that had been previously melted in a steel melting furnace, larger crucibles being employed and a proportion of sand added, in order to flux the protoxide of iron. This test lasted half an hour. Like the preceding one, it demonstrated that sufficient heat was actually developed by the iron and sulphur to keep the mass in a molten condition. A fluid slag was formed, and the copper was concentrated in a small body of enriched regulus, which separated readily from the slag. In other words, it was, so far, conclusively proved that pyrites could be melted by the heat generated in its own oxidation. It was evident that, if iron pyrites could be made to behave in this manner at all, there was reasonable indication that the operation might be carried on in a proper furnace, notwithstanding the fact that the trials were made on pre-molten ore and the furnace would have to take it cold and raw.

However, the small tests revealed a feature which the thermal calculations had been silent on, and that was the insufficiency of a low blast to achieve the best effect, and the necessity of a fairly rapid oxidation. This observation caused the selection of the Bessemer converter as the most accessible and only immediately available apparatus guaranteeing the required pneumatic advantages. Thanks to the assistance of Mr. Matheson, Mr. Hollway was enabled to conduct a systematic series of trials at the Penistone steel works of Messrs. Cammell & Co., near Sheffield, in July, 1878, and subsequently, all of which fully confirmed what yet was wanting demonstration. Mr. Hollway at once expressed his opinion that the Bessemer converter was not a truly suitable apparatus for the work, but, of course, inferences from the behavior of the substances within it could be reliably applied to other apparatus capable of exciting the same energy, which was wholly within the capabilities of the blast furnace of that time.

The material used for these larger experiments was ordinary Rio Tinto pyrites, with about 3.5% copper. It was run down with coke in the pig iron cupola and conveyed into an ordinary 6-ton, gannister-lined steel converter, served by the usual blowing engines, supplying a pressure of 20 pounds. The first blow was made on the 10th and 11th of July, 1878, and lasted half an hour. No sand having been added, the lining was greatly corroded. The second trial was made on the 11th and 12th of July, the regulus obtained after fifteen minutes of blowing showing an increase of copper of from 3.4% to 46%. Sand having been thrown in, the corrosion decreased cor-

*Abstract of Proceedings Australasian Inst. Mining Engineers.

respondingly. Six experiments were made, consecutively, on the 17th and 18th of July, and every metallurgical detail observed, the gases sampled, their temperatures measured, and the spectroscope applied. The six tests all gave similar results.

Mr. Hollway at once followed to their utmost theoretical limits all the possibilities of the process, and laid them before the Society of Arts at a meeting held on the 12th of February, 1879, Prof. Roscoe presiding. Together with the discussion, this article forms one of the most interesting contributions to the archives of the science of metallurgy, just as the magnificently successful experiments themselves constituted one of the most daring and conclusive events in the annals of the art. The simple chemistry of the process is quite fully discussed, and its principles and their corollaries clearly enunciated, and, in fact, that paper, with the critiques of the members, may be regarded as a small pyrite smelter's gospel, voicing early inspirations.

In 1880 F. Manhes began his experiments for blowing mattes up to white metal in one operation, in a regular Bessemer converter, suitably modified, at Vedennes and Eguilles, near Avignon, in France—a scheme which was subsequently perfected by being extended to the black copper stage, and which has become the beautiful process which nowadays is so widely in favor. It belongs to exactly the same metallurgical family as pyritic ore treatment, and is the most fitting supplement to the preparatory work done by the latter, where the ores are suitable. Yet, with the usual subversion of natural sequence characteristic of historical development, it reached its climax first.

The agglutination of the ore column in the upper portions of the furnace shaft by the volatile sulphur, and the consequent hanging of the charge, even when the hearth region showed signs of smelting, was the obstacle encountered at the very beginning of all trials with heavy sulphides. Hot blast might have led to success in such cases, but works treating basic ores did not have this attachment, and those that had it were working siliceous ores, which lacked the pyrites.

Apparently almost no records of such attempts have found their way into literature. One instance, however, may be cited, as probably typical of others, or all. It is the experience of C. A. Hering, who, no doubt, induced thereto by the Hollway experiments, tested the pyritic idea in 1878 at Accessa, in Tuscany. Before tempting the Providence that controls the behavior of blast furnaces, Mr. Hering turned a large roast heap into an exaggerated wind smelting pile, such as the more primitive nations of the middle ages were in the habit of obtaining their lead with. A larger bed of wood was given than usual, the heap built up higher than ordinary, the sides thickly covered with roasted fines, and an updraught through the pile provided. After ignition a great evolution of heat took place, with a sulphur flame at the apex of the pile, which lasted for days, while molten regulus in quantity ran from the base. In three weeks the heap was opened. At the bottom it showed a tremendous sow; above that a conglomeration of ore, matte and slag; over that, well-roasted ore, and on top, the residues from the liquation of the sulphide ores, chiefly consisting of quartz. Some of the latter showed unmistakable signs of fusion, without having been fluxed, so that the temperature evolved must have been enormous. Mr. Hering's next attempt was in the blast furnace at the same place in 1879, the declared intention being to make a richer matte while saving coke. As the plant did not permit of special alterations for the purpose of the best effect, the investigation had to be limited to giving more blast than usual, and later on a higher pressure. The improvement was undeniable. Ordinarily the sulphur loss within the furnace was 11%; it was now 15%. The matte usually contained 23% to 24% copper, but now ran 28%. These small advantages, however, seemed to the experimenter outweighed by certain more serious disadvantages, such as overfire, irregular sinking of the charges, increased flue dust, the dragging of more or less matte into the slag pots, and a worse separation. Consequently no further trials were made.

The pure form of pyrite smelting, as well as partial pyrite smelting, thus lay dormant from 1880 on, and pyritic smelting also seemed to be on the wane. They required renewals of impetus towards further progress which, practically, only those conditions of ore supply and mineralogical character of the same could give, which were sufficiently one-sided to be amenable to no other smelting methods.

F. A. Bartlett is the pioneer of pyritic smelting in America, and during the eighties devoted all his energies to its cause. His operations were conducted in the State of Maine, but his advocacy of the process covered the entire country. He rightly considered it a lost or forgotten art, though filling a most important place in the metallurgical rank and file of methods, even when locally dissociated from the subsequent extraction of the precious metals from the mere middle product, i. e., matte, which is all that it can produce. Mr. Bartlett's opinions on the method resolved themselves into a matte smelting of the raw ores in a very simple blast furnace plant, practically independently of all but the merest traces of copper. In this metal he empirically drew the line at 3% on the charge. He obtained mattes as high as 70 to 80 ounces of silver per ton with both lead and copper absent—i. e., making excessively siliceous slags containing less than 1 ounce of silver—but with ½% copper on the charge he rose to 200 ounces of silver in the matte, and with 3% copper up to 700 ounces, without serious losses. The ores he considered most suitable were those carrying considerable amounts of iron and manganese, and the sulphur contents were to be regulated by partial roasting, when high, and the use of sulphides raw, when low. The advantage of a possible partial desulphurization in the furnace itself came in as a very largely recognized feature also, but was not made the paramount feature. Coke was still used in considerable amount, and only a reducing furnace atmosphere contemplated. Blast pressures were as yet low—i. e., from 8 to 12 ounces per square inch—and furnaces were small. Mr. Bartlett's type of 1887 measured 3 feet by 4 feet at the tuyeres, of which there were eight, and about 8 feet from tuyeres to charge opening. This furnace was water-jacketed all over, except the drop bottom, and used a heated blast derived from the furnace gases by means of an air-jacketed hood above the throat. The blast was trapped for the slag outlet, but there was a special tap for the matte, direct from the furnace hearth. The constructional departures from the European types thus briefly indicated marked the radically different circumstances under which pyritic smelting now had to be made successful, and also indicate the general trend of the improvements to be effected in the wake of the migration into transatlantic surroundings. The utility of a large blast volume was understood, and fans were advocated by H. M. Howe and others, but rotary blowers were ordinarily employed.

We now finally enter upon the period, and into the circumstances, in which the most interesting division of the general subject—viz., the special one of pyrite smelting — suffered a restoration. This revival occurred in the United States of America, in the western part of the country, in the Territory of Montana.

In the latter half of the eighties an English company, originally engaged in, or an offshoot from one engaged in, the pastoral industry on the high plateaux of Montana, founded a township on the banks of the Missouri river, in a promising agricultural valley, about 40 miles east of Helena, the capital of the Territory. The inducement to locate there was the presence of a few mines, and that of the Northern Pacific Railroad, which ran alongside the river at the point selected. The township was called Toston. The original industry having proved disastrous, owing to the long and very severe winters, it may have been proposed to try smelting instead. Any way, a small plant was erected for the purpose, but not much hope of success attended the enterprise until it was decided to utilize the gold-bearing iron pyrites of certain adjacent mining properties, which gave some promise of permanency. The metallurgical affairs were in the hands of W. L. Austin, and to him is due, not alone the second—or Western—rejuvenation of pyritic smelting in America, but also a later, still more excellent, because more difficult, achievement—namely, the consummation of pyrite smelting, as we now know it, in blast furnaces. Mr. Austin's attainments as a Freiberg graduate and erudite metallurgist easily found the only direction in which the local ores could be made amenable to profits, and first suggested the application of the old Roharbeit or pyritic smelting. In 1885 a small, old-fashioned sandstone furnace, about 4 feet square inside, and provided with water tuyeres, was erected for this purpose. Experiments showed that the German spurofen style of hearth construction was the most suitable, the products discharging continuously through a taphole, without trapping the blast. A Herreshoff furnace was also employed, but proved inconvenient, on account of the inaccessibility of the passage leading from furnace to forehearth, which the irony matte constantly choked up. At first, as in the Roharbeit days, the ore was not roasted, but the matte subjected to this operation, and resmelted with siliceous ores to enrich it. Lead soaking, etc., were not carried out, but the product sold to large lead smelting works elsewhere. The most satisfactory results are said to have been obtained with a low column and large volume of air, coke being used for fuel in due quantity. The pyrites in the mines became granular after a while, and finally so fine that one-half of it had to be roasted in a calcining furnace and bricked with lime. No lead or copper ores were bought, but some copper must have been present, however little, for the recoveries clashed with the well-known fact, established through centuries of similar work, that pure iron matte is not a suitable collector for gold and silver. About this time special research by E. G. Spilsbury and others had definitely settled this point, at least as far as gold is concerned. As a matter of fact, too, the mattes subsequently obtained out of the main ore by means of pyrite smelting did contain considerable copper, although it was lost sight of, because not paid for by the purchasers. The undertaking up to this stage seemed but little destined to make a name for itself, for ore was scarce in the immediate vicinity, and not to be had elsewhere except by means of a railway journey of a couple of hundred miles, and coke was very dear.

This precarious and stressful condition of affairs is directly responsible for the revival of the blast furnace bessemerizing of sulphide ores, which had been abandoned by Mr. Hollway, and which, under Mr. Austin's direction, was here to be achieved in a diametrically opposed environment. The former had at his command all the tremendous paraphernalia of the iron industry, the latter only the most limited array of commonplace apparatus, sufficing for matte smelting on a very small scale. Nothing could appear less promising, for it must have seemed that if pyrite smelting was capable of balking even the most intense metallurgical energies which could be brought to bear on it, then the resources available at the poverty stricken Toston smelter had not a shadow of hope of success. However, the outcome was the very reverse. Still, success was not born in a moment, but came by slow degrees.

It was natural, since coke was dear and funds were scarce, that a Freiberg student should revert to hot blast, which could be fired by wood or coal, in order to cut down the consumption of the dearer fuel. Accordingly Mr. Austin erected a small impromptu iron pipe stove, of cramped dimensions. This had, one may assume, all the desired effect, when not out of order. A Root blower permitted of pressures of blast up to 3 pounds in the small furnace.

Now undoubtedly followed a series of observations which, in due course, guided Mr. Austin to the bold step of depressing the coke percentage to less than half the usual amount, with the deliberate object of forcing the fuel qualities of the iron pyrite to assert themselves as an essential contribution to the heat balance of the furnace. In any case, what had not been dared, or, if dared, had not been successfully carried out before, anywhere else, was to be accomplished with the confined and shabby appointments of Toston. Many desultory runs were made, and the process tested as far as possible, although the course of experimenting was made particularly rough by a variety of circumstances, technical and otherwise.

Meanwhile financial stress, scarcity of ore and internecine troubles caused the cessation of smelting operations, and the plant was shut down. For some time it was leased as an auxiliary plant by the Helena M. & R. Co. for the treatment of Cœur d'Alene galena ores, and a 36x78-inch lead furnace, of the usual American water-jacketed type, was erected by the lessees. Upon the termination of the lease this furnace afforded the Toston company a more adequate opportunity for further testing the pyrite work, and, when operations were finally again resumed after finances had been improved, this furnace was altered to suit matting operations. A much more appropriate cast iron pipe stove, of the hanging U-tube pattern, of fair dimensions, was also constructed. In 1890–91 the experiments were resumed on the enlarged scale now possible, but, for various mechanical reasons, which it is unnecessary to detail, the work was not successful as a continuous exhibition of the possibilities of pyrite smelting. There was, of course, the same dearth of proper ores as before, and much rubbish had to be treated. Special precautions were taken to meet special troubles that presented themselves. For instance, the jackets of the narrow lower tier, resting immediately on the bottom plate, were made solid, in order to resist the dynamiting which was resorted to for the purpose of rending the accretions that accumulated in the hearth—this operation being a portion of the regular curriculum of the campaigns. However, sufficient information as to the proper furnace mixtures, etc., was gained to allow of successful exhibition smeltings whenever special occasions required them to show off the process. Mr. Austin went to Colorado in 1891 to introduce the process there, and the patent was granted soon after, in the same year.

On the strength of the latter a new company, operating the Toston plant, was formed, which controlled the rights for the two States of Montana and Idaho. Although a practical superintendent, possessing the whole fund of collective experience at the place, was in charge, it was felt that outside judgment was desirable, and accordingly the writer investigated the Toston innovation in the fall of 1891 for some friends. The aims of the process were being much misunderstood, and its products even placed under a ban, inasmuch as one lead smelting plant, which had purchased the matte, attributed heavy losses in gold, which it had sustained, to the Toston manufactured material. A banker, a man of sagacity, however, was accustomed to declare that if the furnace could be made to run for a day he could not see why it could not be persuaded to run for weeks. The opinion is certainly justified that, had it not been for the common sense, patience and faith of this interested though wholly untechnical gentleman, the art of pyrite smelting would once more have suffered a relapse, in Montana, at least.

Of the few weeks which the writer spent at Toston as the counsellor and guide of the superintendent, it will be sufficient to say that everything went fairly smoothly. It was patent how the furnace action differed from that of the wholly coke-fed furnace, but, as the phenomena required a complete reversal of the predisposition of mind generated by the ordinary blast furnace practice, there was an abundance of novel and interesting points.

(TO BE CONTINUED.)

Disposition of Exhaust Steam From Mine Pumps.

The disposition of exhaust steam from pumping machinery in mines is a worthy subject. In mining operations large bodies of water are frequently met. A method of steam condensation is provided by the A. S. Cameron Steam Pump Works, foot of East Twenty-third street, New York, herein illustrated and described:

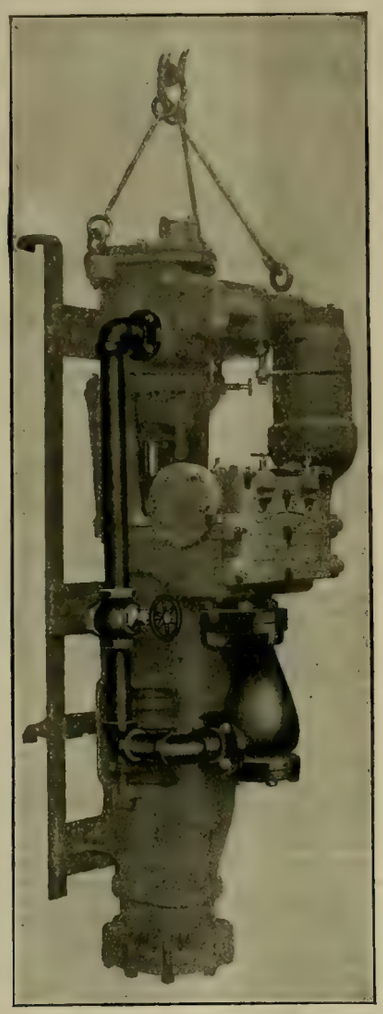


FIG. 1.

Fig. I shows a Cameron vertical plunger sinking pump, having the slings attached by which it is hung in the shaft. The darker portion shows the condenser, with the exhaust pipe leading thereto, and bolted to the water valve chest.

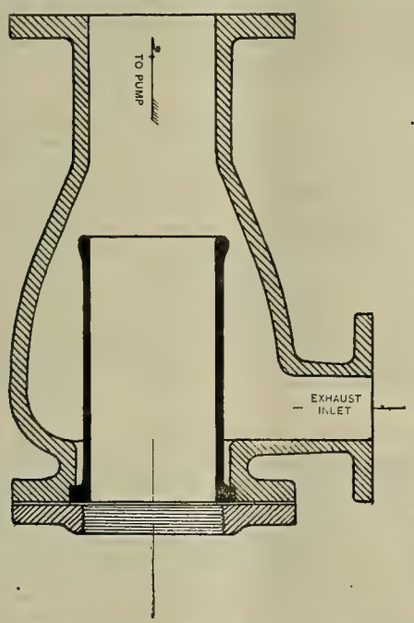


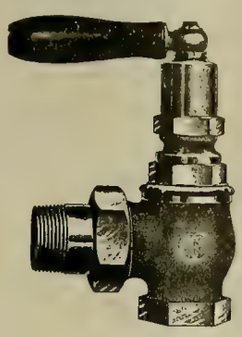
FIG. 2.

Fig. II gives a sectional view of the condenser chamber. The constant flow of water through the suction piping connected to the bottom of the condenser is designed to cool the bronze sleeve which is arranged within this chamber, so that when the exhaust steam comes in contact with the cool surface part of it will immediately be condensed and the remainder passing through the annular opening will also be condensed after mixing with the water passing through the suction. It is necessary that the water cylinder be fully charged before the exhaust steam is turned into the condenser, by allowing the pump to exhaust into the atmosphere until it has become filled with water, then the three-way valve may be turned and the exhaust steam admitted to the condenser, but it should not be allowed to enter except in combination with water. In some cases automatic floats are arranged to stop the pumps when the water supply is down. An air leak is fatal to the successful working of any condensing apparatus.

The manufacturers claim that expense and delay when the pumps are moved about in the mines can be avoided by the use of the Cameron condenser.

Self-Packing Steam Radiator Valve.

Herewith is illustrated a Crane quick opening self-packing radiator valve. The lever handle can be operated by the foot, as well as by the hand. The construction of these valves is such that, when closed, the discs bear on the seats very tightly, and the valve is locked in place until released. The bonnets of these valves are interchangeable with the bonnets of Crane regular radiator valves. These valves have artistically designed proportions and add much to the appearance of a nicely furnished apartment by their symmetrical proportions and rich appearance. Prices, etc., will be furnished by the manufacturers, Crane Co., Chicago.



Falling Bodies in Deep Shafts.

There still remain things connected with the force known as the attraction of gravitation which are difficult to understand. Theoretically, any object dropped in space above the earth falls directly toward the center of the earth. The plummet is supposed to indicate the direction in which the center of the earth lies. Notwithstanding this, it is now said that objects dropped into deep vertical shafts never reach the bottom, but always fall toward the east side of the shaft, lodging somewhere in the timbers, nothing reaching the bottom which falls into the shaft from or near the top. It is said that this peculiar fact has been demonstrated at the Red Jacket shaft of the Calumet & Hecla copper mine, near Houghton. The article, no matter what shape or size it may be, is invariably found clinging to the east side of the shaft. One day a monkey-wrench was dropped, but it did not get to the bottom. It was found lodged against the east side of the shaft several hundred feet down. This incident coming to the attention of the Michigan College of Mines, it was decided to make a careful test of the apparent phenomenon. It was decided best to use a small but heavy spherical body, and a marble tied to a thread was suspended about 12 feet below the mouth of the shaft. When the marble was absolutely still, assuring that it would drop straight down, the thread was burned through by the flame of a candle. The marble fell, but at a point 500 feet from the surface brought up against the east wall of the shaft.

The same would be the case were a man to fall into the shaft. While it would mean sure death, the body, badly torn, would be found lodged in the timbering on the east side. Members of the faculty of the College of Mines are now engaged in experiments with a view of developing data as to the thickness of the earth's crust. It is not hoped to solve the perplexing problem of the distribution of the earth's matter, but it is hoped to add to the information collected concerning it.

To this end the Red Jacket shaft presents advantages possessed by no other place in the universe. The deep shafts in other parts of the country and in foreign lands generally begin at an altitude and end above or very little below the sea level, whereas at the Calumet mine the Red Jacket shaft starts in a comparatively low altitude and pierces the earth's crust deeper and farther below the ocean level than any other in existence. It is hoped within a year to be able to give some intelligent information regarding the investigation.

It is probable that further investigation of this matter will show that the rotation of the earth on its axis is in some measure accountable for these phenomena, and that it is not wholly due, as heretofore supposed, to air currents in the shaft.

THE PROSPECTOR.

The rock sample from Glen Ellen, Cal., is andesitic breccia. The dark colored fragments are andesite and the white, chalk-like material is rhyolite tuff. This rock is very common in the volcanic regions of both the Coast Range and the Sierra of California.

The rock samples from Custer, Idaho, are: No 1, light, a much altered eruptive rock, possibly an old andesite, too much altered and kaolinized for determination. This rock resembles what was known on the Comstock, by the old geologists, as propylite, and was at one time supposed to represent a distinct class of rock, but it is now known that several rocks of that district by alteration take on the characteristics of the so-called propylite. No. 2, the dark rock, is a metamorphic sedimentary rock. It has been silicified somewhat and evidently contains carbonaceous matter.

The mineral specimens from Middletown, Lake county, Cal., are: No. 1, iron sulphide (variety marcasite); No. 2 is principally pyrrhotite, the mono-sulphide of iron, which is magnetic, but associated with it are also pyrite, chalcopyrite (copper sulphide) and cinnabar (the sulphide of mercury). The percentage of copper present is appreciable, probably 3% or 4% in the specimen. No. 2 is an unusually interesting ore, because of the various minerals it contains.

The mineral samples from Weiser, Idaho, are determined as follows: No. 1, a basic eruptive rock in the vesicles of which copper carbonate has infiltrated; No. 2, iron stained jasper; No. 3, a veinlet of crystallized quartz in an eruptive rock, much altered but apparently aplite; No. 4 is a silicified greenstone (diorite); No. 5 is a type of granite much altered and containing a little copper carbonate; No. 6 is also a granitic rock containing pyrite (iron sulphide); No. 7 is volcanic ash; No. 8 is largely magnetic iron sand. Samples of this sand should be sent to Dr. David T. Day at the Exposition in Portland, Or., for a determination of its several constituents.

The rock samples from Sheridan, Mont., are: No. 1, diorite; No. 2 is hornblende granite, much altered; No. 3 is a veinlet of quartz and feldspar, with some iron sulphide occurring in a granitic rock. The pink color is due to iron oxide, and the green color to iron silicate.

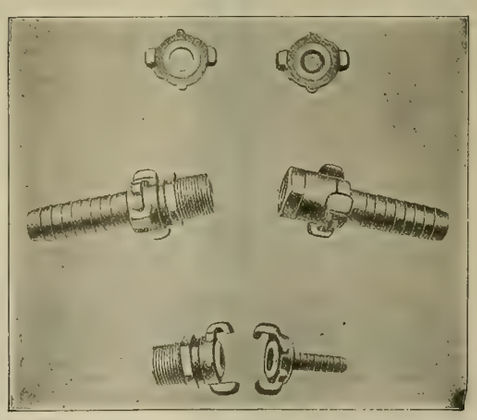
The small black pebble from Hayden Hill, Lassen county, Cal., is black obsidian, a variety of volcanic glass. It has no value.

The soft white mineral from Placerville, Cal., is infusorial earth. The diatoms observable under the microscope are of great variety and interest.

Chicago Hose Coupler.

The Chicago hose coupler is designed to meet the demand for a universal coupler, so that a plant, once standardized, could be so maintained.

The coupler illustrated herewith has no male or female part at coupling end proper, but instead each



half has embodied therein both features whereby each is the same, and will couple regardless of the size and style of the shank.

These couplers are manufactured by the Chicago Pneumatic Tool Co., Chicago, Ill.

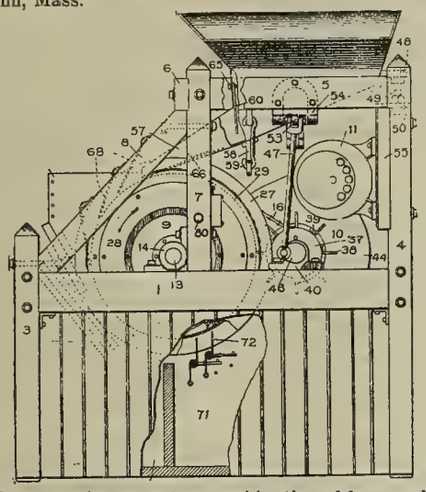
It is uncertain by what process of nature an ore consisting of definite proportions of gold, silver and tellurium, as tellurium ores, are formed. All experiments attempted with a view to produce homogeneous compounds of gold, silver and tellurium have thus far failed, though there has been no difficulty in obtaining metallic gold and tellurium salts, or mixtures of gold and tellurium in irrational composition. The sponge-like gold produced by some mines is thought to be psuedomorph after tellurium. It is not uncommon in Cripple Creek and in some parts of California where tellurides are found.

Mining and Metallurgical Patents.

PATENTS ISSUED OCTOBER 3, 1905.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MAGNETIC SEPARATOR.—No. 800,370; C. M. Green, Lynn, Mass.

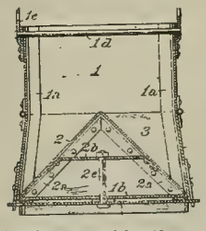


In magnetic separator, combination of frame, electro-magnet mounted thereon comprising two similar interlocking core bodies having pole pieces formed thereon and coil inclosed by core bodies, non-magnetic cover for magnet, contact devices for conveying current to magnet, hopper pivotally supported at one end, means for moving hopper to distribute material to be separated over magnet, means in hopper for breaking up masses of material, means for breaking up masses of material after leaving hopper, and revolving brush for removing magnetic material from magnet.

DEEP BORING APPARATUS.—No. 801,072; E. Frieh, Nordhausen, Germany.

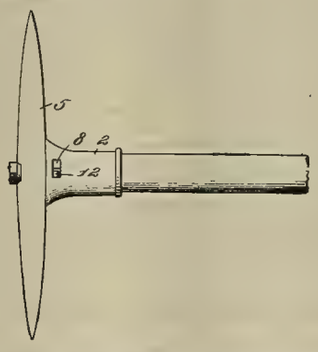
In deep boring apparatus with percussion drill and core tube, combination of boring rod, core tube rigidly secured thereto and provided with slots in lower extremity or shoe, drill driving apparatus within bore hole, and percussion drill connected with driving apparatus and provided with cutters which enter end slots in core tube.

DUMPING BUCKET.—No. 800,711; S. M. Bishop and J. L. Mitten, Wellsville, Ohio.



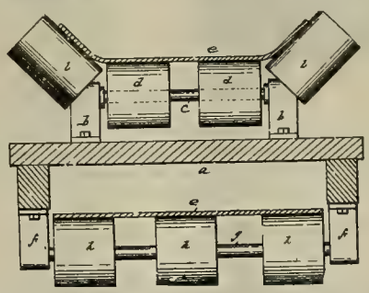
In dumping bucket, combination of quadrangular body having lower discharge opening in each of sides, pyramidal bottom, doors, each swinging outwardly opposite one of sections of bottom, and hinged to body above one of discharge openings, and means for coincidently locking and unlocking all doors.

PICK.—No. 801,166; A. Walker and R. W. Mewes, Whatcheer, Iowa.



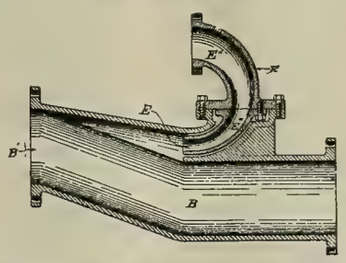
Socket having hole extending thereinto, and slots at opposite sides of hole and opening thereinto, combined with tool blade fitted against socket and having hole to register with that in socket, bolt adapted to extend through registering holes and provided with lateral fins to enter slots when bolt is turned, and nut threaded on to upper end of bolt and adapted to engage outer face of tool blade.

BELT CONVEYOR MECHANISM.—No. 800,786; W. E. Bee, Detroit, Mich.



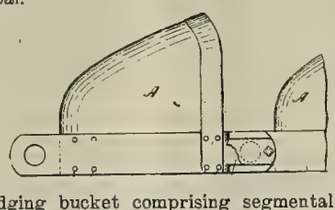
Conveyor belt roller, having in combination therewith upwardly projecting oil case forming interior oil chamber open at upper end and provided with spindle projecting upward through oil chamber, roller constructed with sleeve or hub engaged upon spindle, oil chamber arranged to contain supply of oil to submerge lower extremities of spindle and of hub.

HYDRAULIC ELEVATOR FOR DREDGING PURPOSES.—No. 800,910; B. Flood, Los Angeles, Cal.



In hydraulic elevator, means to introduce water under pressure between elevator pipe and suction pipe, comprising return bend E made up of upper and lower member E″ and E‴, respectively, secured to connecting branch B and together as shown.

DREDGER BUCKET.—No. 800,936; T. O'Leary, Oakland, Cal.



Dredging bucket comprising segmental rim with digging lip at front, longitudinally disposed extension from opposite side of bucket having shoulders and coupling extension at rear, links reversibly secured upon opposite sides of extension having shoulders adapted to engage those at rear of extension, bolt holes through link shoulders and coupling extension of extension, bolts having T-shaped heads convergent on sides, correspondingly shaped channels in link ends in which bolts are reversibly fitted, and supplemental pins or bolts by which heads are secured.

DEVICE FOR HOLDING CHECKS UPON MINE CARS.—No. 800,781; J. M. Wysor, Mannering, W. Va.

Device for holding checks upon cars comprising, in combination with car, board, strap hinges secured to inner face of car and to which board is connected, one of hinges extending beyond swinging end of board and turned to form eye, rod having angled end engaging eye, and other end bent to form hook, designed to pass through aperture in side wall of car, and adapted to receive and hold check.

PROCESS OF SEPARATING NICKEL FROM MATTES.—No. 800,130; R. H. Aiken, Winthrop Harbor, Ill.

Method of separating nickel from copper-nickel-sulphide mattes which consists in adding to molten matte in converter suitable highly heated flux material, principally silica, subjecting whole to air blast to oxidize nickel and removing nickel-silicate slag formed before blast has materially acted upon copper.

PROCESS OF REDUCING ORES.—No. 801,129; H. Arden, San Francisco, Cal.

Method of reducing finely divided ores which consists in mixing with ores carbonaceous matter, hydrocarbon, and water glass, forming mixture into coherent masses, coking masses, and finally reducing ores.

PROCESS OF PREPARING DUST ORES FOR BLAST FURNACES.—No. 801,143; H. E. Esch, Giessen, Germany.

Process of preparing ore dust of high fusibility for blast furnace which consists in feeding ore by rotating advancing action first through region of gradually increasing heat, and then into region where it is subjected to stream of ignited fuel mixed with easily fusible material, thereby agglomerating it, and finally removing resulting agglomerated masses.

MOLTEN METAL CONDUCTOR FOR CUPOLAS, ETC.—No. 801,453; C. L. Glover, Newcastle, Pa.

In combination with cupola or other furnace or vessel from which molten metal is drawn, upright conducting basin or vessel located to receive continuous outpour of molten metal, and having below top lateral discharge spout or trough, and mounted to turn on central vertical axis for pouring molten metal into different molds or receptacles, and capable of tilting on horizontal axis to raise up end of discharge spout during such turning for interrupting pouring, capacity of conducting vessel being sufficient to hold inflowing molten metal and prevent overflow during periods of interruption of discharging or pouring.

PROCESS FOR THE PRODUCTION OF METALS OF THE ALKALI GROUP BY ELECTROLYSIS.—No. 801,199; E. A. Ashcroft, Weston, via Runcorn, England.

The herein described process of producing sodium, which consists in electrolyzing preliminary electrolyte consisting of fused sodium chloride over cathode of fused lead and thereafter using fused sodium-lead alloy thus produced as anode, providing fused sodium-hydrate electrolyte for alloy of sodium-lead and directly producing sodium by dissolving it from anode by suitable current and depositing sodium at cathode with consuming secondary electrolyte.

APPARATUS FOR ELECTROSTATIC SEPARATION OF SUBSTANCES OF DIVERSE ELECTRIC SUSCEPTIBILITIES.—No. 801,380; C. H. Huff, Brockton, Mass.

In electrostatic separation, combination of repelling electrode, opposite electrode, means to intensify that concentration of lines of force in static field for which shape and proximity of electrodes are responsible, means to feed material to repelling electrode at region thereon of relatively low field intensity, repelling electrode being rotary to transplant material from point of delivery toward opposite electrode and into region of relatively high field intensity and divider to intercept particles of lower grade of conductivity during movement from repelling electrode.

PROCESS FOR TREATING PRECIOUS-METAL-BEARING MATERIALS.—No. 801,470; C. W. Merrill, Lead, S. D.

Improvements in treating precious-metal-bearing material containing reducing agents, with cyanogen bearing solutions consisting in first collecting material in container and after removal of liquid when present there from interstitial spaces, oxidizing all or part of reducing agent by means of oxygen of compressed air brought into contact with material in same container in which subsequent contact with cyanogen bearing solutions is to take place, and subsequently bringing cyanogen bearing solutions into contact with materials in container.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Former Congressman De Vries of California, now U. S. Appraiser, has returned to the East after an extensive Western trip, taking testimony in the cases of protests by different firms regarding the method followed by the United States officials in assay tests to ascertain the amount of lead in ores. In making these assays it is claimed that the percentage of lead in the dry sample taken is unfairly reckoned as the percentage of the whole lot or cargo. The claim is made by lead importers that the governmental method results in a heavier duty under the 1½ cent per pound tariff than were a different course pursued. The last testimony taken was at Kansas City, Mo., and Mr. De Vries will shortly issue a ruling in the case.

According to a recent report of the United States Geological Survey, the output of platinum in the United States increased from 110 ounces in 1903, valued at $2080, to 200 ounces, valued at $4160, in 1904. The price rose 10% during 1904. The scarcity of platinum, and the consequent rise in price, led to much energy on the part of Eastern smelters of platinum in urging upon the placer miners of the West the advisability of saving platinum in cleaning up the hydraulic mines. The outlook for increased production for 1905 is good, not only on account of the continued high price of platinum, but because of the investigation undertaken by the Geological Survey of the black sands of the Pacific slope and of the increased knowledge thus furnished to the miners in regard to the value of the platinum and to simple means of saving it. The world's total supply of platinum for the year amounted to about 300 kilograms, or 9625 troy ounces, from South America, and 6000 kilograms, or 192,500 troy ounces, from Russia. No production of platinum from Australia was reported. A slight product of both platinum and palladium from the Sudbury copper mines continues to come on the market, but it is not profitable to extract all of the platinum and palladium which these ores could furnish. Increased interest in the occurrence of platinum in hydraulic mines and dredges of the Fraser river is due principally to the fact that the natural alloy of iron and nickel previously found in Josephine county, Or., and in Del Norte county, Cal., has also been found in commercial quantity in the Fraser river at Lillooet. An interesting and new occurrence of platinum in place in Sumatra has been noted by Prof. L. S. Hundeshagen. All the American platinum came from California and Oregon, inasmuch as operations have been suspended in the Rambler copper mine, Wyoming, which furnished some platinum the year before. The imports of platinum into the United States during 1905 showed a decline of more than 8000 ounces, due to European control of the supply. The present prices are the highest that platinum has commanded in recent years.

ALASKA.

Judge Wickersham has delivered a mining decision that has wide application and settled the question as to what constitutes a discovery of mineral under the location laws. It was a four-sided fight for mining ground on Cripple creek at the mouth of Esther creek. It is a continuation, in a sense, of the Sturtevant case. In this the contention is between two groups, as well as against the individual locator — the Sturtevant case being a group against an individual. Here the groups overlap each other. The ground was first taken up as separate mining claims. Then came a group party and located the same ground, and another group party located adjoining ground, which overlapped this ground. Sturtevant was interested in No. 11, Esther creek, and his claim was included in the original group, but he was awarded the decision. The judge, in dismissing the case, said that he had lately come into possession of a ruling from the Supreme Court and this, together with the fact that he had become better acquainted with the conditions, made him feel disposed to modify some of the points laid down in former decisions. The principal interest is the fact that he indicates that one discovery for eight claims will no longer serve—there must be a discovery for every separate claim.

A new smelter is to be constructed on Windy arm, Alaska, according to T. M. Daulton. This smelter proposition is advanced by J. H. Conrad, who has properties on Windy arm. Discoveries made during the past summer make it necessary to have reduction works on the ground. In September a body of copper ore 60 feet in width is said to have been discovered across the arm.

ARIZONA.

Cochise County.

The Tombstone Con. is now sinking below the 800-foot level and no other stations will be cut until the 1000-foot level is struck. It is expected that it will take a year to reach the latter level and handle the water. A winze is being sunk and considerable native silver is being taken from the 400 and 700 levels.

E. G. Kennedy, general manager, and W. G. Barney, mining engineer of the Black Diamond Co., have started work at the mines of the company in the Dragoon mountains, near Tombstone.

Gila County.

Jos. C. Erman, general manager of the Live Oak M. Co., near Globe, has made a contract with the El Paso smelter to ship to that concern 40,000 tons of ore covering a period of eighteen months. The shipments call for not less than fifty tons daily of siliceous and sulphide ores in the proportion of two of the former to one of the latter.

The Arizona & Eastern Con. M. Co. has been formed to develop and operate the Patterson copper claims on Mineral creek, near Globe. E. L. DeLestry is general manager.

Graham County.

The New England Co. of Clifton has raised $100,000 for development purposes and work on an extensive scale is soon to be commenced. General Manager Ayling has gone East. Jacob King, E. M., is in charge of the property.

The output of the Arizona C. Co. for September was 1,972,000 pounds; the output of the Shannon C. Co. was 1,170,000 pounds of copper.

Mohave County.

(Special Correspondence).—The Pyramid mill is running steadily on ore from the Catharine mine. The mill has twelve stamps and is capable of handling 35 tons of ore daily. If the mill handles the ore successfully it will be improved and enlarged. It is operated by W. C. Howard and J. F. Littlefield.

Kingman, Oct 17.

The San Francisco mine, near Kingman, is to be equipped with a compressor and five machine drills. The main shaft is now down 500 feet and the drift from that level is in 425 feet to the north. A contract has been let to drive the drift ahead while the new plant is being put in.——About fifteen men are at work on the Pinkham and Midnight mines at Chloride. On the 230 level of the Pinkham drifts and crosscuts are being run. On the Midnight a crosscut is being driven to the south toward the main vein.——F. H. Griffith, general manager of the Minnesota-Connor mines, near Kingman, reports opening up ore bodies on the 400 and 500 levels. ——All leases on the Billy Bryan mine of the Gold Road group have been declared off and the company will hereafter operate the property.

Pima County.

The Michigan & Arizona Development Co. has decided to exercise its option on 100,000 shares of stock of the Helvetia C. Co., at Helvetia. The holder of the options considers that the development during the past year under the superintendency of F. B. Close justifies the exercise of the option. The general object now is to continue development; 12,000 tons of ore are blocked out.

Pinal County.

The mill of the Desert Queen mine, near Casa Grande, has made its first cleanup. The mill is a twenty-five-ton plant. Work on the mine was commenced the first of the year and it is expected to be a regular producer from now on. Chas. F. Wren is president of the company.

The Florence Mines Co. will put miners to work on the Brooklyn group, in the Ripsey district, near Florence, under the supervision of J. K. McCarthy.——Juan DeArmitt and J. A. Brady have opened a body of copper ore on their Champaign claim in the South Butte district, near Florence.——The Hotchkiss syndicate has ten men developing the Snyder claims, 40 miles from Winkleman station, on the Phœnix & Eastern, in the Banner mining district. N. H. Mellor is in charge of the work.——Superintendent E. R. Stafford of the Arizona Pacific Copper Co., of Woolley, near Florence, reports development work at the mine progressing. The main working shaft is down 40 feet, and a contract has been closed with Robert Pierce for continuing the shaft to the 550-foot level. It is the intention of the company to sink this shaft to the 1000-foot level as rapidly as possible.——James Crowley, who has a lease on the Vekol mine and mill, near Florence, has completed a profitable run.

Yavapai County.

(Special Correspondence).—The Douglas-Lacy mill, recently leased by Fennell & Davis, has resumed operations. Foreman Knight and six men are handling thirty tons daily of high-grade ore from the Gladstone mine, near McCabe, and expect to increase to sixty tons soon. The Gladstone mine is being developed under lease by C. G. Fennell. Eighty men are employed in and about the mine. A new electric dynamo is being placed on the 800, which will furnish power for the hoist to be used in the sinking of the main shaft to the 1000-foot level. The hoist on the surface has reached its capacity. By this arrangement the ore will be raised to a bin on the 800, from whence it will be raised by the other hoists to the surface.——The White G. M. Co., owning properties near Martinez, is putting up a 40-stamp mill, 13 miles from Wickenburg. Construction has stopped temporarily. The building for the mill is completed. In the meantime operations in the mine are progressing satisfactorily. The main tunnel is now in 585 feet, having gained a vertical depth of 600 feet. The tunnel runs alongside the ledge, which is crosscut occasionally. The winze or shaft is 80 feet below the tunnel, and it is 116 feet to the surface, making the total depth of the shaft 196 feet. From the tunnel to the surface the shaft has been timbered, and timbering from the tunnel down is in progress. A 12 H. P. gasoline hoist for the shaft has been received at the mine, so that the ore can be constantly removed as sinking in the shaft continues.——A strike of rich ore is reported in the R. A. M. mine, owned by G. E. Waddell and C. J. McNulty. The properties are on Little Copper creek, near Prescott.

Prescott, Oct. 16.

The capacity of the Richinbar stamp mill is to be increased and other improvements made that will facilitate the production of the mine on a larger scale. The motive power for the present 66 H. P. plant is furnished by water, but to this is to be added a battery of two 60 H. P. boilers to be operated by steam. One of these will always be in use, the other being for emergency. With the new equipment in place the Richinbar mill will handle 60 tons a day, and it can be increased to 70. There are 30,000 tons of ore blocked out. The new 50-ton cyanide plant is completed.

J. J. Carmichael, superintendent of the Pine Mountain M. Co., at Walker, expects to have his mill in operation Nov. 15. Since Aug. 1 he has sunk the shaft on the Pine Mountain mine from a depth of 520 feet and run a drift from the 500-foot level, where he cut a station and ran a drift 50 feet.

A new wagon road is being built from Turkey to Richenbar. At Richenbar ten stamps are to be added to the mill; there will also be concentrators, and a 100 H. P. steam plant will be put in. The Richenbar cyanide plant is ready to start up. Wm. Theisig of Turkey creek is putting in a 2-stamp mill.

E. Greenwood and E. Campbell have bonded from M. D. C. Putman the Express mine, near Poland.—— M. Canton, of Walker, has his main shaft on the north extension of the Amulet down 75 feet.——It is stated that a quartz mill and cyanide plant are to be placed on the Midnight-Test group, south of Prescott, in Groom Creek district.——The shaft on the Baumann Copper Co.'s Swiss Girl mine, at Dewey, is down about 460 feet.

J. Jackson has started work on the Copper Hill mines, south of Prescott in the Copper Basin district. A hoist is to be put in.——It is proposed to build a wagon road from Crown King to Tip Top. H. J. Newhouse, of Beloit, Wisconsin, E. J. Wager, of Prescott, and A. R. White, Jr., are looking over the route.

CALIFORNIA.

Amador County.

The Fremont M. Co., near Amador City, has built two restraining dams in the gulch leading from the mill to Dry creek to prevent sand from the mill filling up the gulch. ——Groom & Parson have discontinued the canvas plant below the Argonaut mill, near Jackson.

Calaveras County.

The Del Monte mill, near Railroad Flat, is kept running, and an addition of five stamps is being made, giving twelve in all.

Del Norte County.

Ore is being taken from the 200-foot level of the Monumental mine at Monumental.——The Elkhorn Placer M. Co. will start hydraulicking, near Monumental, as soon as there is enough water.

Kern County.

B. Ostick, who has a lease on the Merced mine, in the Stringer district, near Randsburg, is taking out rich ore. ——J. O. Balschweid and Y. Ray have a lease on the Pearl Wedge, in the Stringer district.——E. Shipsey and J. J. London are leasing on the Napoleon, in the Stringer district, and have uncovered a vein of high-grade ore. ——H. Giondoni and C. Taylor are leasing on the Little Butte, in the Stringer district.——Regarding tungsten properties near Randsburg, the Californian states that P. Mertz and M. C. Curran are working on the Opportunity and are taking out some very rich ore that goes as high as 72% tungsten. The ore is being sacked for shipment.——T. McCarthy and C. S. Taylor have received returns from a carload of tungsten ore which they shipped to Germany recently. It netted $8000 after paying freight and all other expenses.——McCarthy, Taylor and Grendoni are crosscutting at the 135-foot level in the La Cross mine to tap the rich body of ore believed to pass into the La Cross from the Sunshine. ——J. J. Osborn & Bro. are sinking a shaft on a fraction claim adjoining the La Cross and Sunshine mines.—— A. E. White, owner of the Sydney mines in the southwestern part of the district, which is known as White's camp, is working four men on the Sydney annex. The shaft is down 200 feet and a drift is being run.

Placer County.

Machine drills and an air compressor are to be put in at the Evening Star mine, near Auburn.

Plumas County.

The Alleghany M. Co.'s tunnel, now in 1300 feet, is being driven to tap the channel at the bottom.

Shasta County.

The Pittsburg & Mount Shasta M. Co., which owns the Little Nellie and Bennington mines, between Keswick and Iron Mountain, intends to develop the Bennington and will drive a 400-foot tunnel on the property at once.

The first furnace of the Mammoth C. Co.'s smelter at Kennet was blown in on October 16. Manager Frederick Lyon has returned from St. Louis, and is superintending the work. No. 3 furnace has been started first, No. 2 next, while No. 1 will be last to start up. The water jackets for No. 2 furnace are on their way. As soon as they arrive they will be put in place and this furnace started. The water jackets and machinery for No. 1 furnace are being made.

The Hiatt mine at Buckeye, near the Quartz Hill mine, is to be opened up by W. S. Haskens and associates of San Francisco.——October 26th has been the day set for the final transfer of the Balaklala mine to the White Knob Co., which now has a smelter at Mackay, Idaho. W. H. Brevort is manager.

Sierra County.

(Special Correspondence).—The gravel claims owned by Truman Clark, on the Middle Fork, were recently examined by T. B. Shepard, David Voss and M. C. Emerson of Nevada City.——C. F. Breed, K. C. Parrish and J. W. Hall of Chicago have finished their preliminary examination of the Comet mine in Jim Crow canyon, near Downieville.——The mines of the Sovereign G. M. Co., near Downieville, are being examined by W. J. Belcher.——R. Phelan is putting in an electric plant at Sierra City to furnish power and light for his properties.

Downieville, Oct. 17.

Siskiyou County.

Superintendent J. H. Tibbitts of the Headwater quartz mine, on Humbug, near Yreka, has started up the sawmill at the mine to secure lumber to build a 5-stamp mill.——The new quartz mill and cyanide plant at the Mono mine, on Punch creek, a tributary of Humbug, west of Yreka, has been completed.——W. A. Chamberlain has put in a large pump at the Black Lead mine, on Greenhorn, near Yreka. The Greenhorn Blue Gravel mine is to be worked by the Yreka Blue Gravel M. Co.

Stanislaus County.

J. T. Quinn of Stockton and J. L. Conrad of Knights Ferry plan to dredge the Stanislaus river for gold between Orange Blossom and Knights Ferry.

Trinity County.

The tunnel which will drain Trinity river for ¾ mile and with the aid of a deflecting dam will lay bare the river bed and enable miners to dig the gold that is supposed to be in the sands, is half completed. The works are at Horseshoe bend, and T. H. Seward, A. W. Lindsay and Henry Anderson have them in charge. The tunnel

when finished will be 430 feet long. In driving the tunnel a great quantity of talc has been cut, necessitating much timbering. Notwithstanding all difficulties, the work is half done.——On New River, 16 miles from Hawkins Bar and 65 miles from Eureka, several promising discoveries have been made this year.——The La Grange hydraulic mine, 4 miles from Weaverville, has made a larger output this year under the management of Pierre Bouery than during any previous season. The last cleanup amounted to $70,000. The water was recently turned off and new flumes are being put in preparatory to next season's work. Unusually low water has retarded mining greatly throughout the summer and fall within the watersheds of the Trinity and Klamath rivers.——The Hupp & McMurray placer, near Weaverville, has had a good run for the season.

The Hunter mine, on New River, has been purchased by Robert Hicks of Junction City and J. P. Hennessey of Tonopah. It is equipped with a 3-stamp mill and was owned by F. J. Ladd.

Tuolumne County.

The Big Creek G. M. Co., which recently purchased the Golden Rock ditch from the Merced G. M. Co., have sent General Manager L. R. Wiley of Bangor, Me., to Groveland and vicinity to superintend the work of putting the property in good condition. Men are cleaning out and repairing the ditches and flumes so as to be in position as soon as possible to supply various mines with water. —— The Harvard mine and 60-stamp mill on Whisky Hill, below Jamestown, was sold at public auction recently for $20,000 to W. R. Payson of San Francisco in behalf of J. E. Carroll of Boston.

COLORADO.

(Special Correspondence).—Oil is being reported from various sections of the State. The oil industry of this State, it would seem, could be made much greater than at present if it was properly handled. The Florence field, in Fremont county, seems to be the only district which is producing to any extent. Boulder field does not improve in activity. A couple of years ago the oil industry in Boulder county was at high tide, but a large majority of the companies operating at that time have retired from business. At Debeque, in Mesa county, several wells have been put down during the past year, but in each case the wells have been lost on account of a heavy flow of water, which the operators were unable to control. Some of the companies in this district have a long lease on certain property and are not operating the property but simply waiting until some of their neighbors develop ground in the district.——The old toll roads in the State are fast becoming the property of the county in which they are located. The last one reported to have gone from private hands to the county is near Silverton.

Denver, Oct. 16.

In an epitome of mining conditions in Colorado forecasting the final summary at the close of the current year, the Denver Post says that all signs indicate a material increase of production in both tonnage and value. The zinc output will be the largest on record, owing to the urgency of buyers and the advanced prices paid. The representatives of big zinc consumers at home and abroad have been urging the operators of mills in districts where that mineral is abundant to make special effort for its recovery; therefore a number of mills that hitherto have given it no attention have added proper devices to meet the demand. There has been marked improvement in Leadville, Cripple Creek, San Juan, San Miguel, Dolores, Summit, Gilpin and Clear Creek through the exposure of great ore bodies and in the facilities for mining and reduction. In Park county the London has come to the fore as one of the richest gold mines in the State. A number of idle properties have been started up and the prospect for better work in that section is very favorable. More mills, air compressors and tramways have been built for Colorado mines this year than in any previous time. Telluride is doing better than ever before and so is La Plata county. By reason of the important work done at Silver Plume, East Argentine and on Seaton mountain, the output of Clear Creek county, large as it has been this year, will be more than doubled next year. The same may be said of San Juan county, because the six or eight big mills now building there will be in action soon after next January. Ouray county is favored by a line of improvements at Red mountain and in various other parts of that extensive mining region that can not fail to produce heavily increased yields in the next twelve months. It is coming into its own again after twelve years of discouraging times. The Camp Bird is earning profits; the Revenue is on a better plane than for the last four years; the Crawford syndicate is pushing two big tunnels. The placer mines about Breckenridge, those in South Park, at Keystone, in San Miguel and on Clear Creek below Golden have all had very satisfactory success the past season.

Boulder County.

(Special Correspondence).—The Myrtle M. Co., A. T. Rautenberg manager, is putting in a 48-foot by 60-inch White-Howell roaster, made by the F. M. Davis Iron Works Co. of Denver. They expect to be operating about Oct. 25. Several other properties are doing considerable development work. The proper method of handling the ore has been a serious drawback to the camp, but the Myrtle people believe they have solved the problem, and if they are successful others will follow their example.

Ward, Oct. 16.

The report on the geology of Boulder district, published by the U. S. Geological Survey, describes a rectangle 16 miles north and south by 9 miles east and west. The city of Boulder is southwest of its center. The chief exploitation for oil has been near the center of the area, from 2 to 4 miles northeast of Boulder. It was necessary to make a careful study of areas at considerable distances from the oil wells, because the wells are located in the broad central portion of the district on the outcrop of the Pierre shales, which are in general so nonresistant and homogeneous that exposures of solid rock are rare. Ground water is found in this area at moderate depths. Within the area mapped granite has not yet been quarried or even studied with reference to its use as building stone. The great mass of the Fountain red rock is not adapted to building purposes. Locally, however, there are near its summit beds of the finest quality of structural stone. The Lyons sandstone is the most abundant rock of economic importance. The flagstone industry has its center at Lyons, 3 miles north of this area. Near Boulder the thickness of the beds is generally greater, and the stone is commonly quarried for building. The brick industry at Boulder is large. The development of oil and gas in the Boulder area began in 1901, though their presence was suspected and rumored as early as 1867. Development has been successful only within a limited area, the center of which is from 3 to 4 miles northeast of the city of Boulder and a little less than 3 miles east of the foothills. About 100 wells from 300 to over 3400 feet in depth have been drilled within 5 miles of the McKenzie and about twenty more are scattered over the area between Fort Collins and Golden. The oil production in 1903 amounted to 39,000 barrels.

Clear Creek County.

H. A. Riedel, acting for the Banner Consolidated Mine Co. of Idaho Springs, has a long-time lease and bond on the Donaldson mine on Trail creek. The Donaldson vein will be reached by the Rockford tunnel, which is owned by the Banner Co., 600 feet ahead of its present breast, and will cut the lode at a depth of 1000 feet below the bottom of the deepest shaft on the Donaldson, which is about 600 feet. The tunnel will drain the upper workings, making them accessible, as well as tapping the ore bodies. Machinery is being put in at the portal of the Rockford tunnel.

W. D. Hoover of Denver, owner of the East Griffith mine on Griffith mountain, near Georgetown, has had tests made to determine the best treatment of the ores and will put in a new mill. The East Griffith during the past year has shipped from 200 to 400 tons of smelting ore monthly. No attempt has been made to handle any of the milling ore and much material is blocked out in the various workings. The shaft is to be sunk 500 feet deeper. Drifts are being run from the 100 and 200-foot levels.——The American Sisters mine, near Georgetown, has made its first shipment under the present operators. The shaft is 265 feet deep, and, according to surveys, connection with the Jo Reynolds tunnel No. 4 will be made soon. Drifts are now being run from the 100, 200 and 250-foot levels by Jarbeau & White. —— Cottingham & Craycroft have taken a contract to sink the shaft on Edgar lode, near Georgetown, 50 feet deeper. This shaft is down 115 feet, and is expected to reach the junction of the Edgar, Rodgers and Junction lodes within the next 35 feet. —— The Maine and Phœnix mines, near Georgetown, are to be developed by the Scotia Mines Co. The property is on Sherman mountain. The incorporators are W. P. Jewell, A. W. Rich and A. C. McCall. —— J. Raymond and J. Molloy, owners of the Pinion and Annex properties on Griffith mountain, near Georgetown, have started development work.

The Loops Mines & Tunnel Co., which owns twenty-five claims on Republican mountain, near Georgetown, has retimbered the mouth of its tunnel and is making good headway in pushing the tunnel ahead. It has cut the Hamburg vein.——Winter supplies have been taken to the mines operated by the Silver Plume M. Co.

Gilpin County.

(Special Correspondence).—The Pozo mine in Nevadaville, owned by W. J. Lewis of Central City, is being operated under lease by A. M. Rucker and associates. About fifteen carloads of ore per month are being taken out. The ore runs as high as 35% zinc by the carload. It also carries gold, silver, lead, copper and iron, and is shipped direct to the Lanyon Zinc Co. in Kansas. The ore is handled principally for the zinc it contains.

Central City, Oct. 16.

Gunnison County.

An electric hoist is being put in at the West Gold Hill mines, near Tin Cup. A crusher and rolls being added to the mill will increase the capacity to 100 tons.

Lake County.

The Norton sampling works and zinc mill, owned by H. H. Norton, in the western part of Leadville, were destroyed by fire October 8, involving a loss of $100,000. There was no insurance. The sampling works were built in 1878 by Eddy & James.

In the Mosquito range section, near Leadville, the Winchell has taken out sixty tons of ore from the 20-foot shaft. The Moffat and New York tunnels are being driven steadily ahead. The London is shipping the usual amount of ore.——On the east side of Fryer hill most of the ore comes from the claims controlled by the Fryer Hills mines, the El Paso, Jimmy Lee, Cora Belle and Bangkok and Silver. Both siliceous and sulphide ores are being hoisted. M. O'Brien and J. Ahern, leasing on the north end of the Chrysolite, are shipping steadily a fair grade of iron.

Routt County.

L. A. Pease, of the Boston-Sierra Madre M. Co. of Three Forks, Snake river, near Hahns Peak, has gone East to arrange for a concentrator on the company's property. The Three Forks mining properties are in Colorado and Wyoming. The concentrates will be shipped from Rawlins, Wyo.——The Elkhorn mine, near Columbine, is being worked. A shaft has been put down 150 feet.——The Slavonia district is on the headwaters of the Middle fork of Elk river, 20 miles northeast of Hahns peak, and extends from the upper edge of Hinman park to Mount Zirkel on the Continental divide, the distance being 12 miles in length by 10 miles in width, with its upper confines closely approaching the Larimer county line.——The Martha Vranesich will be developed this winter by a new tunnel at a lower level to strike the vein at a depth of 350 feet, when a shaft will be put down 50 feet to water level. This shaft is expected to develop copper ore.

Saguache County.

The Rollay M. Co., with E. Y. Burns of Alder as superintendent, has let a contract to J. J. Hand of Cripple Creek for 500 feet of sinking. The company employs twenty-five men.——The Chicago M. & S. Co., with John Wisdom superintendent, is operating a claim on Spring creek, 5 miles south of Alder. It is driving a tunnel to tap a vein that the company has opened by a shaft from which the company has shipped several cars of ore. The big tunnel is in about 900 feet.

San Juan County.

The Frisco Mines & Tunnel Co. has given a contract to Richard Whinnerah for a 5000-foot tunnel, 6x7½ feet in the clear, with waterways and pipe lines, to be run through Houghton mountain, in the Mineral Point and Animas Forks districts, 12 miles north of Silverton. The price to be received by Mr. Whinnerah for the work is $16.50 per running foot. The contractor binds himself to make at least 180 feet of bore per month. A 6-drill air compressor and Ingersoll-Sargeant drills, steam boiler and engine have been put in. On the ground of the Frisco Mines & Tunnel Co. on Houghton mountain there are rich mineral veins which will be cut by the proposed bore. The tunnel when completed will afford easy transportation of the ores of the various veins to the Ouray side of the mountain for treatment at the mill to be built by the company, and ultimately the tunnel will be made use of as a carrier for passengers as well as for the product of other mines.

The management of the Bullion Mountain M. Co. with claims in the Needleton district, south of Silverton, after a summer's work with successful results, have closed the property down for the winter, with the intention of resuming operations in the spring. Several other properties in the district will probably continue work all winter, among them being that of the Aztec G. & C. Co.

H. M. Bennett's lease on the Shenandoah No. 3, on King Solomon mountain, near Silverton, is shipping two carloads per week to the Durango smelter. A hoist has been put in and water which threatened to flood the workings is under control.——Milwaukee capitalists have bought claims near the summit of Galena mountain, between the Ridgeway and the Anti-Periodic groups. As soon as new surveys and plats of the territory are completed, the owners intend to develop them. Work on the group will be continued all winter under the supervision of F. E. Schurman of Silverton.

Summit County.

The Morning Star lode, on Mount Baldy, near Breckenridge, which is being operated by Condon & Shrock, is keeping one team hauling ore to the sampler at Breckenridge.

The new stamp and concentrating mill of the Laurium mine in Illinois gulch, near Breckenridge, has been completed and is running day and night on the crude ore from the large veins recently opened by the 1600-foot tunnel and its branches by Niles & Walker. The mill is said to handle about twenty tons of crude ore per twenty-four hours, and reduces five tons of crude ore that assays $7 per ton into a ton of concentrates. Besides the silver and gold contained in the ore, the concentrate carries sufficient lead and iron sulphides to make it of a desirable grade for smelting. An upraise is being driven at the breast, 1640 feet from the portal of the tunnel, on a 2-foot wide streak of partly oxidized smelting ore.

The Mary Verna and the North American companies, near Breckenridge, both of which were organized and floated by J. E. Parker of Memphis, Tenn., have let a contract for a $12,000 power and drill plant to the J. G. Leyner Engineering Co. of Denver, Colo. The plant is to be driven by water power in the Ten-Mile canyon, near Frisco. The same plant is designed to supply the mines of both companies with light and power.

Teller County.

The shaft at the City of Cripple Creek mine is down 415 feet. A drift has been started north toward the First National. —— Preparations are being made by the Omaha Leasing Co. for putting in a larger hoisting plant on the Dexter. It will be placed behind the plant in use, which is proving inadequte. Ore is being raised from the second and third levels and additions are to be made to the shaft. —— Machinery has been put in by J. Jolly, superintendent for the Beacon Hill Leasing Co., on the Robert H. claim on the west slope of Beacon hill. The plant will be used in continuing the shaft, which is down 70 feet. —— It is proposed to sink the Pharmacist shaft, near Cripple Creek, from the 650 to the 1000-foot level. Marshal Bowers is leasing the property.

An adit being driven into the Blue Bell property of Gold hill, Cripple Creek, by a leasing company, is in 650 feet from the portal.

Engineer D. W. Brunton made his report to the mine owners on the proposed drainage tunnel for the Cripple Creek district on October 14. Brunton's plan is to run the new drainage tunnel from Window in the Rock, on Cripple creek, 3½ miles from the El Paso mine. Should the tunnel be extended to the west side of the camp, or to the Vindicator mine, the extreme length of the tunnel will be nearly 6 miles. The tunnel level, as proposed, will be at an altitude of 7660 feet, or 1130 feet below the present El Paso drainage tunnel. The cost of the new tunnel is estimated at $510,000. Engineer Brunton's report was discussed and a decision deferred to the next meeting, which is subject to call. The Rocky Mountain News deduces that the Window in the Rock plan would give 350 feet greater depth at an additional cost of $80,000 over the Gatch park scheme, or only $228 additional vertical foot of ground drained. The tunnel which Engineer Brunton favors would have an elevation of 7660 feet at its portal, as against an elevation of 8020 feet for the Gatch park plan, or 8160 feet for the Cape Horn location. It would drain to a depth of 1130 feet below the present Cripple Creek drainage tunnel. A depth of 1000 feet would be gained and the cost per vertical foot of depth drained would be only $468, as against $581 for the Gatch park tunnel and $628 for the Cape Horn project. The entire cost of the tunnel would be $510,000. It is figured that the Gatch park scheme would take $430,000 to put it through and the Cape Horn $380,000. It would take 2½ years to construct the Window Rock tunnel. Brunton says that the tunnel should cross the eruptive area from the El Paso to the Vindicator mine. The scheme he favors would make the distance from the portal to the El Paso shaft 17,200. He states it is not necessary to crosscut the entire distance to drain it, although the extra expenditure would be justified by

the combined advantages of draining, ventilation and prospecting. The shortest routes to the productive area are found in the Cripple Creek canyon; that while Wilson creek affords some excellent tunnel sites at 8100 feet, the distance to the Gold Coin shaft would be 17,900 feet, and it would be 20,500 feet before the igneous rock is reached to begin drainage. The same result could be obtained, he says, from Cripple Creek a distance of 5000 feet shorter. Engineer Brunton submitted his report at the meeting of the Cripple Creek mine owners, held at the offices of the Elkton Consolidated M. & M. Co. E. A. Colburn of Denver was chairman and A. E. Carlton of Cripple Creek secretary. No definite action was taken regarding the selection of a plan, but a committee was appointed to have the report printed and distributed to the owners for their personal consideration. This committee is composed of Frank G. Peck, representing the Portland: S. S. Bernard of the El Paso and William Lloyd of the Stratton estate. The report was accepted. Brunton was tendered a vote of thanks for the thoroughness with which he treated the matter, his report being a very exhaustive document. The following figures showing the cost and dimensions of the three projects considered were submitted by Engineer Brunton: Cape Horn tunnel, elevation of portal, 8160 feet. Depth below the Cripple Creek drainage tunnel, 630 feet. Distance to the El Paso shaft, 12,840 feet. Distance to the main water channel, 13,840 feet. Distance from the portal to tunnel shaft, 8840 feet. Depth of tunnel shaft, 650 feet. Length of time to complete tunnel, 1.97 years. Cost $380,000. Depth gained 605 feet. Cost per vertical foot of depth drained, $628. Gatch park tunnel: Elevation of portal, 8020 feet. Depth below Cripple Creek drainage tunnel, 770 feet. Distance to El Paso shaft, 14,550 feet. Distance to main water channels, 15,550 feet. Distance from portal to tunnel shafts, 10,570 feet. Depth of tunnel shaft, 880 feet. Length of time to complete tunnel, 2.1/4 years. Cost $430,000. Depth gained, 740 feet. Cost per vertical foot of depth drained, $581. The Window Rock tunnel: Elevation of portal, 7660 feet. Depth below the Cripple Creek drainage tunnel, 1130 feet. Distance to El Paso shaft, 17,200 feet. Distance to main water channel, 18,200 feet. Distance from portal to tunnel shaft, 12,690 feet. Depth of tunnel shaft, 1140 feet. Length of time to complete tunnel, 2½ years. Cost $510,000. Depth gained, 1090 feet. Cost per vertical foot of depth drained, $468.

Two rich finds of ore have been made in the American Eagles mine, on Bull hill, Cripple Creek. In the first level south of the shaft in the back of an old level, 4 feet of mineral is being broken. The other find was made in the second level, and consists of a flat vein.——A. O. Keener, who has a sublease on the Old Summit mine, on Globe hill, has opened a new ore shoot.——The shaft on the Empire State, of the Isabella Co., is down 1100 feet, and at the depth of 1120 feet sinking will be stopped temporarily to permit of levels being driven. A depth of 400 feet has been reached by the Exposition Mines & Leasing Co. in the South Burns shaft of the Acacia Co., on the east slope of Bull hill, Cripple Creek. As soon as a station is cut, sinking will be resumed. The shaft will be continued to a depth of 600 feet.

IDAHO.

Elmore County.

T. J. Brownfield of Lincoln, Neb., is developing the Mary Glenn and Old Sam properties in the Skeleton Creek mining district. A 500-foot tunnel being driven on the Mary Glenn is in 350 feet. On the Old Sam nearly 500 feet of tunnel work has been completed. One well defined ledge and several good stringers have been cut, and recently another ledge, ranging from 4 feet to 7 feet in width, has been discovered. The Skeleton Creek district is on the South Boise drainage, 14 miles by trail east of Atlanta.

The cyanide plant that has recently been put in the Franklin mine at Pine is in operation. It will be used for the tailings from the mill and also on the old tailings dump that has been accumulating at the mine for some time past.

Shoshone County.

It is reported that the Federal M. & S. Co. has bought the Morning mine of Larson & Greenough at Mullan. They have been under bond for $3,000,000. The Morning mine consists of a large group of claims of which the principal ones are the Morning, Evening, Grouse and You Like. These mines are at present worked through the No. 5 tunnel which taps the various ore bodies at a depth of about 1000 feet. The No. 6 tunnel, which was projected to tap these ledges at a depth of 1000 feet below the No. 5 level, recently cut the You Like vein and opened up big chutes of shipping ore and high grade milling ore. It has 1000 feet yet to run to tap the Morning vein. A shaft has been sunk on the Morning vein from the No. 5 level to a depth of 600 feet. On the 200 and 400-foot levels of this shaft drifts have been run on the ledge. The mine is equipped with a 40-drill compressor plant, a 1000-ton concentrator and a narrow gauge railway from the mill to the mine.

James Bond of Black Bear has leased the Argentine mine, 2½ miles west of Wallace.——It is expected that the Hercules 300-ton concentrator near Burke will be completed and ready for operation by November 1. It will be operated by electric power from Spokane. The power line to the mill has just been completed.——The Monarch concentrator near Wallace has been closed down and will not resume operations until there are better transportation facilities. About 20 men are employed at the mine on development work.

Washington County.

In the Rapid River section, near Iron Springs, the Great Northern Mining, Milling & Development Co. has bought the Pedro No. 1 and Pedro No. 2 from W. L. Doiling and C. S. McMillan.

MICHIGAN.

Houghton County.

It is reported that the Calumet & Hecla Co. has purchased a large interest in the Superior copper mine, south of the Isle Royale and operating on the Baltic lode.

MISSOURI.

Jasper County.

The Joplin News-Herald reports that the Billy M. Co., operating on the Teel land near the old Log Cabin mine at Duenweg, have made a rich strike of lead ore. In sinking the shaft a distance of 18 inches in the ore, 1500 pounds of lead are said to have been taken out. There have been a number of good lead strikes in this locality recently, which was at one time the most famous lead diggings in the district.——Two new strikes of ore are reported this week from the Rob Roy lease, south of Joplin—one by Hendry, Blanchard and associates on a two-lot lease just west of the lease of the Togo M. Co., with good ore at 60 feet; the other by G. M. Keller of Joplin and Webb City associates on a two-lot lease south of the Mike the Duck mine, where silicate was struck at 45 feet. Good zinc was shown by the drill at 63 feet, the silicate not being indicated by the drill.

Newton County.

The Auburn M. Co., composed of Chicago and Joplin parties, have secured leases and fees on 1412 acres of land near Spring City and will at once begin mining operations. The company has a shaft down to a good body of ore at this place; but as the pump drained a large section of the country, the company wished to secure control of it also.

MONTANA.

Beaverhead County.

The Silver Fissure M. Co., which is operating the Polaris mine, 40 miles from Dillon, is preparing to haul its smelter machinery from the railroad to the mine with a traction engine. They are grading the road between Red Rock and the mine. J. J. Cusick of Butte is in charge of the work. The engine will have a hauling capacity of 100,000 pounds, and in addition to hauling in machinery, it will be used afterward for transporting coke from the railroad to the plant and hauling matte from the plant to the road.

Fergus County.

About thirty men are employed by the New Mines Sapphire Co. in the Yogo district, near Lewiston. Charles Gadsden is the superintendent, Wallace Danforth mine foreman, and H. E. Maltby timberman. Two shifts are employed in sluicing and cleanups are made four times a day. A shaft has been sunk 100 feet, from which drifts are run to reach the lead. The rock in which the stones are imbedded is raised from the mine by a steam hoist and dumped in piles from the ore carts. It is then saturated with water and left to decompose, after which it is worked through sluice boxes containing riffles. The gravel is placed in a rocker, which has screens of different sized meshes. After the finest screen has been used the cleanup is placed in sacks or boxes and stored away, to be eventually looked over for the sapphires contained therein. The New Mines sapphires are shipped to London, where they are cut, polished and prepared for market. Work in the mine will be continued all winter and sluicing as long as water can be had.

Granite County.

The Goff concentrator, at Garnet, has recently made a shipment of several tons of concentrates to the smelter at Helena.——Having unwatered the property to the bottom of the 150-foot level, Superintendent Illingworth, who is in charge of the Copper Cliff mines, near Garnet, began stoping in the level, and is taking out some high-grade copper ore.——A new lease has been given on the Nancy Hanks, near Garnet, to Thienes and Lowery. They will sink an incline shaft.——C. D. and D. McPherson, who have a bond and lease on the Daisy claims, between Garnet and Top of Deep, have opened a strong lead in the tunnel which they have been driving.

Lewis and Clarke County.

Manager F. M. Smith, of the East Helena plant of the American S. & R. Co., states that the price of lead paid at this smelter for lead in ores has been over 2 cents per pound for 90% of the lead contents. This price is equivalent to a quotation of $3.50 per cwt., less 1½ cent per pound for 90% of the lead contents. Beginning with Monday, October 9, they will pay for lead in ores on the following basis, when the lead is 5% or over: For 90% of the lead contents 90% of the average sales price in New York for common desilverized domestic lead in 50-ton lots, as made by the American S. & R. Co., during the week preceding date of settlement of the lot in question, less 1½ cent per pound, so long as such selling price shall be $4 per cwt. or over. Should such price exceed $4 per cwt., then the price to be paid in settlement would be 90% of $4, less 1½ cent. For example: The selling price of domestic lead in New York is $4.85 per cwt.; 90% of $4 equals $3.60; plus one-half the difference over $4 (42½ cents) equals $4.42½ per cwt.; less 1½ cent per pound equals $2.52½ per cwt. Therefore, instead of paying $2 per cwt. or 2 cents per pound for lead as heretofore, they will pay $2.52½ so long as lead is selling at $4.85 in New York.

Missoula County.

H. J. Rossi and H. J. Read of Wallace has bought the Monitor mine, and will proceed with active work with a large force. E. P. Spalding, manager of the Monarch mine at Murray, will act as consulting engineer. The Monitor is a copper-gold mine, near Saltese, Mont.

Silver Bow County.

The blast furnace of the Pittsburg & Montana Copper Co., with which the company has been making matte since the old blower gave out, is in operation again. It had been closed down a few days to permit of some changes in the manner of getting rid of the slag. In the first place the company had a centrifugal arrangement for carrying the slag outside of the building, but it gave out, and Manager Baggaley decided to install a system like that in use in other smelters.

The plant of the Montana Zinc Co., which is the old 60-stamp mill of the Alice Co. in Walkerville, has been started up again. The mill was closed down recently because of an inadequate water supply. A pipe line has been put in near the Lexington mine, where it is connected with the hill system of the Butte Water Co. to the mill. The company has on hand about 1000 tons of ore from the Lexington mine on which to resume operations. The company expects to run between 80 and 100 tons per day through the mill. The zinc saved from this product aggregates 45% or 50% in addition to which there is some iron and lead, and also some gold and silver in the zinc. The company is figuring on adding machinery that will make the total zinc product 80% instead of 50.

NEVADA.

Esmeralda County.

The Goldfield Custom Mill Co. has been incorporated under the laws of the State of Nevada to build a 20-stamp mill at Gold Center. M. G. Rhodes is president and H. H. Hubbard secretary.

Lincoln County.

Sinking has been resumed at the Pompeii mine, near Searchlight. The mine will be opened up by drifts, crosscuts and upraises, and if the showing to the 600-foot depth is as satisfactory as indicated in the present workings a double compartment shaft will be sunk west of the present gallows frame. This will be used as the main shaft of the mine, the present shaft being used for air.——At the Searchlight M. & M. Co.'s property sinking has been resumed. The water supply is steadily increasing and is now of sufficient volume to keep the mill running continuously. The new pump is handling the flow satisfactorily.——W. R. Gosewisch, president of the New Era M. Co., will sink 200 feet on a new discovery and then drift north towards the main shaft, on the same level, till the two connect. Pumping machinery is to be put in.——E. J. Roberts, manager of the Eldorado-Nevada M. & M. Co., operating the Silver Legion mine at Knob Hill, has started development work.——The new 500-foot working shaft in the Rand ledge has been started by the Black Hawk M. Co. of Eldorado Canyon.

Lyon County.

Ely & McSorley intend to put in a 100-stamp mill and cyanide plant at the Hulley Logan mine, near Como.——The purchasers of the Haywood mine, near Silver City, will also put in a large milling plant.

Nye County.

The Four Ace M. Co. has started a shaft near the base of the south end of Montgomery mountain, near Bullfrog. T. Kilker is superintendent and E. W. Griffith is manager.——The Big Bullfrog double compartment shaft is down 110 feet. A. L. Fontana is superintendent.

NEW MEXICO.

Grant County.

Ground is being graded for the extension to be made to the 200-ton concentrator of the Burro Mountain Copper Co. at Leopold. Twelve additional Wilfley tables and Frue vanners will be put in.

The North American Co. is sinking on the Cobre Negro property, near Lordsburg. The work is being done on the main shaft and is under the supervision of W. E. Hockie.——The Morning Star Co. has decided to sink a development shaft on the Atlantic mine, near Lordsburg. A depth of 800 feet is the intention.

Ground is being graded for the extension to be made to the 200-ton concentrator of the Burro Mountain Copper Co. at Leopold.——Metcalf & Mungaul, working a silver-lead property at Camp Fleming, have netted 191 ounces of silver and 21% lead, or $206.77, from a test shipment of 5300 pounds to the smelter at El Paso.——At Fierro the Hermosa Copper Co. has added twenty-five men to its force; the Phelps-Dodge Co. is employing twenty-five men on the Hanover dump and in the Hanover mine.——The Colorado Fuel & Iron Co. has employed 100 laborers from Mexico in its mines at Union hill and is increasing this force.

OREGON.

Baker County.

Manager E. I. Field of the United Elkhorn mine, near Baker City, says that a drift is being extended on the 400 level of the shaft workings. This work is opening the same shoot that has been explored on the 300, 200 and 100 levels. On the No. 3 level the manager says that he is breaking three sets in width, as the shoot has widened at that depth and the grade of ore is excellent. The milling plant continues to deliver about fifteen tons of concentrates daily at Baker City for the Sumpter smelter. The crosscut which is to open the Baisley vein system at a depth of 1200 feet is being driven.—— A 3-drill compressor is being placed on the Ben Pierce property, Little Salmon district, near Greenhorn. A crosscut is to be driven to open the vein at a depth of 500 feet. O. E. Connors and O. Binkley have an option on this property and expect to work it steadily.——H. H. Ames, one of the owners of the Morning mine, near Tipton, says that the crosscut of the Morning mine may be opening the Fairview ore shoot at a depth of 200 feet below upper workings. This crosscut is on the mill level.

The Don Juan 10-stamp mill, near Greenhorn, has been started by Ellis & Ludwig.

Josephine County.

A. Jeldness of Grants Pass has put men to work at the Blue Ledge copper mines at the head of Applegate river. J. F. Reddy of Jacksonville is interested.

UTAH.

Juab County.

The Supreme Court of Utah has decided in favor of the Grand Central M. Co. in its long-pending litigation with the Mammoth M. Co. Both properties are in the Tintic district. The opinion affirms the decision given by Judge Marioneaux in the District Court for Juab county. The action was begun in September, 1899, by the Grand Central M. Co. against the Mammoth M. Co. to recover $300,000 alleged to be due because of the extraction of 6000 tons of ore by defendant from the Silveropolis mining claim, owned by the plaintiff company. The defendant set up a counter claim, alleging that the ore bodies were in a vein which had its apex in U. S. lot No. 38, which is in Mammoth territory. The issues were tried out on the claim to the apex, and in this Judge Marioneaux, in District Court, ruled in favor

of the Grand Central. The case was first tried before Judge Higgins, who ruled in favor of the Grand Central. But a new trial was granted by Judge Marioneaux, with the result stated. Upon the determination of this point rested the action for damages for the extraction of ore. Judge Bartch's opinion enters with great detail into the testimony of the experts on the case, and into mining laws in general. The gist of the opinion is that the case is largely one of evidence, and on this he rules that the weight is in favor of the Grand Central's contention as to the Silveropolis claim, and while the lower court may have erred in some particulars, his decision must be sustained on the main points in question. The decision covers only the question of title to the ground in dispute, which is awarded to the Grand Central Co., the matter of the $300,000 alleged damages for ores claimed to have been extracted from the ground now awarded to the Grand Central having been held in abeyance until the determination of the question of title. There is another and similar action pending in the Federal court, which had been brought there because of the reincorporation of the Grand Central Co. under the laws of another State.

The ore shipments from Tintic district for the week ending October 13 were: Bullion-Beck, 4; Centennial-Eureka, 58; Gemini, 11; Victoria, 3; Grand Central 7; Black Jack, 1; Mammoth, 8; Ajax, 4; Carisa, 4; Swansea, 6; Eagle and Blue Bell, 8; Eureka Hill (lease) 2; Star Consolidated, 2; Uncle Sam Consolidated, 4; total 127. Concentrates: May Day jigs, 22; Uncle Sam mill, 1; total, 23.

Work has been resumed at the Raymond mine, near Eureka.——A 75-ton mill is to be put in at the Godiva mine, at Eureka. J. C. McChrystal is manager.

Salt Lake County.

The Shawmut Consolidated Copper Co., of Bingham, has decided to push development work just as soon as the mine is unwatered. Superintendent F. A. Darrenougue is in charge of the property and has ordered new machinery. The Crown Point shaft, now 230 feet deep, will be sunk to a depth of 800 feet. S. H. Williams of Boston is general manager.——A new hoist is to be put in at the Bingham Mary.

A. Van Patten, president of the New York & Great Western M. & D. Co., has made arrangements to resume work at the Bazouk mine, Bingham.

Tooele County.

The Eastern & Western G. & C. Co., has been formed to operate claims at Ophir. James Quinn, superintendent of the Buckhorn mine, and Mark Lumb are the owners of the ground.

WASHINGTON.

Ferry County.

A tunnel has been started on the Trojan property, on the summit of the northern end of Toulon mountain. According to the surveyor's figures, the length of the new tunnel will be 775 feet in order to reach the ore body, and will give a vertical depth of 450 feet, cutting the ore body 250 feet lower than tunnel No. 2, which cuts the main ledge 400 feet in from its portal.

WYOMING.

Carbon County.

E. K. Hum, general manager of the Ferris-Haggarty mine, tramway and smelter at Encampment, reports that the Ferris-Haggarty mine has closed down for the winter, but will be opened again as soon as the proposed new railroad is completed to Encampment next April. This action was taken because of the great expense of getting coke into the camp and hauling the copper to the railroad. The big reduction works will continue to run until the ore now in the bins has been exhausted.

FOREIGN.

AUSTRALIA.

Victoria.

The regulations for testing the qualifications of mine managers, under the Victorian Mining Act of 1904, have been published. They provide that every candidate for a certificate must produce evidence as follows: For first-class certificates as mining manager, 5 years' practical mining experience, and be 25 years of age; second-class mining manager's certificate, 3 years' practical mining experience, and be 23 years of age; underground foreman's certificate, 2 years' practical mining experience, and be 21 years of age; battery manager's certificate, 1 year in charge of works or under a competent manager, and be 21 years of age; for a certificate as cyanide works manager, 1 year in charge of works or under a competent manager, and be 20 years of age; for certificate as chlorination works manager, 1 year in charge of works or under a competent manager, and be 20 years of age. In addition to this, candidates must either undergo an examination, or produce a certificate of having passed the requisite examinations of any school of mines or institution approved by the board of examiners for mining managers. The standards for examinations are extremely comprehensive, and cover a wide field.

CANADA.

BRITISH COLUMBIA.

Boundary District.

It was recently announced that the directorate of the Dominion Copper Co. have decided to build their smelter on the North Fork river, ½ mile above the Granby smelter. It has been generally thought that the Morrissey creek situation was the favorite, but it has been learned that by building above the Granby smelter no damage by smoke would be done to any fruit farms, which was feared if the other location had been taken. The new plant will have six furnaces to commence with, with one large stack. The entire plant will cost $750,000, and will take a year and a half to complete.

East Kootenay District.

W. F. Collins, of Perry creek, is preparing to work a bar opposite Old Town, and for this purpose is constructing a flume.

Slocan District.

The Canadian Metal Co. has secured control of the Pilot Bay smelter and of the Bluebell mine, and will begin operations as soon as possible. It has been decided to operate the concentrator at Pilot Bay as soon as it can be restored to working order after seven years' idleness. The company now has two plants, the newly constructed one at Frank and the one at Pilot Bay. It is probable that the Frank plant will be reserved for the treatment of silver and lead ores, to which it can easily and readily be adapted, and that the Pilot Bay smelter will treat zinc ores exclusively. Work on the concentrator has been started. The ore of the Bluebell mine, already available, will supply material for operation for a considerable length of time. The company, however, already has control of many other zinc properties of proved extent and value.

Vancouver Island.

(Special Correspondence).—The Tyee Copper Co.'s smelter ran 11 days in September, and treated 1919 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $35,019.24.

Duncan's Station, B. C., Oct. 16.

West Kootenay District.

At the Silver Cup mine, near Five Mile, development is being pushed by twenty-five men. A flume is being built to supply water power to the compressor.

MEXICO.

Chihuahua.

The shaft of the San Cristobal, near Parral, is being unwatered with the new 150-gallon bucket and work on the 5th level is being pushed both to the north and south.

The Pinos Altos mill, near Chihuahua, will be put in operation just as soon as the cyanide tanks can be placed in position. Ore has been opened up on the eighteenth level.

The State Government has issued new regulations regarding the taxes on ores. Briefly summarized they state that the value of metals shall be the basis of all taxes. Silver and gold in bars or bulk pay 1½% of their value. When gold or silver are brought to the Federal assay office in Chihuahua the payment of taxes shall be made to the State Treasurer; otherwise, to the tax office of the district whence it came. When the exact value of the gold or silver is not known, the owner can make bond or deposit to the satisfaction of the tax collector, together with a manifest of the number of bars, exact weight and approximate value. When gold and silver are taken from the place of production without compliance with the foregoing articles, such violations are punishable, as provided in the Ley de Hacienda. Ores and metals extracted for reduction in and out of the State for transportation will be taxed on the total value, according to the testing works' liquidations. Included in this valuation are all metals which pay charges according to Article 120 of the Law of Hacienda. Owners or managers before shipping will make a manifest of the exact weight and approximate value before the metals or ores will be allowed to be shipped and the tax office guaranteed the tax by bond or deposit. The State Executive will accept igualas for imports on metals when asked for on the following basis: When the value of the metals contained is $50 or over per ton, 1½%; when the value is $40 and less than $50 per ton, 1¾%; when $30 and less than $40 per ton, 1½%; when the values are less than $30 per ton, 1%. Crushed ore and concentrates will be taxed 1% of their metallic value. To procure an iguala it will be necessary to make a bond to the State Treasurer to the value per year of the tax. Having procured a bond, the recipient thereof will make manifestations. The agencies of reduction plants and the offices of metals buying agencies are obliged to make monthly statements to the tax office in the districts in which they are located. These statements must specify where the consignments are made, the value of the metals in dollars, and the names of the owners. For any violation of this rule the ores will not be permitted to be transported.

Durango.

The Guanacevi Tunnel Co. of Guanacevi will put in air drills. This company have placed a new boiler and hoist on a rich gold vein, which they are now developing at a depth of 120 feet. —— The 300-ton mill which is being built near Guanacevi for the treatment of the product from the Soto group will be started Nov. 15.

Jalisco.

The Mexican Premier Syndicate, Ltd., has taken over the Gachupinas mine, in the Hostotipaquillo district, together with the La Cruz del Sur and Saturno mines in the same district, and it is not unlikely that the America mine of D. B. Nichols and W. J. Payne will be acquired. Operations at the Gachupinas mine are being conducted under the management of D. B. Nichols.——B. H. Hammett of Guadalajara, accompanied by G. J. Snook of Akron, Ohio, president of the Castana M. Co., and H. H. Slater of Cleveland, Ohio, are examining their placers in the Pihuamo district. A hydraulic elevator has been put in and operations will be commenced at once. A dam has been built across the Belem river for storage purposes and a pipe line to carry water from the river 2 miles to the placer has been constructed.

Zacatecas.

The work of unwatering the old San Rafael Grande mine, which extends under Zacatecas, is in progress, and water from the old workings is being supplied to the city of Zacatecas under the contract entered into by the Stilwell Co. and the State Government. The contract specified that the mining operations of the company should be exempted from taxation in return for supplying water to the State capital. The company is headed by Arthur E. Stilwell, president of the Kansas City, Mexico & Orient Railroad. It is estimated that it will cost at least $75,000 to unwater the San Rafael Grande. The mine was at one time one of the greatest producers in Mexico, and it is believed that when the mine is cleared of water and sinking operations are commenced below the old workings rich ore will be again found. The mine is being operated in the upper levels, but the ore there is low grade.

NEW ZEALAND.

According to the Mining Journal, the three Smith-Davidsen mills at the Waihi Co.'s 90-stamp mill at Waihi are doing excellent work, and pulverizing beyond expectations. E. G. Banks, the company's metallurgist, reports that in the earlier working the mills were set the task of grinding the whole of the coarse sands passed through a 25-mesh from ninety stamps. Since then the 20-mesh has been adopted, and the management are pleased to discover that the coarser the sand the mills have to deal with the more effectively and finer they crush. One would naturally surmise that the fine sands from a forty mesh would receive a finer grinding than if the mill had to deal with the coarse sand from the twenty mesh. Not so, however; for the mills grind more rapidly and much finer when the sands are coarse. The importance of the above fact lies in its bearing on the future rapid treatment of ores; for by the use of the 20-mesh the duty of the stamps will show an appreciable increase, while the task the tube mills have to perform can be carried out without any increase of speed or extra labor. They are now crushing and treating fully 30% more ore by the aid of the mills, compared with what their 90-stamp mill was dealing with prior to the acquisition of the tube mills. It is now only a matter of time when the company's Union mill of forty stamps at Waihi, and Waikino mill of 200 stamps at Waikino, will be fully equipped with the required number of mills. The Banks vacuum slime process is satisfactory in action.

Personal.

C. W. PURINGTON is at Sunrise, Alaska.

F. G. FARISH is in Montana on professional business.

A. J. BETTLES has returned to Salt Lake City, Utah, from California.

T. A. LISTER has returned from Pennsylvania to Lordsburg, N. M.

J. J. JACKSON is manager Copper Hill M. & S. Co., near Prescott, Ariz.

A. W. TIBBALS has charge of work of Goldfield G. & C. M. Co., near Goldfield, Nev.

WM. TEMBY has been appointed superintendent Sunset M. Co , near Platteville, Wis.

H. H. NICHOLSON, manager Standard Con. Mines Co. at Quartzburg, Or., is in Mexico.

H. C. CUTLER has been appointed superintendent Sandstorm mine at Columbia, Nev.

B. F. HARTLEY, superintendent Three Stars mine, near Auburn, Cal., is on a trip East.

C. T. BROWN has returned to Socorro, N. M., from mine examination at Tres Hermanos.

RICHARD ROUSKELL of Calumet, Mich., has returned from inspecting mines near Globe, Ariz.

PETER DAWE of Hancock, Mich., has been appointed mine inspector for Houghton county, Mich.

W. B. MORRIS has succeeded H. C. Cutler as superintendent North Star mine at Tonopah, Nev.

WILLIAM WILLIAMS of Ironwood, Mich., is superintendent Comanche M. Co., near Silver City, N. M.

F. A. HILL has succeeded G. H. Broome as manager Canadian Coal & Coke Co. at Frank, Alberta, Canada.

W. F. MILLER, manager the United States Tin Co., has begun operations at Corona, Riverside county, Cal.

HOMER WILSON, president Wildman Con. M. Co., has returned to San Francisco, Cal., from New York City.

V. C. HEIKES of the United States Geological Survey is visiting the mining districts of Mohave county, Arizona.

T. J. GALIGER, superintendent Stockton G. M. & M. Co. at Stockton, Tooele county, Utah, has gone East on business.

KARL STAAHLGREN, president Wayne M. Co., has returned to the mines at Granite Falls, Wash., from New York City.

J. H. MCCHRYSTAL, formerly of Salt Lake City, Utah, has opened offices as mining engineer at 333 Pine street, San Francisco, Cal.

Z. A. HARRIS of Cleveland, O., president Twentieth Century M. Co. at Roosevelt, Idaho, has been at Boise, Idaho, on company business.

H. B. LODWEN has assumed the position with the Colorado Iron Works Co., Denver, Colo., made vacant by the resignation of F. S. Cronk.

EDGAR RICKARD, who recently resigned the managership Progresso M. Co., Triunfo, Baja California, is in California, his present address being 21 Fremont St., San Francisco, Cal.

O. F. WESTLUND has resigned as manager Aguascalientes, Mexico, plant of the American S. & R. Co., to take the management of a new smelter in Oaxaca. Kuno Doerr has succeeded him.

G. F. RENDALL, consulting engineer for the American Lead Corporation, 120 Liberty street, New York City, has been inspecting the Cleveland Consolidated mine at Bullychoop, Shasta county, Cal.

GOVERNOR CUTLER of Utah has named the following delegates to the American Mining Congress, which meets in El Paso, Tex., Nov. 14 to 18: Senators Reed Smoot and George Sutherland, Congressman Joseph Howell, J. R. Twelves of Provo, Alma Eldredge of Coalville, J. C. Sullivan of Eureka, Frank Pierce, W. H. Tibbals, D. H. Peery, Caleb Tanner, Gomer Thomas, David Keith,

H. S. Joseph, P. T. Farnsworth and Benjamin Tibbey of Salt Lake City.

THE following delegates have been appointed by Governor Warner to represent Michigan at the El Paso meeting of the American Mining Congress: James McNaughton, Calumet; James Chynaweth, Calumet; Fred Smith, Kearsarge; Norman W. Haire, Houghton; Frank McM. Stanton, Atlantic; F. W. Denton, Painesdale; John L. Harris, Hancock; M. M. Duncan, Ishpeming; W. H. Johnson, Ishpeming; O. C. Davidson, Iron Mountain; William Kelley, Vulcan; W. J. Richards, Crystal Falls; J. H. McLean, Ironwood; H. F. Ellard, Ironwood; George B. Morley, Saginaw; E. B. Foos, Bay City.

Latest Market Reports.

SAN FRANCISCO, October 20, 1905.

METALS

SILVER. — Per oz., Troy: London, 28 1/16d (standard ounce, 925 fine); New York, bar silver, 62½c, refined (1000 fine); San Francisco, 62¼c; Mexican dollars, 50c, San Francisco; 47½c, New York.

Bar silver is higher locally, in New York and in London, than for some time past, the quotation at present being 62¼ cents per ounce. Although the advance is small, it means, in most cases, just that much additional profit, as the expense of producing the metal is not in the least increased. While the hope for high-priced silver is a thing of the past, every small advance over 60 cents is gladly welcomed by producers of the metal.

COPPER.—New York: Standard, $16.37½; Lake, $16.37½@16.75; Electrolytic, $16.32½; Casting, $16.00@16.37½. San Francisco: $16.75. Mill copper plates, $17.50; bars, 18@24c. London: £72 10s spot per ton.

Copper shows a firm tone, there being a slight advance over last week's quotations. Those controlling the market have no desire, apparently, to allow the price to go above 17 cents, as it stimulates production in too large a degree, while also offering an inducement to consumers to substitute other metals — iron, aluminum, etc. — for copper.

LEAD.—New York, $5.50; St. Louis, $4.50; San Francisco, $5.00, carload lots; 5¼c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6½c. London: £14 18s 9d ₱ long ton.

SPELTER.—New York, $6.20; St. Louis, $5.75; London, £28 12s 6d ₱ ton; San Francisco, ton lots, 7c; 100-lb lots, 7½c.

TIN.—New York, pig, $32.50@32.75; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ₱ lb., 40c. London, £148 17s 6d.

PLATINUM.—San Francisco, crude, $18.50 ₱ oz.; New York, ingot, $20.50 ₱ Troy oz. Platinum ware, 75@$1.00 ₱ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ₱ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb, .04c.

NICKEL.—New York, 55@60c ₱ lb.; ton lots, 40@47c.

ALUMINUM.—No. 1, 99%, small lots, 37c ₱ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $15.25; gray forge, $14.75; San Francisco, bar, 3½c ₱ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $21.00@$24.00; open hearth billets, $23.00@$25.00; San Francisco, bar, 7c to 13c ₱ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ₱ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ¼c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $3.00@4.00 ₱ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ₱ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ₱ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ₱ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ₱ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ₱ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ₱ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10¼c; 10 oz. stearic, 40s, 9¼c. 100-case lots and over, ¼c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ¼c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3¼c ₱ lb.; caustic soda, in drums, 3@3¼c ₱ lb.; Cal. s. soda, bbls., $1.10@1.20 ₱ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¼@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 5¼@5½c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

CHROMIUM.—90% and over, ₱ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ₱ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ₱ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ₱ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ₱ lb., 2¾@4c.

MERCURY.—Bichloride, ₱ lb., 77c.

MOLYBDENUM.—Best, $2.75 ₱ lb.

PHOSPHORUS.—American, ₱ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ₱ lb., $1.

TUNGSTEN.—Best, ₱ lb., $1.20.

URANIUM.—Oxide, ₱ lb., $3.40.

Commercial Paragraphs.

THE Salt Lake Hardware Co. of Salt Lake City, Utah, were again awarded the gold medal on Keller assay balances at the Lewis and Clark exhibition at Portland, Or.

AT a directors' meeting of the Crocker-Wheeler Co., manufacturers and electrical engineers, on the 13th inst., at Ampere, N. J., the regular quarterly dividend of 1¼% was declared.

AT the Lewis and Clark Exposition at Portland, Or., F. W. Braun & Co. of San Francisco and Los Angeles, Cal., were awarded a gold medal on their exhibit of assay and chemical laboratory apparatus, consisting mainly of the following: Braun's disc pulverizer, Chipmunk crusher, combination assay furnaces, hydrocarbon burners, Marvel crude oil burners and cupel machines.

THE S. H. SUPPLY CO., Denver, Colo., have made recent shipments of the following American air compressors: 8-drill tandem compound machine to Arizona; 6-drill tandem compound to Wyoming; 5-drill straight line to Sunnyside, Coal Co., Louisville, Colo.; 3-drill straight line to United Mines and Exp. Co., Central City, Colo. This company is also furnishing a complete 40-stamp mill, including concentrating plant, to Sonora, Mex., and a 20-stamp mill to the same company.

THE superior jury at the Lewis & Clark Exposition, Portland, Or., has approved seventeen different and several awards in the electrical department, relating to the exhibits of the General Electric Co., which is stated to have been the largest manufacturer exhibiting in that department. The highest award granted by the jury was a gold medal. The company states that it received a gold medal for the best exhibit in the electrical department and also gold medals on each of the seventeen features of the exhibit. For its new metalized carbon filament incandescent lamps, the company also received a gold medal. This exposition in common with other recent American expositions was lighted by Edison incandescent lamps, furnished by the General Electric Co.

THE Pelton Water Wheel Co. of San Francisco and New York has a contract with the Oro Water, Light & Power Co. of Oroville, Cal., for two Pelton units of 2000 H. P. capacity each, direct connected to electric generators, the wheels operating under 465-foot head. The water wheel arrangement embraces the double overhung type of construction, which is typical of Pelton apparatus. The current is to be used for both light and power, the latter involving the operation of gold dredgers, in which the fluctuations of power and load are sudden and heavy. Other recent orders include a wheel equipment for a power and pulp company of Washington, consisting of a triple Pelton unit for direct connection to heavy pulp grinders in the paper mills. The wheels are mounted on a steel shaft 18 feet in length, provided with an oil thrust bearing of special design. Takata & Co. have ordered a 300 H. P. unit for Tokio, and a large wheel has just been furnished the Ingersoll-Sergeant Drill Co. for direct connection to one of their compressers. The Pelton Water Wheel Co. will enlarge its works, and has bought a block of land in South San Francisco, where a modern machine shop is now being built.

Trade Treatises.

Catalogue G of The Deming Co. of Salem, Ohio, illustrates and specifies an extensive line of power pumps of the triplex, deep well and other types. Pumps for many purposes are handsomely pictured.

Air Cooled Duntley Electric Drills are illustrated and described in special circular No. 52 of the Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill. A table of tests shows its adaptability for rapid and economical drilling of cast iron and steel plate.

The Ingersoll-Sergeant Drill Co. of 11 Broadway, New York City, issue an interesting booklet on "Stone Working Tools" from the pneumatic tool department. It illustrates the application of air power to the various processes of stone carving, polishing and dressing.

The tenth Catalogue of Assayers' and Chemists' Supplies, from the Denver Fire Clay Co. of 1742-46 Champa St., Denver, Colo., gives illustrations and prices of a great variety of muffles, crucibles, scorifiers, furnaces, chemical and physical apparatus and general laboratory supplies.

Books Received.

As extracts from "Mineral Resources of the United States," the United States Geological Survey has issued "The Production of Mineral Waters in 1904" and "Production of Gas, Coke, Tar and Ammonia at Gas Works and in Retort Coke Ovens in 1904," by E. W. Parker.

Obituary.

W. A. ROBERTS, a mining man of extended experience throughout the Pacific coast States, died at Hornbrook, Cal., on October 12th.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING OCTOBER 3, 1905.

801,057.—SAW SWAGE—C. J. Anderson, Eureka, Cal.
801,129.—REDUCING ORES—H. Arden, San Francisco.
800,791.—WATER PURIFIER—F. K. Bowden, San Jose, Cal.
800,842.—GLOVE—F. H. Busby, San Francisco.
800,982.—SAFETY PIN—E. A. Campbell, Los Angeles, Cal.
801,061.—GAS GENERATOR—E. A. Chamberlin, Los Angeles, Cal.
800,793.—FEED WATER REGULATOR—C. H. Chandler, Seattle, Wash.
800,794.—HOPPLE AND TAIL HOLDER—J. G. Conneli, Hoquiam, Wash.
800,907.—TELEPHONE MOUTHPIECE—W. B. Curtis, San Francisco.
801,063.—RAILWAY TIE—H. S. Delamere, Cloverdale, Cal.
801,065.—SQUARE—R. M. Dixon, Stockton, Cal.
800,910.—ELEVATOR—B. Flood, Los Angeles, Cal.
801,077.—CLOTH STRETCHER—L. B. Girard, Los Angeles, Cal.
800,846.—COMB—E. D. Hamilton, Montavilla, Or.
800,912—NAIL—M. Hermelink, San Francisco.
800,804.—OIL BURNER—C. R. Herrington, San Francisco.
801,015.—FLUE CUTTER—C. J. Johnson, Seattle, Wash.
800,852.—SAW JOINTER—M. Kapp, Bellingham, Wash.
800,746.—PLANT PROTECTOR—C. Landon, Yuma, Ariz.
800,807.—SOLDER—H. P. Larson, Portland, Or.
800,808.—HAY RAKE—C. E. Lindberg, Seattle, Wash.
800,872.—HOE—J. O. Newcomb, French Camp, Cal.
800,936.—DREDGER BUCKET—T. O'Leary, Oakland, Cal.
800,943.—EGG CARRIER—D. B. Replogle, Los Angeles, Cal.
801,106 —VIOL ORGAN—E. Ringer, Tacoma, Wash
800,882 —WINDOW—D. Schuyler, Los Angeles, Cal.
800,947 —FIBER PICKER—A. M. Sheakley, Stockton, Cal.
801,118.—TELEGRAPH RECEIVER—G. T. Swenson, San Pedro, Cal.
801,119.—PENCIL HOLDER—E. P. Van Alstyne, Bisbee, Ariz.
800,775.—CULVERT—W. J. Walsh, Miller, Cal.
801,120.—WINDOW FRAME—T. F. Ware, Reno, Nev.
801,122.—LAWN MOWER—J. West, Seattle, Wash.

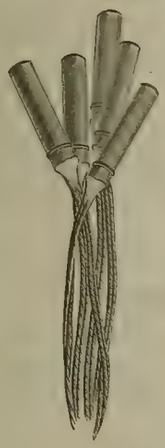
Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

POCKET CALCULATOR.—No. 801,354. Oct. 10, 1905. F. S. Beckett, San Francisco, Cal. This invention relates to improvements in calculating devices, and pertains particularly to a chart in the form of a pocket tape designed for computing, multiplying, dividing, ascertaining the roots and powers of numbers, etc. The object of the invention is to provide a simple, compact, handy device for calculating mathematical problems and which may be readily carried in the vest pocket. It consists of a flexible tape longitudinally divided along one side into two scales, one scale graduated to a series of natural numbers, the other to the corresponding logarithms of said numbers or their fractions, and the graduations so arranged that a portion of the numbers of one scale are equally spaced, while the spaces between the corresponding figures of the other scale vary, and other details of construction designed to produce the desired result.

Dividends.

Oct. 14 the Bunker Hill & Sullivan Mining & Concentrating Co. declared dividend No. 98, of $180,000, payable on Nov. 4. This makes total paid since Jan. 1, 1905, $2,955,000, and total to date $5,226,000.



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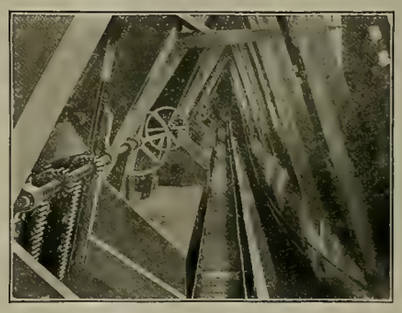

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MINING AND SCIENTIFIC PRESS

Whole No. 2362.—VOLUME XCI. Number 18. SAN FRANCISCO, CAL., SATURDAY, OCTOBER 28, 1905. THREE DOLLARS PER ANNUM Single Copies, Ten Cents.

Danger in Mines.

With each succeeding year the statistics of mine operation continue to show loss of life through underground accidents. Constant effort is being made in most mining regions to provide greater safety to miners, and means are taken to lessen the likelihood of accidents from certain causes, such, for instance, as overwinding, breaking of hoisting ropes, caving of ground and many other like contingencies with which all miners have become more or less familiar. These precautions, however, appear to be insufficient, for accidents continue to occur. To one who carefully investigates the majority of accidents in mines it becomes at once apparent that these accidents are usually of a kind that could not well have been anticipated or they would not have happened. Miners have become familiar with the dangers which are a part of underground life, and the old saying, "familiarity breeds contempt," is as applicable to underground dangers in mines as it is to men.

A large percentage of accidents is due to carelessness of the men themselves. Miners walk carelessly into shafts—a gate is placed between the shaft and the station floor—and the next man will as carelessly step from a skip into the yawning compartment adjoining and fall to his death. Roof falls occur where all felt secure. Runs happen when and where little expected, or the necessary protective means would be employed to avert the disaster. The natural tendency is to pass legislative enactments that will protect miners from these dangers. Mine inspectors are appointed to see that such accidents cannot occur, or, at least, that by proper inspection their frequency be diminished, but it is not apparent that the percentage of accidents, relative to the number of men employed, is less in those States having inspectors than in those having no such officials.

The superintendent of a mine is as anxious to avoid an accident as the miners working under him. He can see no advantage in a cave, a run, a flood, or other unexpected and expensive interruption of work, any more than can the mine inspector, and if he understands his business he will take all the precautions necessary to avert it. If men put up frail staging, which gives way when the miners are at work standing upon it, the miner is as much to blame as any one, unless he be an inexperienced hand, in which case he should not have been intrusted with work of so important a character. Some mining companies provide a code of rules as a guide to the conduct of miners when underground. These rules are devised as a protective measure, not only to the men, but to secure the company from loss through carelessness of the workmen, and any infringement of the rules results in the prompt dismissal of the guilty party if he is discovered. Often one careless man will endanger the lives of a score or more of his fellow workmen. Not that he would intentionally injure any one of them, much less himself, but he is simply careless and neglects the most ordinary precautions.

In the handling of high explosives the careless miner excels. It is not uncommon to find an old and experienced miner opening a 50-pound box of nitropowder with a pick, or serenely fixing his primers while puffing contentedly at a pipe. He will take a small box containing a dozen or more sticks of powder, and fuses with caps attached, climb a ladder to a stope and give box and all a careless toss over a pile of obstructing rock or timber at the top of the passage way. He has done it many a time before without serious result, and he comes to believe it perfectly safe to continue such dangerous practice. Nothing can protect such men from serious injury sooner or later but sheer good luck, which may some day desert him.

Bluenose Mine at Goldenville, Nova Scotia. (See page 290.)

Interior of Dodiver Mountain Mill, Nova Scotia. (See page 290.)

Moose River Mines, Nova Scotia. (See page 290.)

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Gold Production of the World.

Carefully compiled statistics indicate that the present gold production of the world is about one million dollars daily. This large increase in the gold output of the mines of the world is due more to the application of modern methods and machinery to low grade deposits than to the operation of mines of phenomenal richness. Mines producing unusually rich ore are generally short lived, as compared with those of low grade. The former have a meteoric existence—flash into prominence and in a few months are exhausted and are soon forgotten—while the large low-grade mines continue to produce year after year, for a generation or more. The improvement in dredging machinery has made available a source of gold not previously possible to operate at a profit—the placers of the valley lands, where grades are almost nil, and where the amount of gold disseminated in the gravel is so small as to make limited or small scale operations commercially impossible. Twenty-five years ago, the cheapest mining done in the world was by means of hydraulicking in some of the largest mines of this class in California, but the cost of operating a modern dredger is not more per cubic yard than the average of the most economically conducted hydraulic mine of those former years. Not only does the dredger work as cheaply, but the cost of installation is far less than that of one of the large hydraulic plants, many of which cost from $200,000 to $500,000 or more. A large modern dredger can be built for $75,000, and, under ordinary conditions, will handle from 50,000 to 65,000 cubic yards per month. Dredgers are operating or are in construction in almost every country in the world where extensive low-grade placer deposits exist, and where the conditions are favorable to this method of gold mining.

The modern methods of rock mining, too, have aided materially in increasing the activity noticeable in the gold mining industry. In iron mining, methods have been devised to meet existing conditions and to cheapen the cost of production. It has been found that some of these economical methods are also applicable to gold mining practice and a lowering of cost of production has usually followed the introduction of these methods wherever the experiment has been tried. It is the low-grade mines which are becoming so important a factor in the swelling and maintaining of the world's gold production.

Metallurgical science is also aiding in this direction. In former years gold ores not readily treated by amalgamation were shipped to smelters, or if this could not be done at a profit, they were allowed to remain in the mine because they were unprofitable, awaiting a more propitious day. The improvements in concentration have made it possible to successfully eliminate a large percentage of waste from such ores, the values being collected in a small volume of enriched material—concentrates. These may be shipped to smelters or treated at the mine by chlorination, or by some of the wet processes, among which the cyanide process, with its varied modifications, is most important.

Improvements in every branch of the industry have made available ore deposits previously of no commercial value. There still remain other deposits, which, for the same reasons as in the past, are at present unavailable, but which, by further reduction of the cost of mining and further improvements in metallurgical processes whereby the cost is diminished and the recovery of gold values increased, will become a source of revenue and swell the world's gold output.

There are those who think they can see in this tremendous output of precious metal, the greatest in the history of the world, a danger to the standard of monetary values by reason of overproduction. This condition, which in the past did at several times in the history of the civilized world actually occur, is not likely to be repeated in the present age. The constantly expanding commercial life of the world demands a continually increasing supply of gold, and this all the mines of the earth are not more than capable of supplying. The real danger appears to lie in exactly the opposite direction—the failure of the mines to keep up with the demand. It is not at all likely that this condition will soon obtain, but, eventually, the gold deposits now known must have been exhausted, and we must then look to those deposits, at present either unknown or too low grade to be profitably exploited, to maintain the supply.

PRESENT effort is being made in British Columbia to continue the existing import duty on American products, and especially the bounty on lead, which latter has thirty months more of life under former legislation. The Dominion lead bounty in 1904 was $326,000; in 1903, $191,000. Canada's total lead production in 1904 was valued at $1,637,000; of this amount British Columbia produced $1,422,000. The increase of import duties on white lead has occasioned a great advance in lead ore production; there is now throughout British Columbia over $20,000,000 invested in silver-lead mining plants. The assertion is made that under present conditions the lead bounty virtually represents a protection of 20%. The Province will ask, through its mining legislators, for the removal of the duty on steel rails when used for mining purposes, a 50% reduction on the present tariff on candles and explosives and a reduction of the tariff on mining machinery, the latter designed to afford fair competition on the part of American mining machinery manufacturers. The British Columbia smelting men are particularly strenuous in the request that there be suitable reduction in the present mining machinery tariff, which does not inure to the benefit of the Province. The fact is also pointed out that the cost of dynamite is the American price with 60% duty added on importations from the United States. This last item is largely a matter of commercial relations between makers of dynamite on both sides of the boundary line; but, as a matter of mine development, it would seem that the requests of the British Columbia miners are just and equitable, and that due regard for the mining interests of the Dominion would warrant compliance with the requests for change and modification.

The Value of Iron-Bearing Sands.

At the present time a great deal is being said and published about the "newly discovered" values in the iron sands of rivers and beaches of the Pacific Coast States. It is by no means a new discovery, for the existence of these iron sands has been known for the past half century, and no attempts have been made to separate these iron sands from the accompanying earthy minerals. The increasing demand for platinum (and its growing scarcity) was one of the things which induced the United States Geological Survey to undertake the testing of the sands from the gold districts of California and Oregon, where platinum was known to occur, in the hope that new sources of this metal might be discovered and, incidentally, it was decided to carefully search the sands for such other elements of value as they might contain. The work of conducting the investigation was placed in the hands of Dr. David T. Day at the Portland, Or., Exposition which recently closed. With the aid of the newly introduced electromagnetic separators and of several types of excellent mechanical concentrators, many tests were made on sands from nearly all of the Western States and some of these sands were found to be comparatively rich in gold, monazite, zircon and other minerals, but chiefly in magnetite in the form of black grains. The streams producing the greatest abundance of these iron sands were found to be those which flowed through the vast fields of basaltic lava, which cover thousands of square miles in Oregon, Idaho and Washington. Magnetite is a prominent constituent of nearly all dark-colored, basic, igneous rocks, and the erosion of areas of this character supplies a vast quantity of iron ore, in the form of grains of magnetite, to the streams tributary to such areas. Gold, platinum, monazite, zircon and other metals and earthy minerals of high specific gravity, and also a portion of the magnetite, must have been derived from granite and other crystalline rocks underlying the lava beds.

A good concentration was found possible in most cases on the mechanical concentrating machines, but the fine differentiation of the minerals of high specific gravity was effected on the electro-magnetic separators by the employment of electric currents of varying intensity on the respective magnets of the series in each machine. In this manner sands consisting originally of quartz and other minerals of comparatively low specific gravity were separated from those of high gravity, and this partially concentrated material was then run through the electromagnetic machines with a close separation of whatever minerals were still present. These were usually found to be varying proportions of magnetite, chromite, gold, platinum, monazite, garnets, zircon, etc. The most abundant concentrate, in every case, was magnetite. The tests have merely proven what has been known for fifty years, viz., that these sands contained a large amount of iron ore in the form of magnetite. The presence of the other valuable minerals was only suspected in most instances, and not positively known, particularly in the case of the monazite, which is a mineral with which the Western miner, up to the present time, has not become familiar.

While it may be gratifying to know that there lies in these Western rivers, and on some of the ocean beaches, a great store of high-grade iron ore, it remains to be demonstrated that it can be utilized in the production of iron and steel in large quantity in successful competition with iron and steel made in the East and in Europe in blast furnaces. It is a significant fact that in the iron production of 1902, for instance, the total output of iron ore in the United States was about 35,500,000 tons, of which 30,500,000 was red hematite, 3,300,000 was limonite and but 1,688,000 was magnetite. About 27,000 tons of iron carbonate ores were also treated. This indicates that in the Eastern iron mining region the hematite and limonite ores are preferred to magnetite.

Although electric smelting is comparatively in its infancy, having, as yet, scarcely emerged from the experimental stage, yet it is to this branch of metallurgy that we must turn to make available the magnetic iron ores of those Western rivers. Magnetite, when pure, produces more metal from a given weight than any other kind of iron ore, and for this reason

should be more valuable. As compared with the production of iron from other classes of ore in the blast furnace, magnetite might also be considered as possessing other advantages, providing the economic problem is solved by the new electro-metallurgy. In the making of about 18,000,000 tons of pig iron in 1902 there were required about 73,000,000 tons of raw materials, of which only about 33,000,000 tons were iron ore, the remainder being coke, coal and limestone.

In the manufacture of iron and steel from the black magnetic sands of the Western rivers two factors appear as absolutely essential to commercial success. These are cheap and abundant water power for the generation of the electrical current, and a deposit of magnetic sand easily and cheaply available and of an extent sufficiently great to justify the installation of a suitable plant. It has been demonstrated that good iron and steel can be made direct from the ore by electrical methods of smelting, but upon how large a scale this can be accomplished remains still to be proven. Experiments in this direction are now in progress, and while the outlook is most promising much still remains to be demonstrated on the economic side of the proposition.

THE national Government of Mexico and the Governors of the several mining States of that Republic are doing all that can be done, apparently, to promote legitimate mining enterprise in their country. Mexico is recognized as a country possessing great mineral wealth and vast undeveloped resources. The success of modern companies operatign mines there, both old and new, is attracting much attention abroad, and a constant stream of foreign money is pouring into Mexico to buy, equip and operate mines. The United States has mineral resources more vast than those of Mexico and second to no country under the sun, but the same energetic interest is not taken in the development of these resources by our Government, or by the States, as that shown in Mexico. There the mineral lands and the operation of the mines are directly under the eye of the Government, while in the United States mining is only one of a great many large resources of the country, and the mining industry is largely left to work out its own destiny in the hands of individual owners, and all that has been accomplished here is due to this unassisted personal effort and to the mines themselves.

MEXICAN mines find great favor in the eyes of British investors at the present time, while similar American propositions are "not in fashion" in London, just now. The complaint has been made in England that disaster has too frequently followed investment in the mines of the United States. One does not have to seek far to ascertain the cause of British losses in American mines. English experts are constantly scouring this country in search of what appears to be good mining property. Not infrequently they find a mine that will stand up to rigid investigation. The proposition is placed in the hands of promoters—English not American promoters—who find no difficulty in setting a valuation on the property 400% to 500% higher than its development will warrant. They, with equal facility, place the stock, preferred and common, as well as bonds of the company and the venture is a success, from the promoter's standpoint. The investors have bought a million dollar mine from their own people at a $5,000,000 price. The mine fails to meet with expectations, the investors lose on a falling market and American mines get the odium of it all. History repeats itself, and, unless rare caution be exercised by English investors in Mexico, it is not difficult to foretell what will happen in connection with Mexican investment within a very few years, for it is an easy matter for the "frenzied" promoters to transfer their methods from Kafir or American to Mexican mines.

ALTHOUGH the lead-silver mines of the Cœur d'Alene district of Idaho have established the reputation of being the greatest producers of lead-silver ores in the world, the indications are that these mines will eclipse all previous records during the year 1905. Several important strikes of high-grade ore have recently reached the outside world, and their development will help to swell the already large output in no small degree. The district is largely operated through lengthy drainage adits, which have greatly cheapened the cost of production in that district.

The Law of Location.

It is a natural supposition that after the many years of experience in mining in the West, miners generally would be perfectly familiar with the law relating to mines, and yet some are surprisingly ignorant of those features which have a most important bearing on the subject of location—the initial point in securing mining property on the public domain. The laws relating to aliens, to the extra-lateral right, and to some other legal phases of mining, are not so readily understood, the most astute attorneys being themselves often at a loss how to proceed with safety to their clients, but the statutes defining the location of claims is simple and easily understood. To such an extent is this a fact that the logical inference is, that in some cases the miner purposely fails to understand, or frames a law of his own which suits his ends better than the plain language of the statutes. The laws regulating the location of mining claims and securing title to them by the performance of certain acts are plain and easily understood, and for this reason the conflicts constantly arising over the ownership of mining ground should not occur at all. The fault often lies with the locator himself, who carelessly fails to comply with the requirements of the statutes and sets up an insufficient number of corner monuments or posts—sometimes none at all, or putting them at the proper places, they are so frail as to be readily destroyed or so inconspicuous as to remain unobserved by others seeking mining ground. Often too much dependence is placed on the discovery stake, upon which is posted the claims of the locator, who states thereon the name of the location and the extent of the territory he locates under the law. This is insufficient and will not meet the requirements of the law. Stakes must also be set out at the corners and at the end centers of the claim. These stakes or monuments must be plainly visible from one to the other, and if, when standing at any of the stakes, the next adjacent stake can not be seen, because of intervening brush, rocks or rising ground, then additional intermediate stakes must be set, so that, in the language of the statutes, the boundaries of the location may be plainly traced.

Discovery is the inception of the miner's right. This should first be made and the location laid out to conform to existing conditions — as to strike of the vein, etc.—as nearly as may be ascertained. Often it is difficult or impossible to determine without considerable work the direction of strike of a vein or ore deposit, and then the miner must stake the claim to the best of his ability and judgment. A claim may be laid out prior to discovery, but it must be remembered that in such event the legal date of location begins at the time discovery is actually made, and not from previous date of location. Such location may be permissible when the outcrop of the vein is obscure, but a location without previous discovery is difficult to hold against trespassers.

The mining law should be amended in this respect that the bona fide locator may have sufficient time, based upon continued work, within which he may hold his claim against others while searching for the vein or deposit of mineral believed to lie beneath the surface. Occurrences of this character are numerous in regions of bedded deposits, deep placers and flat veins, but no law exists on the statute books which makes provision for discovery under such conditions.

The most confusing feature of mining legislation is the lack of uniformity of State laws. The several States have the power to enact laws regulating the location and development of mineral lands, providing such enactments do not conflict with the United States laws, and most of the States have taken advantage of this to pass laws calculated to promote the development of their mineral resources, by requiring a stated amount of actual development within a limited time — sixty to ninety days, generally — this requirement being made a part of the act of location. Laws of this character have been proven to be beneficial to the legitimate and more speedy development of the mineral lands of those States, as it does not permit the location of mineral ground without the performance of any work for nearly two years, which is possible under the Federal laws. The only unfortunate phase of the State laws is the lack of uniformity. That which is legal and proper in Colorado may not be sufficient in Arizona, or in Idaho.

In view of this fact, the miners in several States should familiarize themselves with the Federal laws relative to making mining locations, and also with the laws of the State and district in which they live, and then, having a knowledge of these laws, seek to comply with them in the fullest degree, and there would be far less mining litigation than there now is.

Science in Mining.

There seems to be a disposition on the part of many well-meaning people to cavil at the work of scientific men in geological science and mining practice, and they who are thus disposed apparently take particular delight in pointing out that "the scientists are again at fault" in their judgment of this or that mining district—that their prophesies are entirely disproven. So common have such remarks become that many are misled into believing that these strictures are well deserved. The fact is that really accomplished scientific observers are usually too slow in expressing an opinion where they have insufficient data upon which to base their judgment, or to hazard a theory as a possibility.

It is the pretenders—those without real scientific knowledge or training—who are so prompt to thrust themselves to the front with unsolicited opinions as to the possibilities of that or this district. These parvenu scientists represent the extremists in theory—one side claiming the most extravagant things for the newly discovered district, the others dismally predicting disaster for the same region. Meanwhile the real scientist is carefully noting the result of development, and in time finds sufficient grounds upon which to base a tenable theory.

When Cripple Creek, Colo., was first discovered the fake scientists were quickly on the ground, looking wise and gloomily shaking their heads, while predicting that the "values would not go down." Their optimistic brethren were also there, and quickly announced that the vast wealth of the district was without precedent, and the veins would never be bottomed by a device within the range of human possibility, and the values would not decrease in depth. Needless to say, the latter were in the popular favor. Both were wrong, and this may be said of them wherever they appear.

Science is based upon observed facts, not upon irrational theory, nor to a great extent upon analogy. The same experience is now the lot of the new rich mining districts of southern Nevada. The misfit scientists are there in full force, predicting good, bad and indifferent things, and are freely quoted by the uninitiated, while the real seeker after knowledge is eagerly seeking the facts, yet reserving his judgment, that he may not fall into the erring ways of his less modest imitators.

FOR years the Homestake mine shafts at Lead, South Dakota, have been equipped with cages—generally with two decks. On these the loaded cars are run and hoisted, and the empty cars returned to the levels below. No skips are in use, which is probably due more to tradition than to any lack of appreciation of the value of skips. The miners are accustomed to cages, and many of them never have seen a skip in a shaft, but the Homestake management is said to be seriously considering the advisability of putting 10-ton skips in the Ellison shaft, to replace the cages in use there. So large are these cages that the sides are made of solid sheets of steel instead of the usual frame of steel rods. The vibration was found to be too great with the ordinary type of cage. The contemplated change will necessitate considerable expense in underground arrangements, but the advantage of skips over cages, where such large tonnages are handled, has become so obvious that the contemplated change is likely soon to be made, and when it is decided to make it, it is probable that the skips will be installed without the loss of an hour's time or the hanging up of a single one of the thousand stamps in the mills of the company.

CONCENTRATES.

MILL PLATES for inside the battery are usually about $\frac{3}{8}$ inch in thickness, the outside plates being from $\frac{1}{16}$ to $\frac{1}{8}$ inch thick.

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A GOLD DREDGER was in operation some years since in northern Italy, and the enterprise is said to have been successful.

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WHEN molybdenite occurs finely disseminated, but in small amount, in rock, it is not likely that the mineral contained can be recovered at a profit. The same thing may be said of graphite.

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THE loss of gold by volatilization increases rapidly with the rise of temperature above its melting point, which is higher than that of silver and a little below that of copper.

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SOME recent experiments made with nickel-steel wires for hoisting purposes have shown that carbon steel is superior to that containing nickel. The presence of nickel up to 6.28% in the steel does not prevent rusting.

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"BLUE BILLY" is a purple "ore," resulting from the calcination of pyrites and the residuum from roasting ferriferous and manganiferous zinc ores and is mixed with other iron ores in the manufacture of pig iron.

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BATTERY GUIDES must not be allowed to become so badly worn that the stamps interfere with each other in passing. The guides must be kept in such condition that the stems pass without unnecessary friction; but too much space should not be allowed, or broken stems are likely to result.

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WHEN square sets are placed in a mine, the timbers must be strongly braced and blocked against the surrounding walls and ore faces—ends, sides and top—or blasting may knock out several timbers of one or more sets and do a great amount of damage, beside increasing the danger from caving.

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POTASSIUM is a constituent of many minerals, but particularly of orthoclase feldspar. It is a complex silicate of potassium and aluminum. When potassium combines with aluminum and sulphuric acid the product is known as alum. When it combines with nitric acid it is called saltpeter or potassium nitrate.

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THE tabulated statement of assays of black sand appearing in the issue of Oct. 7 is evidently of the sand just as it was received by Dr. David T. Day at the Portland Exposition, and it is presumably the sand which has been going to the tailrace after sluicing, the greater portion of the gold having been caught in the riffles of the sluice boxes.

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IN no instance is a quartz mill fed as regularly and properly by hand as by a good properly regulated automatic feeder. All experienced mill men understand the advantage of regular feeding. Without it the discharge cannot be evenly maintained, and the even flow of pulp over the plates will be interrupted unless the feeding is regular.

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THE Attorney General of Nevada has given the following opinion concerning the taxation of patented mining property in that State: "The County Treasurer can refuse legally to accept less than one-half of the full taxes due on each patented mine, irrespective of the number of owners. He should give but one original receipt, but if duplicate receipts of the original are demanded the County Treasurer should give same to each individual owner."

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THE necessity for a chuck tender in machine drilling is largely due to the lack of ability and knowledge of the machine on the part of the drill runner. An expert machine man will frequently drill holes 5 to 7 feet deep with no assistance from the chuck tender other than making the necessary changes of drills as the work advances. A drill runner, who carelessly starts his hole and allows it to become fitchered, needs the services of not only a chuck tender but an instructor.

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IN roasting pyritic concentrates, the presence of a small percentage of siliceous sand is advantageous. It is well also that the ore should not be too fine, but rather that it should contain about 25% of grit of a texture which will just pass through a No. 25 gauze, one that contains twenty-five holes per lineal inch; this facilitates the perfect roasting of the ore, rendering it spongy and thus promoting the easier circulation of heat and evolution of gases. The perfect roasting of the ore is, of course, essential to close extraction by subsequent amalgamation, and for this reason too great care cannot be exercised in conducting this stage of the operation.

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IN a Nova Scotia coal mine a shaft, 12 feet 6 inches by 24 feet, was sunk during September, 1905, a distance of 113 feet. During the month 146 feet of shaft were timbered. Considering the size of the shaft this is probably the most vigorous shaft sinking on record, though in the distance sunk in a single month about 100 feet behind some of the record work in this direction done on the Rand in South Africa, where the shafts are less than one-half of the superficial area of the Nova Scotia shaft.

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AT Doornkloof, South Africa, a diamond drill hole has been bored 5560 feet deep, the core being $1\frac{5}{8}$-inch diameter. It required fourteen months to put the hole down, three shifts working eight hours daily. When a depth of 5000 feet had been attained, it required nearly four hours to haul out and disconnect the rods, which were in 50-foot lengths. An equal time was required to replace them and continue drilling. A hole has recently been put down to test the banket on the Rand, which has reached a depth of 5582 feet. It was bored in nine months.

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THE essential manufacture of the materials in hydraulic cement are calcium carbonate and clay. These ingredients are various in their original form. The calcium carbonate may be in the form of marble, of travertine, chalk or any other material supplying an essentially pure carbonate of lime. The clay is usually derived from clay banks most easily available. In some localities there exists a natural rock which contains the several ingredients in the proper proportions. Furnace slag is also largely used in some localities, in the manufacture of Portland cement.

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IN charges of black powder, that portion of the fuse which enters the powder should be wrapped with some fire proof substance to prevent the fuse spitting into the powder, and exploding it prematurely. In the case of dynamite, the primer can be placed on top of the charge and held in place with clay tamping. Should the primer be placed in the middle or bottom of the charge, the chance of burned holes and stinkers is materially increased. Any one on burning a piece of fuse will notice the fire burn through the fuse at short intervals, and wherever this happens in the charge, it sets the powder on fire.

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THE climatic and probably the geological conditions under which the ancient river channels of California were formed were very different from those existing in that State at the present time. The larger ancient streams flowed in broad shallow valleys, and there must have been a far greater amount of water than at present. Some of the channels were not unlike the modern streams, having steep grades and narrow rims, but some of the great rivers were from 1000 feet to over a mile wide, with gravel 300 to over 1000 feet deep. Ice may have been an important factor in the formation of those streams. In some of these streams boulders of immense size are often found surrounded by gravel and cobbles of uniformly small size.

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CYANOGEN is a compound of carbon and nitrogen ($C_2 N_2$). Carbon does not combine with nitrogen under ordinary conditions, but if these two elements are allowed to come into contact at very high temperatures in the presence of metals they combine to form substances known as cyanides. The cyanide of potassium is not made from orthoclase (potash feldspar). Potassium cyanide is prepared by fusing in an iron crucible a mixture of thoroughly dry potassium-ferro-cyanide (8 parts), with dry potassium carbonate (3 parts). As soon as the escape of the carbonic acid gas ceases and the metallic iron has settled, a clear fused mass of cyanide and cyanate of potassium remains, which may be poured into a suitable mould.

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REMSEN thus summarizes the knowledge of bases, acids and salts: An acid contains hydrogen; a base contains a metal; when an acid acts upon a base the hydrogen and metal exchange places; the substance formed by substituting hydrogen for the metal is water; the substance obtained from the acid by substituting a metal for the hydrogen is neither an acid nor a base, but is generally neutral. An acid is a substance containing hydrogen, which it readily exchanges for a metal, when treated with a metal itself, or with a compound of a metal, called a base. A base is a substance containing a metal combined with hydrogen and oxygen. It easily exchanges its metal for hydrogen when treated with an acid. The products of the action of an acid on a base are, first water, and second, a neutral substance called a salt.

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THE natural color of gold is yellow, and all pure refined gold has this color. The idea that gold from different districts has different colors is not based upon facts, but is due to the metal being alloyed with silver or copper, which gives it variety of shades of yellow, from a whitish silvery yellow to reddish color. Refined gold is of uniform color, no matter from what part of the world it may come. It is the only metal that has this yellow color. Some alloys of tin and copper, copper and zinc, and other mixtures have a golden yellow. Brass, for instance, is almost the counterpart of gold in color, but may be easily distinguished from the latter by its lower specific gravity, and by being readily attacked by most of the mineral acids, while gold is only soluble in nitro-hydrochloric acid, no single acid having any effect on it. Precipitated gold in a finely divided state assumes various colors—violet, purple, ruby, brownish and black. On heating to redness these colors disappear and the pure yellow color again appears.

PLACER MINING in Siberia is carried on usually under considerable difficulty, owing to the lack of grade, which is characteristic of most of the valley gold districts. The sluices are short, seldom being over 100 feet in length. The upper end of the line of boxes is raised on a trestle, in order that the line of boxes may be given the necessary grade. The gold-bearing gravels occur for most part in low, flat valleys, in which the streams flow sluggishly or the water lies in marshy tracts, with no perceptible current. Ordinarily the ground is worked in a series of terraces or benches, each about 5 feet in height. The gravel is either carried by men or is hauled in some kind of vehicle to the sluices. This method of working would be very expensive if it were not for the fact that labor is very cheap in Siberia. It may be that the gravels could be successfully mined by dredging in many of these districts as dredgers are already successful at work in some of them.

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THE capacity of an air compressor to compress free air is determined by calculating the piston displacement per minute. This is ascertained by multiplying the area of the piston in feet by the distance traveled in feet per minute; this gives approximately the displacement per minute. Calculate what volume this air will occupy at the working pressure, and this will be the required volume of the receiver. Example: The maximum piston displacement of compressor per minute equals 65 cubic feet; working pressure equals 80 pounds (gauge). To determine the volume of 65 cubic feet of free air when compressed to 80 pounds pressure, the following formula may be used:

$$V_2 = \frac{14.7 V_1}{P_2 + 14.7}$$

In which V_1 equals maximum piston displacement in cubic feet per minute equals 65. P_2 equals working pressure (gauge) equals 80 pounds. V_2 equals volume of the air at the higher pressure. Substituting in this formula we have:

$$V_2 = \frac{14.7 \times 65}{80 + 14.7}$$

equals 10 cubic feet, which would be the volume of a receiver 18 inches in diameter and 6 feet long.

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THE interesting case of a flat vein crossed and intersected by a fissure at a high angle, near Phillipsburg, Mont., is a difficult proposition to size up from description alone. From the statement that the croppings of the flat vein for a depth of 12 to 15 feet extend for a distance on the strike of 125 feet, the impression is gained that the ore shoots in the flat vein have a strike essentially north-south. There may be several of these. Ore deposition in limestone is extremely uncertain, but in this instance the proposition appears to be simplified by the fact that the ore occurs between a shaly and a massive limestone. It is quite probable that the crossing fissure may be found to bear some direct relation to the disposition of the ore bodies on the contact. "Concentrates" believes it would be good judgment to sink on the south side of the fissure and on the line of intersection. The shaft could be excavated in this manner without much difficulty. Another way to explore the contact south of the fissure is by drifts run through the fissure from the shaft already sunk on the north side. There is no rule by which one can be guided in exploratory work of this character. The contact is known to be ore bearing, and the probability is that the shoots strike north-south; by exploring with inclines driven in an east-west direction these shoots should be discovered if they exist. That the fissure is responsible for the mineralization of the contact is only an assumption. If such is the case there should be some evidence of it at the line of intersection.

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A VEIN composed of quartz carrying considerable amounts of red hematite, specular hematite, limonite and nodular masses of copper (the latter occurring as chalcocite), it would be good prospecting and good business to follow the same and develop it both longitudinally and in depth in search of a pay shoot. Veins of this character not infrequently carry gold, and occasionally are rich, particularly in the vicinity of the copper nodules. A mine in San Bernardino county, Cal., the Rose, was of this character, and when the copper masses were encountered the values went up to as high as $500 gold per ton. In the same range of mountains, but 25 miles distant from the first mentioned mine, is another mine, the Lookout, where similar ore occurs, and there the values are also high, particularly when the copper appeared. These nodules varied in size from that of hazel nuts to lumps as large as the fist. On Castle creek, in Arizona, near the Tiptop district, specular iron occurred in considerable amount in the Roberts mine, and it carried payable gold values. In Brazil, an eminence known as Mount Itabira is largely formed of a highly ferruginous mica schist (specular iron) which is gold bearing. Other occurrences are the Carolinas, of Sutton, Canada, Norway, and the Gold Coast, West Africa. That the amount of specular iron is an index of the amount of copper that may be found in depth is very doubtful, for the reason that in some instances no copper at all is found in veins of this character. The theory that specular iron is the result of different processes from those forming other varieties of hematite is probably the expression of an individual opinion. Nearly all large iron mines produce more or less specular iron. Near Lynchburg, Va., are found iron deposits consisting of hematite, limonite and magnetite. Where the enclosing rocks are both limestone, the bed of ore is limonite; when limestone on one side and sandstone on the other, the ore is red hematite; where it is sandstone and schist, the ore is magnetite.

In Nova Scotia.—II.*

Written for the MINING AND SCIENTIFIC PRESS by T. A. RICKARD

Milling methods are simple, as they should be, for the usual product of the mines is the simplest type of gold-bearing quartz, containing a little pyrite, usually mispickel. In most cases the treatment consists of crushing under stamps, with one inside plate, followed by passage over the amalgamating table outside; and there it ends. At the Caribou a 40-stamp mill is treating quartz yielding from $2 to $4 per ton, giving a tailing which has ranged between 8 and 32 cents per ton during the last two years, despite the fact that extraction of gold ceases after the passage of the pulp over the apron—12 feet long. The ore carries about 1% of sulphides, chiefly pyrrhotite, with a little galena, blende and pyrite. At the Richardson mine the ore contains more sulphide and the treatment is more complex. Sixty stamps, in twelve mortars, provided with a front plate, discharge onto 12-foot aprons. Thence, without classification, the pulp goes to Wilfley tables—one table for each ten heads. The ore yields concentrate in the ratio of 3%, the assay value being $20, equivalent to one ounce of gold per ton.

At this mine the bromo-cyanide process is employed to treat the concentrate, which is not roasted. The salt used is a mixture of bromide and bromate of potassium; it also contains sodium chloride and is sufficiently variable in composition to hinder accurate chemical work. This reddish salt is dissolved in water, to which sulphuric acid is added in an amount that just avoids precipitating the liquid bromine. A given quantity of this solution (equal to one twenty fourth of the amount used per diem for the particular grade of concentrate under treatment), is put into an ordinary pickle bottle. To this a 10% solution of potassium cyanide is added slowly, so as not to crack the bottle with too sudden a generation of heat, until the wine-red color has changed to lemon-yellow, marking the end point of the reaction that forms the bromo-cyanide of potassium. This is then added to the working cyanide solution in the vats. The manager, H. S. Badger, informed me that the working solution can be used continuously without danger of reprecipitating the gold, until it contains $45 to $50 per ton; even a solution assaying $70 has been employed safely. Owing to this enrichment of the solution, the precipitation of the gold in the zinc boxes is rapid, the precipitate being so heavy as even to show the characteristic gold color. The concentrate is arsenical pyrite (mispickel) mixed with 20% of silica; when treated by ordinary cyanide solution, without roasting, it requires twenty-eight to thirty days for satisfactory extraction; with the bromo-cyanide, the treatment is completed within forty-eight hours and gives an extraction of 80% to 81%. The consumption of bromide salt is at the rate of three pounds per ton of concentrate, which is high. The bromo-cyanide solution is acid and therefore destructive to the KCy; if a neutral bromide salt could be used the loss would be diminished. Bromine itself is not obtainable because of danger in transport, the carboys being liable to breakage, especially during hot weather; therefore the railroad and shipping companies refuse to handle it.

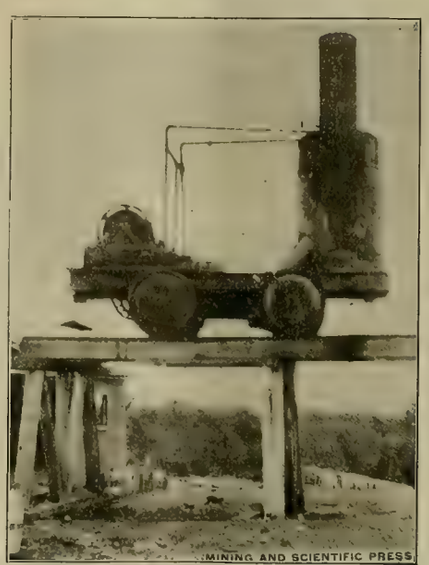
The following test, made at Brookfield, where this process was first tried in Nova Scotia, will be of interest: Fifty-three tons of concentrate, assaying $38 per ton, yielded in forty-eight hours a tailing carrying $1.50 per ton, showing a calculated extraction of 96%. The fifty-three tons contained $2014, and the resulting solution, by assay, carried $1634. After precipitation on zinc there was obtained 120 ounces slime, which on reduction with H_2SO_4 and roasting of the residue, yielded ninety-two ounces bullion, worth $18.20 per ounce.

As already stated, this method was first introduced at the Brookfield mill, but it has been replaced there by plain cyanidation. Several years ago Captain Adolph Thies installed a chlorination plant modeled on that which he had operated so long and so successfully at the Haile mine in South Carolina. It included three single hearth reverberatory furnaces, each with a hearth 8 feet wide and 70 feet long. Ferrous sulphate was the precipitant. But it was not an economic success—the fate of this particular barrel process everywhere, save at the Haile mine, where the ore is of exceptional character, the gold being fine and lying between the laminæ of the schist, so as to be readily soluble to chemical treatment, while the gangue itself is wholly insoluble; after chlorination, W. L. Libbey, the energetic manager of the mine, tried the bromo-cyanide method introduced by E. D. Maze, who had worked with Messrs. Sulman and Teed. This, in turn, gave way to plain cyanidation. Nevertheless, I expect, eventually, to see the application of bromine in the treatment of pyritic concentrate, because whether employed as a compound with cyanogen, or directly, in a manner analogous to chlorination, it has been found to accelerate solution of the gold and to facilitate the subsequent filtering.

*See illustrations on front page.

Another metallurgical problem now being solved in Nova Scotia is the treatment of gold-antimony ore. At West Gore, in Hants county, the Dominion Antimony Co. is working a series of lodes yielding an ore in which the gold is closely associated with both native antimony and the sulphide (stibnite). The gold is often visible. After sorting, the first-class ore carries 45% to 50% antimony and 2½ to 3 ounces gold per ton. The second-class stuff contains 20% to 30% antimony and $20 to $30 in gold. There is a fairly constant ratio between the two metals. Various methods have been tested, until finally J. S. MacArthur, whose name is identified with the cyanide process, originated a scheme which depends upon the solubility of stibnite in caustic soda. The mineral is dissolved in a dilute solution of caustic soda (NaHO), which is then neutralized with carbonic acid gas (CO_2), with the formation of a red precipitate of amorphous antimony sulphide (Sb_2S_3). The intention is to cyanide the residue to extract the gold, and the problem will be to get rid of the soda before cyanidation. This is confidently expected. In the meanwhile the selected ore is shipped to Swansea.

Operating costs in Nova Scotia are creditably low. At the Richardson, the total cost is $2.40 per ton, when supplying thirty stamps and the bromo-cyanide plant. At the Caribou, L. W. Getchell has reduced his cost, when running forty stamps, to between $2.50 and $3 per ton, despite a difficult problem in mining. At Brookfield, the total cost, with twenty heads and cyanidation, is $3 per ton. Milling ranges between 25 and 60 cents per ton at the three mines mentioned. Wood fuel is cheap—$2.25 per cord; but mines near tide water burn coal, as at the Richardson, where I saw a curious engine, affectionately known as the Nancy Hanks. The photograph shows



The Nancy Hanks—An Original Engine.

that she looks like the ingenious application of remnants of machinery, but the peculiarity of construction is due to the fact that the engine was designed for double duty, to push ten tons of coal over a primitive railroad and to hoist freight from vessels onto the wharf at Isaac's harbor. The forward axle is geared by sprocket chain to a short counter-shaft under the platform between the two axles; this counter-shaft is geared similarly to a shunt pinion sprocket wheel on the shaft of the engine, which can actuate either the hoist or the car axles. The Nancy Hanks has done pioneer work, but the cost of her maintenance has been, as might be supposed, excessive.

Labor is cheap in Nova Scotia. Drillmen get $1.70 to $1.75 per day, ordinary miners $1.35 to $1.60, working ten hours. There is complaint, by the operators, of a scarcity of workmen, despite the small number of active mines. This is owing to the fact that the men are independent and go off to their hay making, farming, or lobster fishing without apology, leaving the mine operators shorthanded. The lobster canneries pay $2 per day during the season. Low wages are due to the restricted demand for miners; so few properties are in operation, and even these are far apart. Nevertheless, the workmen are better off than their friends in the unionized camps of the West where high wages are obtained. The Nova Scotian pays from $2.50 to $3 per week for his board; he is sober, he has his farm or his fishing to help him; and I venture to say that taking a period of ten years he will save more money and be in better health than the men who get $3.50 per day, a large part of which goes to the saloon and the gambling den, while they have to pay for their board and their other expenses, a percentage which in the end largely offsets the higher wage. I have heard sneers against the Nova Scotian miners because they are, in part, fishermen and farmers. The natives of the province resemble the greatest miners the world has known, the Cornishmen, who, like them, live in a rugged country encompassed by the sea, so that they earn their livelihood on the deep as fishermen and in the depths as miners. The result has been that the Bluenose and the Cousin Jack have been pioneers the world over, as sailors and as prospectors. He who can force his way through the rock in search for ore and take his dory through tempestuous seas in pursuit of the finny spoil is a man—a man built on the scale of 12 inches to the foot.

Emigration is draining the best blood of Nova Scotia. The languishing condition of the gold mining industry has led many of the energetic to go to British Columbia and the Northwest. Of late, the demand for laborers in the wheat fields of western Canada has attracted the young men. Up to the end of August this year 3700 men had left Nova Scotia and New Brunswick on "harvest excursions" to Manitoba and Alberta; nor was the exodus at an end. The railroads offer unusual facilities, the rate to Winnipeg being only $10 for the trip. Every year several thousand vigorous men go westward and a large part do not return, but take up land on their own account. Nor is this migration altogether strange, the contrast between the Atlantic coast and the bountiful West affords excuse enough; if the West had been as near Europe as the East, then, there can be very little doubt, the eastern seaboard would have been regarded as a never-never land, an inhospitable region, fitted only for the most hardy and the most unhappy.

(TO BE CONTINUED.)

A Noted Pyrite Deposit.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

Almost within the city limits of Deadwood, S. D., is a notable occurrence of sulphide ore in what is known as the Whizzers mine. The property is a portion of a group of claims locally called the Montezuma and the Whizzers. The group consists of several claims, lying on the divide between Deadwood and Whitewood canyons.

The geology is simple, consisting of upturned schists of Algonkian age—hornblende and mica schists, and slates, quartzites and other metamorphic rocks of that remote period. The most pronounced feature of this formation in this vicinity is the bold outcrop of several quartzite reefs. These are particularly prominent and may be followed for long distances, their course only interrupted by the numerous canyons of the region. Sometimes the quartzites become slaty, and then for some distance their outcrop may be somewhat obscure; but ordinarily they reappear in massive ridges, often standing boldly above the surface from 10 to 50 feet in height. Occasionally these deposits are 100 feet or more in thickness.

These prominent quartzite reefs are of very common occurrence in the eastern half of the Algonkian area of the Black Hills. In some of them gold has been found and in several of them copper also occurs. Ordinarily they are extremely siliceous, but occasionally carrying considerable iron oxide in the outcrop—both hematite and limonite. In the early days of mining in the Black Hills some development work was done on these quartzites near Deadwood, and small bodies of massive pyrite and quartz carrying disseminated pyrite were found; but no systematic mining was undertaken, as the ore was low grade in gold and the copper content was too small to be commercially valuable.

When the Deadwood & Delaware smelter began operations, the supply of siliceous ore came from the Bald Mountain and Terry Peak region. The smelting of these ores required a large amount of iron ore and limestone. The limestone was readily available in a score of places within a mile of the smelter, but the greater portion of it was obtained on the line of the railroad, about 12 miles distant—a striking lesson in the economy of mining, though possibly it could not have been obtained any cheaper near the smelter, the railroad haul being 25 cents per ton. For a time the Homestake Co. supplied the necessary iron ore from the accumulation of years of concentrated sulphides in their mills. This supply was soon exhausted and search was made in the veins near Deadwood known to contain iron sulphide. Several mines were opened; some of them proved more valuable than others as producers of sulphides for the smelter.

The last of these deposits to be opened and the one most extensively developed was the Whizzers mine. At first a tunnel was run on a mineralized vein, which, though furnishing some good ore, was too small to meet the requirements. To the westward of this vein about 250 feet was a heavy iron gossan on the surface, and it was determined to explore this zone in search of ore. A tunnel was driven into the hill, which quickly entered a body of solid pyrite and continued for some distance, it being found that the ore body was continuous and evidently of considerable magnitude.

A second and larger tunnel was driven several feet higher than the original prospect drift, in order

that cars might be run from the mine directly over the ore cars on the railroad track. In 100 feet from the portal of this tunnel the deposit was encountered. From that point the drift has been continued for more than 600 feet, all in solid pyrite, carrying a small percentage of copper and variable values in gold. The vein was found on opening out the headings to be about 45 feet in width. It seems remarkably uniform in character—a dark-colored, pyritous hornblende schist, forming solid masses of mineral in many places, though usually containing over 80% iron sulphide. The walls are covered with an efflorescence of copper sulphate, showing that copper is present throughout the mass. In some of the ore chalcopyrite can be seen disseminated throughout the pyrite. A winze sunk near the hanging wall side of the ore body is in similar ore to that found above, though the copper content is somewhat higher. Gold was also found to increase somewhat at this point. Whether this single prospecting hole below the general level of the workings is an index of the character of the entire deposit in depth can only be surmised. The water flowing from the tunnel is strongly acid and impregnated with copper salts. Considerable copper could be obtained from this source if the owner would take the trouble to run the water through a line of sluices containing iron scrap; but no attempt in this direction has yet been made.

The mining methods by which the ore has been removed from the Whizzers are not such as would commend themselves to a manager with any regard to the future success of the property. The plan generally followed has been to put up a raise, build a timber chute at the foot of it, and then open out a large stope overhead, only enough ore being removed to allow the miners to keep within convenient reach of the back. When the stope had been carried up from 20 to 50 feet, the ore was all withdrawn, leaving large open excavations, without timbers or filling for support, and making future operations somewhat dangerous. There is still abundance of good ore available when desired; and this may be removed while the inaccessible portion in the large stope is placed within reach once more by filling the stopes from the surface, when extensive operations may be resumed on a larger scale.

The Montezuma mine, which constitutes a portion of the property, is on a parallel reef of quartzite and has as yet only superficial development.

Copper and gold both occur in the superficial portions of this outcrop, and more extensive development of this reef may find that large ore bodies also exist in that zone.

The smelter at Deadwood has been idle the past two years, having been closed down through difficulties with the labor unions, and the owners, the Golden Reward Mining Co., have not resumed operations. It may be, however, that the large body of pyritous ore in the Whizzers mine can be mined and matted with profitable results, as it contains both gold and copper. The proposition to make copper matte from this ore is now being considered, and the Whizzers mine may yet be operated independently. Siliceous ores are obtainable in abundance and limestone may be had for the quarrying in the vicinity.

The Drainage of Cripple Creek Mines.

Ever since the great benefits derived from driving what is known as the El Paso drainage tunnel in the Cripple Creek district of Colorado have been fully demonstrated and realized, engineers, mine superintendents and mine owners in that vicinity have been discussing the advisability of another lower and longer tunnel, which would effect the drainage of a much larger area, and make it possible to more economically and rapidly explore and work the deeper portions of the great system of veins which have proven so richly profitable in the portions above the present drainage level.

Before the El Paso tunnel was driven some of the deeper mines found it almost impossible to proceed to greater depth owing to the heavy inflow of water encountered in the shafts. Where shafts were sunk deeper it was only at largely increased expense. It was figured that if a tunnel were driven to connect with the lowest level of the El Paso mine, a large area would be drained to a depth of between 200 and 300 feet below the lowest level of the greater number of mines of the vicinity. The tunnel was successfully driven, and long before its completion the direct benefits due to drainage of the ground were apparent to all.

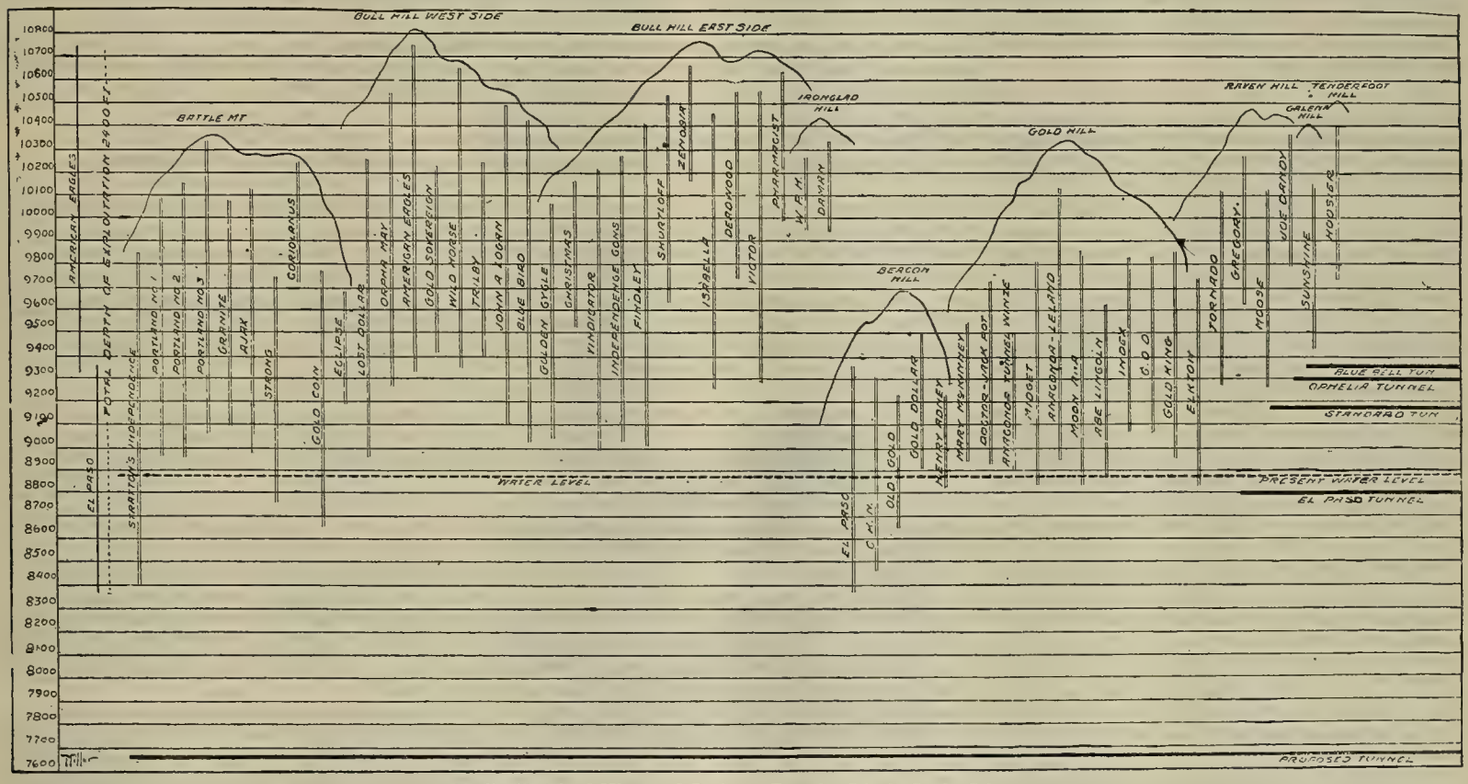
This enterprise having been carried to a successful termination, it is not strange that some of those most largely interested, foreseeing the need of a similar and deeper adit, some time since began to vigorously agitate the idea and urge its importance upon all those of the district who would be directly benefited by it. Drainage tunnels are not an experiment. They have been used to good advantage in other places in the United States, notably on the Comstock Lode at Virginia City, Nev., at the Ontario mine, Park City, Utah, and also in the Cœur d'Alene district of Idaho and elsewhere, as well as numerous instances in the drainage of European mines.

The lease of life gained by driving the El Paso tunnel is drawing to a close, the mine workings are mostly down to the tunnel level, and the ore reserves are no longer of such magnitude as to give confidence in the future prosperity of the district. When the El Paso tunnel was driven attention was then called herein to the future needs of the district, and the fact emphasized that the El Paso tunnel would afford only temporary relief. This statement is now verified in the present condition of the mines of the Cripple Creek district, and a deeper tunnel has already become a pressing need if the mining industry is to be perpetuated. Some of the important mines on the line of the El Paso tunnel are now practically exhausted down to that level, and others are rapidly approaching it.

The accompanying profile sketch, showing the important mines of that portion of the district, is reproduced from the Rocky Mountain News of Denver, for which the data were compiled. The sketch shows the relative position of the several shafts and their approximate depth, together with the proposed new tunnel, which will drain the mines over 1100 feet below the present drainage level. It is known that payable ore exists in nearly all of the more important mines to the greatest depth that has been reached by any of them. There are few important exceptions, and these exceptions have no extensive development below their lowest ore shoots, so it may be reasonably inferred that, with further deep exploration, these, too, will be found ore bearing at greater depth.

The need of the deeper tunnel is fully realized, and as the project is in good hands it, like the El Paso tunnel, is likely to become a reality. It is thought the completion of the tunnel now proposed will lengthen the period of life of the mines not less than ten years. It is thought by engineers of the district that, unless conditions change materially with greater depth, the cost of the new tunnel will be about $500,000. The El Paso tunnel cost about $85,000, and gained about 250 feet depth. The new tunnel will gain nearly five times that depth.

A report on the feasibility and cost of the proposed enterprise has been made to the associated mine owners by Engineer W. D. Brunton and the report favorably accepted by the association at a recent meeting held in Colorado Springs.



Profile Sketch of Mines and Drainage Tunnels, Cripple Creek, Colo.

Temperature of Feed Water.

Every steam engine, and every regimen of steam, has its own peculiar temperature of feed-water which gives the maximum economy of fuel, and which can only be experimentally ascertained. No experiments have been made to determine, in given different cases, this temperature. Probably it admits of wide variation without affecting the fuel economy, the gains sensibly equilibrating the resulting losses. The higher the feed-water temperature, the less tube surface is required in the condenser; but, then, the higher the feed-water temperature, the larger must be the capacity of the cylinder for developing equal powers, other things equal, owing to the increased back pressure against the piston with higher temperature of the condenser. The higher temperature of the feed-water increases the economic vaporization by the boiler in a higher degree than is due, numerically, to the increased temperature of that water, because the heating surface of the boiler having, in equal time, to transmit less heat, will, necessarily, utilize more of the heat in the gases of combustion than it would do with feed-water of lower temperature.

Further, with the same engine, for the production of a given power with equal reciprocating speed of piston, the boiler pressure must be carried higher, the higher the back pressure against the piston, and there is a distinct and measurable economic gain due to the greater dynamic effect of a given weight of steam of higher pressure over the same weight of steam of lower pressure, after allowing for the greater total heat of the former.

Placer Mining in Alaska.*

NUMBER XI.

Regarding the use of punched plates in working New Zealand gold-bearing marine deposits, H. W. Young says:

"The best size of perforation for hopper plates has been a matter of experiment by myself and others, variations from ¼ to ⅝ inch having been put to working tests. It is proved that holes of less than ⅝ inch diameter unduly limit the discharge through the plates, are liable to choke, and that there is no advantage whatever to be gained by their use. The discharge through $\frac{7}{16}$ inch holes is sufficient in amount, and the fine shingle particles which pass through with the sands and seldom exceed ¼ inch in diameter are not troublesome in their size and quantity. In fact, many consider that they are of benefit in keeping lively the sands on the tables. With holes exceeding $\frac{7}{16}$ inch in diameter, the size and quantity of small shingle become excessive, and the water passes away so rapidly as to prevent material from being carried forward over the plates."

The above remarks are of somewhat general application for the use of punched iron screens in any form of undercurrent where it is assumed that a portion of the gold, including any nuggets which may occur, has been previously saved. In northern deposits where dredgers have been installed, as in the Klondike and on Stewart river, punched iron screens used in revolving trommels have large holes, up to 1½ inch, even when a tailings stacker is used, while the average size in Oroville dredging practice is ⅝ inch.

A screen installed in one box of the main sluice of a plant on Ophir creek, Seward Peninsula, consisted of a number of longitudinally disposed round iron rods, acting as a grizzly, fitted above the bottom of the box, the gold being saved on mats below. This box, which was placed at the end of a 120-foot sluice, was said to save much fine gold.

When it is desirable to introduce the principle of the undercurrent, separate from the main sluice, the following device, adapted from one used in Siberia, as described by E. D. Levat, may be adopted. Its capacity is given as 172 cubic yards per shift. The principle of the undercurrent is here introduced, but the discharge, of both coarse and fine, is to the same heap. This contrivance uses no power, and the method of handling accumulations of tailings will be more expensive than in plants already in use. Where the steam scraper is so generally employed, however, as in the Klondike, for handling tailings, the innovation of the modified "kulibinka" here figured (Fig. 20) would not add over $1000 to the expense of installation, while the efficiency in saving the values would be greatly increased.

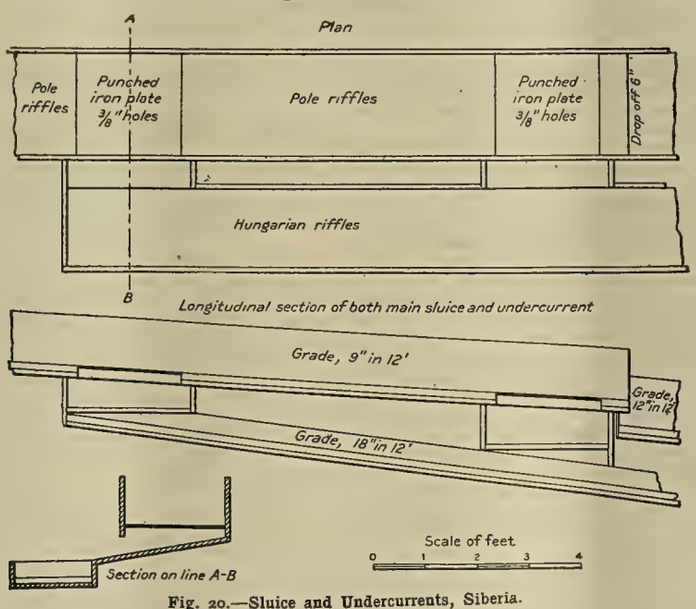


Fig. 20.—Sluice and Undercurrents, Siberia.

It has been shown that the Klondike sluice generally necessitates a man forking. The object of this forking is to take out the stones, from 6 to 18 inches in diameter, after their surface is washed. Mechanical devices for accomplishing this would be advantageous. Experience with gold dredgers has proved that the revolving screen or trommel, inside of which play powerful jets of water, accomplishes this screening process most successfully. The trommel is, however, expensive, and its various parts and castings must be specially made at elaborately equipped works. Therefore it is worth while to consider whether simpler and cheaper devices will not accomplish nearly as good results for the Alaskan miner.

A plant to accomplish good washing results with sticky clay and gravel, and which can be built of materials at hand, is shown in Fig. 21. This type of plant, founded on the idea of the Siberian pan, has a capacity of from 100 to 200 cubic yards in ten hours, and can be built in the winter months. Assuming that steam power is already at hand, it requires no outside material beyond the iron shoes and simple castings and the punched steel plate which forms the floor of the pan. Its operation will require 10 H. P., and, if the material is conveyed to it by self-dumping carrier, the services of two men are sufficient to take care of the tailings. The machine will not only break up and thoroughly wash clayey gravel, but with properly arranged tables below will save the bulk of the fine gold which has been set free from its matrix. The cost of a pan of the dimensions here figured will not exceed $2000, including the tables and sluices. The device for automatically clearing the bottom of the pan of large stones is not used in Siberia, where hand labor is cheap enough to dispense with it, the large stones being periodically removed by the lifting of gates in the periphery of the pan. The amount of water used in such a machine does not exceed 125 miner's inches.

The drawing of this machine is made diagrammatically, since the manner of its construction will depend on local conditions. A four-armed casting, keyed to the shaft and bolted to the horizontal timbers, is advisable. As used in remote districts in Siberia, the central shaft is frequently a wooden beam, and, instead of the iron shoes, heavy stones dragged with chains, as in the arrastre, may supplant them.

The above suggestions are made with reference to

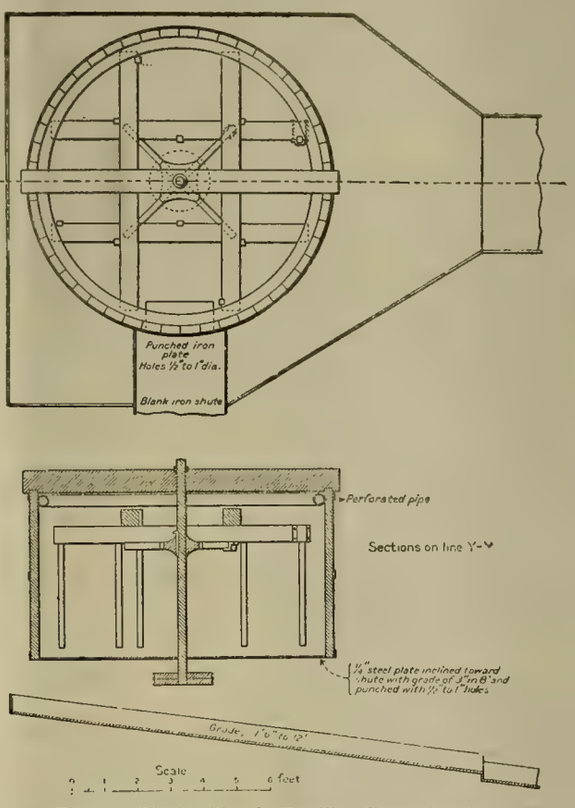

Punched iron plate Holes ½" to 1" dia.
Blank iron shute
Perforated pipe
Sections on line Y-Y
⅛" steel plate inclined toward shute with grade of 3" in 8' and punched with ½" to 1" holes
Grade, 1'6" to 12'
Scale
0 1 2 3 4 5 6 feet

Fig. 21.—Siberian Plan for Handling Clayey Gravel.

working the rich gravels of the shallow northern placers. Gravel containing less than $2 to the cubic yard is rarely worked by the method of the cable and traveling bucket. Lack of natural grade makes it necessary that the miner elevate his material, and the impossibility of getting water under head makes the use of steam power imperative. The point is that when such elevation is attained, it should be made available to thoroughly wash the gravel. At present this is not done. Perhaps the suggestions here offered may be of benefit to some operators.

In the construction of washing plants of a larger and more expensive kind, the operator has the benefit of the experience developed in gold dredging. This now rather important industry has brought into service devices for gold saving, in the use of which one of the main objects is to utilize to the best advantage all available vertical and areal space.

The employment of large mechanical excavators for placer mining has a field in the Northwest. Such operations necessitate one or more permanent washing plants to receive the gravel from each machine. It has been demonstrated that the dredger is the only form of excavator which can economically transport its sluices as it moves. Therefore a plant, situated as safely as possible with reference to danger from floods, and economically with reference to tramway, dump and water supply, must be constructed frequently at a considerable expense.

The shaking screen, although it has received a thorough trial on gold dredgers, does not find as much favor as the trommel. It is not impossible that modifications of the principle of the shaking screen and of the shaking table may be developed which will act more efficiently in saving gold than the trommel. F. Francois has recently figured and described a "shaking sluice box" system of gold saving, for installation either in stationary washing plants or in dredgers. He claims a very high percentage of saving, and as additional advantages the elimination of the use of quicksilver and the employment of a small amount of water. He does not give the cost of the plant, however, nor any actual results of its operation in practice.

A trommel was used in a stationary washing plant erected in the Klondike in connection with a steam shovel and incline operation. A short description of this plant is appended, but it should be understood that for the average miner the installation of such a plant is impracticable on account of first expense and the difficulty of getting the complicated machinery. The plant used 125 miner's inches of water, led by a ditch from Bear creek; the capacity was said to be 500 cubic yards in ten hours. The material elevated to the platform at the upper end of the trommel was dumped into a hopper feeding the trommel. The water was led into the lower end of the trommel and fed through a perforated pipe. The largest holes in the revolving screen were 1 inch in diameter, and all oversizes passed through and into

*Bulletin 263 U. S. Geological Survey.

the hopper below the lower end, whence the tailings were hoisted in a self-dumping carrier, on a cable, for a horizontal distance of 200 feet and a vertical distance of 60 feet. The fines passed over 80 square feet of riffle tables, floored with expanded metal and cocoa matting, on a grade of 12 inches to 12 feet, followed by sluices with iron Hungarian riffles. The fines were, after passing out of the 96 feet of sluice boxes following the tables, elevated by a steam scraper to a pile 200 feet distant and 15 feet high. The expense of installation of such a plant will be not less than $5000, and will more likely be $10,000 in any part of the interior of Alaska.

In arranging a number of gold-saving tables to receive the discharge from a screen, great care should be taken to distribute the material equally to these tables, so that the duty of each may be the same. This in the best Oroville, Cal., practice is done by leading a small sluice trough from the main receiving sluice beneath the screen to each of the tables. In case of a second sizing, as in the Atlin dredger described below, the distribution is necessarily accomplished by a series of grizzlies in the main sluice. If small ducts or troughs are used, they should be provided with gates, the whole made of wood, like those used for distributing the pulp to the tables in concentrating mills. The attempt to distribute the fines directly from the trommel by means of iron gates is considered less satisfactory.

Riffles for the saving of fine gold in sluices are of many kinds and are of very ancient origin. Humboldt (Asie Centrale) refers to the method in use of working the placers of Colchis—that of employing wool in the sluices—as a possible explanation of the legend of the "Golden Fleece." It was in fact known that the kings of Imeret in the eighteenth century used wool for collecting gold in Tskinitskali and Abacha rivers in the Caucasus, while the Turkish gypsies use goatskin for gold saving on Belichta river.

The pole riffle made of saplings, with or without strap iron nailed to the top, has long been in favor in small placer operations in the United States, and is to-day employed in the primitive shoveling-in operations throughout the northern territory. An improvement on this riffle, simply made, aiding in the disintegration of clay, was seen by F. L. Hess in the Rampart district of Alaska, and a sketch furnished by him is shown in Fig. 22. Small squares of sheet

Fig. 22.—Pole Riffle With Knives for Cutting Clay.

iron $\frac{1}{16}$ inch by 2x2 inches are driven cornerwise into the poles.

A development from the wooden pole riffle is the iron or steel rail, laid longitudinally in the sluice box.

At the present day the saving of fine gold is receiving marked attention on gold dredgers, as the product of these machines frequently consists largely of gold in an exceedingly fine state of division.

The Oroville gold contains a much larger proportion of fine colors than the northern fields. From an undercurrent sample of Klondike gold, assuming that it represents 5% of the total recovery, screening tests appear to indicate that under 1% of the Klondike gold, and under 2% of the Fairbanks creek gold, will pass 150 mesh.

The fineness of the gold on Sulphur creek is shown by the table below:

FINENESS OF GOLD FROM SULPHUR CREEK.

Mesh.	Per Cent.
Under 150	10
150–100	60
100–80	20
80–60	10

Moreover, the gold, whatever its fineness of division, is generally round and shot-like and not flaky. Under such conditions, in view of the Oroville experience, losses such as undoubtedly occur in the northern practice are inexcusable.

The riffle shown in Fig. 23 is designed to hold a

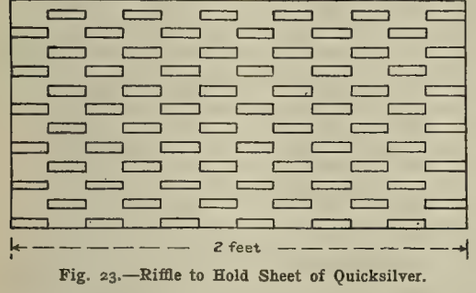


Fig. 23.—Riffle to Hold Sheet of Quicksilver.

divided sheet of quicksilver. Another form is made by boring 1½-inch augur holes to the depth of ½ inch. Some operators claim that a recurring quick jar imparted to the fine gold tables by means of an eccentric or other device aids the saving of gold. The efficiency of this principle is questionable.

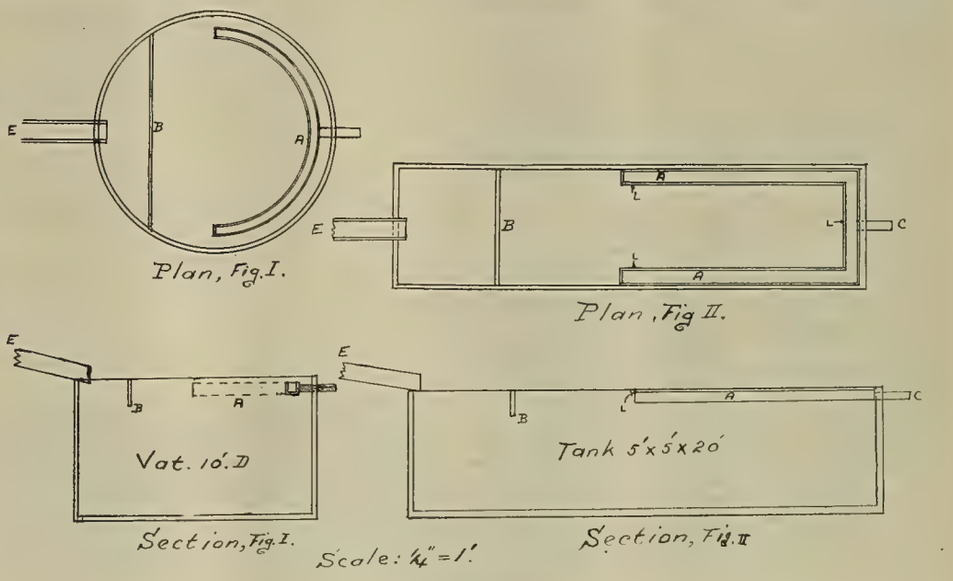
(TO BE CONTINUED.)

An Experience in Water Recovery.

TO THE EDITOR:—The "Experience in Water Recovery" by George S. Binckley is interesting, and, having had a very similar experience some eleven or twelve years ago, I believe I can offer a few suggestions that will insure clear water at all times.

The plant would be about as outlined and drawn by Mr. Binckley on page 123 of the Aug. 19th, 1905, number of the MINING AND SCIENTIFIC PRESS, only, instead of the pyramidal downtake box, a baffle board B, as shown in the accompanying drawings, should be put across the heavy-slimes box, or tank, about 2 feet from the end, into which the slimes are discharged, if round, and 4 feet if square, the delivery trough E discharging at the level of the top of tank, and near the edge.

If the discharge trough L is placed, as shown in sketch, just below the edge of the tank, say 2 inches lower than the top of the baffle board, and have at least 15 feet of skimming surface (the more the better), the water should be discharged practically clear from the second tank, or the one Mr. Binckley designates as the heavy-slimes tank. I believe this will prove to be so, in case the skimming launder be set in a semi-circle, 6 inches from the inner edge of vat, opposite to and farthest from baffle board B, as indicated at A in the plan (Fig. 1).



Water Settling Boxes.

Should slimes still pass over, the light-slimes tank or vat could be arranged identical to the one just described, and, from my experience with exceedingly slimy ores, I am certain no slimes would be conveyed to the mill water tank.

Fig. 1 is an excellent model, and the collecting trough A should be set 2 inches below the top of the vat, and should be made with the edges beveled in, as shown by Mr. Binckley.

The baffle board B need not be more than 1 inch thick and 12 inches deep; but it must absolutely cut off the flow of water and slimes, and should be set flush with the level of the top of the tank.

In the rectangular tank, which should be not less than 20 feet long and 5 feet wide, the baffle board B (Fig. 2) should be set 4 feet from the intake launder E. The discharge launder, or skimming trough, can be made 4 inches wide and 6 inches deep, with the side L cut 2 inches lower than the other side, the higher side being nailed to the top edge of the tank and level with it, thus leaving the side L 2 inches lower than the top of the tank. This will allow the thinnest of sheets of water to pass over into the collecting launder, creating a minimum of current, and the slimes particles, deflected down by the baffle board, will never rise to the surface, even though the slimes fill the tank to within 1 foot of the bottom of the baffle board. This is my experience; and at first I met with almost the identical difficulties that Mr. Binckley encountered.

I here adopt Mr. Binckley's model of collecting trough; for, where I used round vats, I cut down the upper edge of the vat itself 2 inches, leaving the inside edge sharp, with the bevel toward the outside, building a circular collecting launder around the outside, just below the lip of the skimming edge.

Where I have used rectangular tanks I have done the same, cutting down the edge of the sides and discharge end (the discharge end of the tank being about double the width of the intake end in a 25-foot long tank), collecting the clear water on the outside. Either way will do the work and give almost perfect results.

I have never seen the third—or fine-slimes—tank used, but can readily see that it would be of advantage with soft, earthy, decomposed ores, giving a large percentage of clay slimes. E. A. H. TAYS.

San Jose de Gracia, Sinaloa, Mexico, Sept. 18.

THE PROSPECTOR.

The slaty rock from Yreka, Cal., is a graphitic schist. The rock contains no molybdenite. The scales are graphite.

The ore from Sonora, Cal., is quartz containing iron, copper and zinc sulphide, the dark colored mineral being the zinc blende. The ore also contains gold. The silvery white mineral on one edge of the specimen is foliated talc.

Samples continue to arrive for determination without the name of the sender. One sack containing eight pieces of rock, each marked with red paint and a running number, has been received, but the tag accompanying it has been so badly mutilated that the sender's name is unknown.

The samples from Belgrade, Mont., are: No. 1, hornblende schist containing considerable finely disseminated pyrrhotite (magnetic iron sulphide). It may also contain gold, silver, nickel, cobalt and other minerals, and should be assayed for these metals by competent assayers. Ore of this character frequently occurs associated with sulphide copper ores. No 2 is quartz and lime spar (calcite). The specimen contains a very little pyrite and a few scales of molybdenite.

The rock samples from Phœnix, Ariz., marked W. L. H., are: No. 1, aplite (micaless granite); No. 2, Labradorite (soda-feldspar); No. 3, diabase; No. 4, a much altered greenstone, now consisting largely of what is known as pro-chlorite; No. 5 is quartz-diorite carrying pyrite and chalcopyrite.

It is not sufficient for a prospector going into (to him) an unknown portion of the desert region with only a general knowledge of the whereabouts of springs. While springs are not numerous, and perennial running streams are almost wholly unknown in the deserts of the southwest, the sources of water are usually numerous enough to make the passage of the intervening wastes safe if the traveler knows accurately where these springs are. Old Woman's spring, in San Bernardino county, Cal., flows enough water to supply a thousand people or more with all the water they require, and yet one may pass easily within a few hundred yards of it and not suspect its existence. Coyote Holes, a spring north of Calico, is even more obscure, and Paradise spring, which flows nearly 5 inches of water, could only be found by those who know where the springs are, being off the main routes of travel. A small spring exists on the north side of the large dry lake north of the Calico mountains, but it is probable that not over 50 people know of its existence. In Riverside county, about 12 miles northeast of Walters' station, on the Southern Pacific railroad and ¾ mile from the road leading to Cottonwood springs and Eagle mountain, is a small spring known to only a few travelers in that region. It is not so much the lack of springs on the desert as it is the exact knowledge of where these springs are that makes travel dangerous in that region. The instances here mentioned are but a few of the great number of obscure springs occurring on the Mojave and Colorado deserts. Those unaccustomed to the desert and unfamiliar with the water holes and springs should not venture out into these wastes without a guide who knows the road and trails where water may be obtained, and who also knows from experience how to travel on the desert and to make the best of any situation.

Sampling Products of Concentrating and Sliming Tables.*

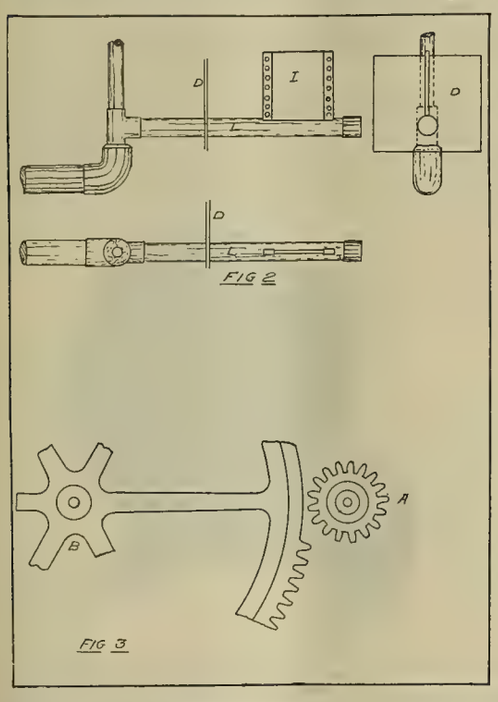
Written by J. C. Bailar.

In the discussion of this question it may be well to consider the sampling of the products of a stamp mill using plates, with tables for concentration of the tailings.

If there are no sampling works in connection with the mill, a sample of the ore may be taken by catching it as it comes from the stamps in a long pan placed in front of the screen.

For sampling the products of the amalgamating plates and concentrating tables almost every mill has its own device. In some the sample is taken by hand, in others by an automatic sampler.

The hand sample is usually taken by catching the water and pulp in a bucket as it comes from the launder. If taken in this manner the sample should be collected at regular intervals and the bucket should never be allowed to overflow. If the bucket overflows there is liable to be a concentration, as the lighter particles are more liable to be carried away than the heavier ones. After a sample is taken it should be allowed to settle until the water is perfectly clear, when it may be drawn off by suitable means. The settling may be hastened by warming.



Tailings Sampler.

Sometimes a sample is taken by passing a pan or bucket with a regular motion along the lower edge of the plate or concentrating table. This is not good practice, but, if it is necessary, care should be taken not to touch the edge of the plate or table, as the slimes clinging there may be far from an average of the ore. When possible, samples should be taken from the launder, and best from the end. When samples cannot be taken from the end of the launder they may be taken at any convenient point by a swinging or sliding gate which diverts all the water for a short time into the sample box. The objection to this device is that, while it may divert all the water, there is almost sure to be a small amount of ore close to the bottom of the launder that escapes.

*Journal Western Chem. and Met.

The automatic sampler consists of a spout or box that is carried at intervals under the end of the launder. Some of these samplers are driven by the power that operates the mill, some by water carrying the ore. Of these latter one very common device is an overshot wheel; another is a scoop-shaped box, so arranged that when it is full it tilts, emptying itself and at the same time causing the end of the sample spout to pass under the end of the launder. Still another device consists of two such boxes placed back to back with the spout for taking the sample between them, the whole resting upon a support so arranged that it can rock from side to side. (See Fig. 1.)

When the right-hand box is full it tilts to the right and the left-hand box is brought under the falling stream and when it is full the sample tilts to the left. At each tilting the sample spout passes under the end of the launder, taking a sample. Any of the above can be made by the mill carpenter. The overshot wheel is best where there is a large amount of water flowing and the tilting box where the amount is small.

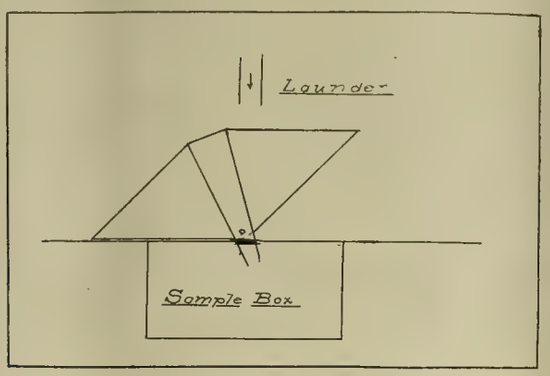


Fig. 1.

A very ingenious and satisfactory device in use by a Montana copper company consists of a 2-inch pipe about 6 feet long, closed at one end, and pivoted near the center so that it turns in a horizontal plane. At the closed end a slit is cut about ½ inch wide and 16 inches long. To the sides of this slit are fastened what might be termed "side boards" of sheet metal about 8 inches high and connected at the ends, forming a box 16 inches long, 8 inches high and ½ inch wide, opening at the bottom into the pipe. This is driven by an intermittent gear, consisting of a large wheel with some cogs on one side. With each revolution of this wheel these cogs engage a small cogwheel attached to the sampler, rotating the latter and causing the open end to pass under the falling stream. The sample falls into the opening in the pipe and passes out through the open end into the sample box. The sides of the opening in the pipe are not parallel, but form radii of the circle in which it moves. (See Figs. 2 and 3.)

In many of the mills of Gilpin county, Colo., the concentrates are thrown in a heap and sampled by thrusting into the pile a "pipe" or "spear" sampler. This is made by splitting an inch gaspipe about 3 feet long. When it is withdrawn from the pile it brings with it a "core" of ore. This is not always a fair sample of the section through which it passed, as the ore may clog in the end and push everything before it, not cutting out a clean section of the pile. It would give a much more accurate sample to dry this ore and sample it by some approved mechanical sampler.

The greater part of the errors made in sampling are so evidently wrong that it would seem unnecessary to call attention to them. Some of the more common are:

Allowing the bucket to overflow when taking a sample by hand.

Not sampling at regular intervals.

Not allowing the sample to settle before decanting off the water.

Sampling immediately after changing feed or water.

Scraping the lower edge of the table when taking a sample.

Not drying and properly cutting down the sample after it is taken.

The sampling department should determine not only the value of every product of the mill, but also the quantity, so that the foreman may know what becomes of every pound of ore and every gallon of water that enters his mill. Without this knowledge the most accurate sampling may be of little value.

In proof of the above statement may be cited the case, well known in the history of metallurgy, of a copper company of Ducktown, Tenn., which suffered large losses until they adopted the practice of weighing everything that went into the plant. After this the loss was quickly discovered and corrected.

The fact that the tailings from a mill run very low is not proof that all values are being saved. There should be a system of checks that will discover every loss as soon as it occurs.

History of Pyritic Smelting.*

NUMBER III.

By Robert C. Sticht.

The practice of returning matte to the pyrite furnace unroasted, either alone with quartz or together with ore, for the purpose of concentrating it, was practiced at Toston from the very beginning, and also subsequently at once at all the other plants that adopted pyrite smelting. They were all naive enough not to look upon this as in any manner a meritorious achievement, though this most facile and rapid method of enrichment appears not to have found an entrance into the conventional branches of copper smelting, in spite of its equal applicability.

Another point of some interest was the behavior of pyrrhotite, which is so much dreaded by the copper and lead smelter using the ordinary process. When the opportunity came, its very special suitability for pyrite smelting immediately showed itself, and once more demonstrated the superfluity of carrying apprehensions from one metallurgical branch into another which is not parallel with it.

The proof of permanency achieved at Toston now removed financial hesitation, and gave encouragement to the starting of a new company, the Boulder Smelting Co., which, under the supervision of the writer, erected a little one-furnace plant in Boulder valley, Mont., on the strength of a promising pyritous quartz lode carrying fair gold—the Hope mine at Basin, not far away. The reef subsequently attained a certain amount of celebrity on account of the abundant occurrence, in a pyritous portion, of grains and slugs of native gold. But this was after, not during the smelting experience. The ore was expected to form the financial mainstay of the metallurgical operations, the basic ore to be obtained from other sources. The furnace was blown in in July, 1892, but the conditions for true pyrite smelting, or even pyritic smelting only, were so unfavorable that operations quite rivalled those at Toston for erratic running and spasmodic puffs of activity. Almost the only basic ore that proved available without loss was stuff that the general market rejected, and which carried 21% zinc and 11% of lead. It was totally unfit for the methods in their early innocence, and still remains so for their present cunning. A very interesting hot-blast stove was installed, built on the efficient Groditz type, which has not been used in pyrite smelting anywhere else, although quite suitable for it, if well built, owing to the comparatively low temperatures which are sufficient. The principle was that of a series of concentric horizontal pipes, duly cross-connected in a combined horizontal and vertical zigzag manner, and so arranged that the blast was confined to the annular space between the pipes. The flame coursed around the outside and through the inside of each double pipe, and the whole was laid out on the counter-current principle, and enclosed in a simple brick structure, with a wood-fired fireplace below. The temperatures obtained when this stove worked well were very high, but false economy had caused the taking of too many liberties with the simplification of the pipe connections, so that the stove usually leaked unmercifully, and the pressure went down as low as 2 or 3 ounces at the furnace.

In the meantime, W. L. Austin had made a demonstration run at Leadville, Colo., in the spring of 1892, in an improvised experimental plant, at the old La Plata works, which sufficiently proved the profitableness of the method for it to be taken up by local parties, and a regularly appointed plant at once to be erected by them, on the basis of data gathered from Toston and Boulder and locality. This was the Bimetallic Smelting Co. Needless to say, the greater practical sagacity inherent in the local furnace crews—always an important feature in a new departure, and which was more abundant in a smelting district like Leadville than it had been at either of the purely agricultural districts of Toston and Boulder—assisted largely, so that, under the careful direction of Franklin Ballou, the method was finally placed in good odor, a desirable issue which neither of the Montana works had been able to achieve. Leadville ores, too, although by no means clean, were far more suitable, pyritically, than those of the northern State.

Encouraged by the example of the Bi-metallic smelter, a further plant was erected at Kokomo, near Leadville, by the Summit M. & S. Co., in 1892, but on a very zincky and friable pyrites, which also happened to be totally devoid of copper. This absence of copper, or any other vehicle for collecting, in the presence of zinc, gave serious trouble, and the writer was again called for to adjust matters late in 1892. Slags were rich in silver, separation was bad, and forehearths froze up. To counteract the evil it was natural to propose the addition of copper ore. But copper ores were scarce in the State of Colorado. The arrival of the single railway truckload which was procured, and had to travel all the way from Silverton, in the southern part of the State, to this inaccessible northern portion, at an elevation of over 10,000 feet above sea level, was awaited with

*Abstract of Proceedings Australasian Inst Mining Engineers.

great anxiety. The first shovelful of the ore, which contained about 30% of copper and about the same amount of lead, put into the furnace, however, at once relieved the entire slag distress, and subsequent truckloads relieved it permanently. It was here, also, at a moment when the conditions were favorable, that the gratification of running the furnace wholly without coke was experienced for the first time. This pleasure had, however, to be limited to 5 hours, for by that time the furnace showed signs of weakening on the heat side. The Kokomo enterprise lasted until the middle of 1893, when the depreciation of silver and the deviation of pyritic interest to more promising localities put an end to it.

Under the same auspices as the Kokomo works, another plant was erected in the San Juan district of Colorado, at Silverton, subsequently followed by one or two others, all, like the above, hot-blast pyrite plants treating basic iron pyrites and siliceous ores. But most of these had a short life, chiefly for want of proper ore, and also in consequence of rather poor machinery, since frugality compelled the financial pioneers of pyrite smelting to use it second hand to the greatest possible extent. Nevertheless, experience trained a few men to the work, from the practical point of view at least, and established the superfluity of any special method of furnace charging, as well as the fact that no special furnace construction whatever was required, and that the ordinary American Rachette type of furnace, suitable for matte-smelting, was fully adequate. A trifling change in blast connections was required by the use of hot air. The only point of importance, perhaps, was the multiplication of the number and the closer setting of the tuyeres. Hot air was produced in U-tube stoves, preferably heated by means of a cheap petroleum residue, but blast temperatures, though recorded high by the pyrometers, were, as a matter of fact, very low. Comparatively much coke was employed, and generally a belief soon arose that coke was cheaper than hot blast, and faith in the latter weakened.

It must be remarked that most of these plants were misapplications to ores that were not suitable. The pure pyrite method, as Dr. Peters early pointed out, will never be applicable to many of the more important mining districts, for, as a rule, heavy pyrite ores are scarce. Hot blast itself was by some regarded as the magic measure by means of which all smelting difficulties could be overcome and the most siliceous ores reduced to ready fusibility. The impression, in fact, arose that the method was particularly adapted for the smelting of a maximum of siliceous ore with a minimum of pyrites. The practical results, however, as the public could easily discern, did not justify such an inference.

In 1894 W. L. Austin patented an improvement of the original pyrite idea, which embraces comprehensive claims for a method of treating raw sulphides, etc., in a blast furnace, by means of rapid oxidation, and without the use of coke or coal, but with the introduction, through the tuyeres, of gasified carbonaceous fuel, or hydrocarbons, or powdered solid fuels, the purpose being the production of a reducing or semi-reducing atmosphere immediately in front of the tuyeres. This was to prevent the formation of ferric oxide there. At the same time limestone in lumps was to be mixed with the charge, not as a flux, but to prevent the sulphides from fusing together. The blast was intended to be cold, except for such heat as the fuel injection would impart to it, and the atmosphere before the tuyeres was to be reducing, the rest of the furnace, however, being expected to oxidize.

There has been no opportunity for noting how this innovation would fare at the hands of the ever-ready theoretical Germans, for in 1894 the latter were still occupied in proving the impossibility of smelting pyritically at all after the manner of the original idea without considerable carbonaceous fuel in the furnace. The original claims had not been taken seriously in America in this respect, and, with other features, were renounced even by the most interested. L. Kloz, in January, 1894, correctly set forth the position as it had actually developed in American practice, and defined the method as a means of working up argentiferous and auriferous pyrites with as much quartzose ore as the formation of a proper slag necessitated, and with the object of collecting the precious metals in a matte, together with the simultaneous combustion of a certain proportion of the sulphur (and iron). This was really partial pyrite smelting, and represented the degree of pyrite smelting into which the paucity of sulphides had driven the various plants. Several interesting and valuable essays descriptive of the pyrite process were published in the various journals by Mr. Austin, and the aspersions at home and abroad caused him to reply to Hering's assertion that pyrite smelting could not be carried out without carbonaceous fuel. He calculated the pyrometric intensity developed as 1836° C. for an excess of air of 50% and a blast heated to 400° C. Hering, however, not satisfied, retorted thermo-chemically, and definitely demonstrated that the claim (not advanced by Mr. Austin, however) that the process was adapted for working up a maximum of siliceous ore by means of a minimum of pyrites, and without carbonaceous fuel, was wrong, and that the process was more likely to be suitable for a maximum of pyritic ores with a proper modicum of silica, leaving the question of the total exclusion of coke in suspense. Here the whole matter has since rested. The controversy is only mentioned for the reason that it was the first sound scientific discussion of the thermal features of the process which found its way into print.

It is sufficiently clear that the earlier career of this newest and most interesting of all blast-furnace smelting was by no means a happy one. When the writer came to Mount Lyell in March, 1895, there was not a single plant in the United States running satisfactorily on the process in its purest form, and not one that promised an extended life. Scarcity of ore and metallurgical romance interfered with the extension of its application.

In 1895 the Mountain Copper Co., an English company, which, at Keswick, Cal., owns a pyrite deposit, similar to Mount Lyell, though carrying some zinc, also began pyrite work, and installed an ingenious system of treatment in which various novel mechanical ideas were first introduced, among them a method of heating the blast by means of the waste heat of the slag, etc. However, the time was not ripe for the proper mechanical execution of these novelties. The results were disastrous, and the naturally short-lived patience of the company caused an early return to the old roast-reduction process. This important desertion created a bias against pyritic smelting which has only of late years been overcome. In the same year James Douglas, in a Cantor lecture before the Society of Arts, fairly stated the objects of the process, and benevolently predicted a great future for it, notwithstanding its frequent semi-failures in the United States.

About the same time pyritic smelting operations at Tilt Cove, Newfoundland, by the Cape Copper Co., were successfully being conducted, but beyond the oft-repeated statements that no carbonaceous fuel whatever is being used, that the ore has 4% copper and 8% silica, and that the matte therefrom, by cold blast, contains from 6% to 8% of copper, also that the addition of silica is found to be objectionable, nothing definite has come to public knowledge about the practice.

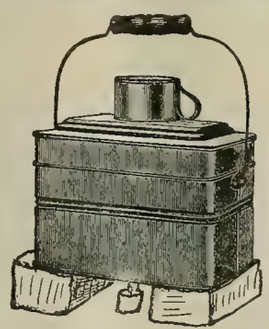
(TO BE CONTINUED.)

An Inexpensive Powder Thawer.

Written for the MINING AND SCIENTIFIC PRESS by MATT W. ALDERSON.

In the elevated mountain sections of the northern part of the United States it is necessary to have facilities for thawing dynamite the year round; for even in some of the warm summer months, where the magazine is kept on the surface, the temperature at any time is liable to go below the freezing point of such an explosive.

The company employing a large number of miners has no difficulty in securing a thawer which has large capacity and can be operated at small expense. The prospector, who roams over considerable territory,



Portable Powder Thawer.

and the operator who employs several men in different places on a property, often feel the need of thawers of small capacity, easily moved from one place to another. The writer has paid from $5 to $10 each for thawers to be utilized in this way and he has known of persons who did not care to go to expense in such matters, who have adopted expedients exceedingly dangerous. Thus, at one time, I remember walking into a tunnel where two men were at work with a candle box on end behind them, a shelf in the upper part of which was filled with powder being warmed by a lighted candle below. I made my visit exceedingly short and heaved a sigh of relief as I reached a safe distance. Just below I passed a shaft house in which a similar contrivance was in full blast. A few days later I passed the same place and the shaft house had disappeared. Fortunately, the explosion had occurred while there was no one near and the prospector was down in the shaft. He was showered by pieces of broken boards, but was not injured.

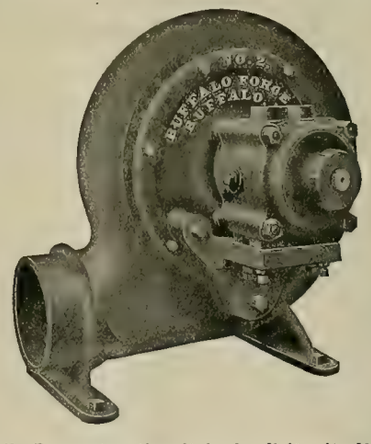
Powder manufacturers inform us that there is practically only one way in which dynamite may be safely thawed and that is by thawing it on the glue pot principle—in other words, where the tray or shelf carrying the powder is surrounded by water. The danger in thawing dynamite is in raising it to too high a heat, and any radiating heat, as a dry heat from flame or fire, may raise a portion of the powder to the point (360° F.) where it is certain to explode. Heated in a water jacket, the temperature will be equable and it is almost impossible to raise the heat to the danger point. Nevertheless, the prudent man uses judgment and care in heating even with a water thawer, and there is no necessity of ever heating the water beyond 100°, or say half way to the boiling point.

The writer has found a very convenient inexpensive powder thawer for the prospector and isolated miner in an ordinary lunch pail—the oblong kind, where the bottom of the pail may be used for water and the upper part to hold the powder. There are two sizes of these pails on the market, the larger of which is admirably adapted to the purpose. The tray of the upper part is long enough to admit the 8-inch sticks and wide enough to allow five to lie side by side. This is ordinarily all one man will use in half a shift, but there is no trouble in thawing fifteen or twenty sticks at a time, if the miner thinks he will need them. In ordinary weather, a piece of candle 2 inches in length will thaw the powder nicely and in a cold situation one will seldom need to exceed 4 inches. By lighting the candle when one goes to work, the powder will be nicely warmed and ready to use in from two to three hours.

I have paid for these thawers from 35 to 60 cents each. They are not heavily tinned, so with some mine waters they will soon rust and leak; but, on an average, they will last sufficient length of time to make their cost not exceed 5 cents each per month. This is expense which is no tax on the poorest prospector and it is a convenience he can not afford to do without. He can carry it into the hills with him as he goes, the powder thawing in the meantime, if he puts warm water in it before he starts; and, if the weather should be too cool for the powder to remain thawed till he needs it, all he has to do is to set two stones under the ends and place a piece of lighted candle between. As the capacity for water is limited, he will need to see that the lower part is filled frequently and it will do no harm if the tray is washed occasionally. The intelligent mine manager often carries on prospecting at points distant from regular work and where it would be inconvenient to have the men come to the general magazine for their supplies. With the simple thawer above described, each man at a distance may be fitted out independently at a saving of time and money to the management.

Blower and Engine Set.

The combination of blower and engine shown in the accompanying illustration is unique. At a first glance one might think it simply a blower with some sort of patent bearing, but on observation it will be found to be a blower direct connected to an engine, which its manufacturers claim "is entirely fool-



proof." In construction it is simplicity itself. The moving parts consist of a spider and four roller valves. When running these valves roll upon the bore of the cylinder and are held there by steam pressure and centrifugal force. Their action is that of check valves between the pressure and exhaust. The particular Cooley engine shown in this cut is 3 H. P. and runs at 2600 revolutions per minute; it is 8x9x8 inches in size and weighs forty-three pounds. Steam or compressed air can be used. The blower to which the engine in the cut is connected is a No. 2 Buffalo B volume type having a 6-inch discharge.

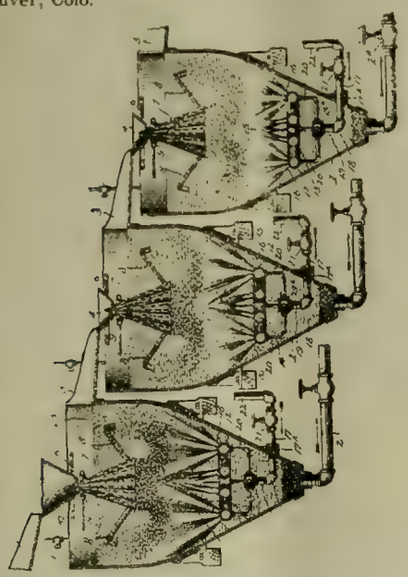
THE Michigan Copper mine in Ontonagon county, Mich., has always been considered a "mass" copper mine. The masses of copper have varied from a few pounds to one weighing 500 tons. The Minnesota, Cliff and other mines have produced large amounts of mass copper. These masses are cut up by men who make it their trade. Hammers and cold chisels are the implements employed in this work. Although these men develop great skill in their line, the expense of cutting up large masses of copper absorbs a large portion of the values.

Mining and Metallurgical Patents.

PATENTS ISSUED OCTOBER 10, 1905.

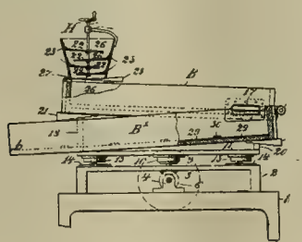
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

HYDRAULIC CLASSIFIER.—No. 801,200; H. S. Bailey, Denver, Colo.



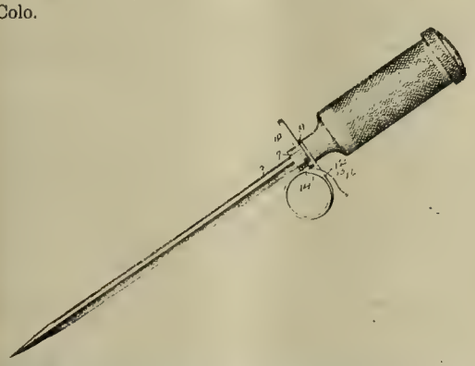
Hydraulic classifier, comprising chamber provided with overflow spout, valved discharge outlet in bottom portion of chamber, hopper in chamber, conical sieve in chamber below hopper, water supply ring surrounding conical sieve at apex, and plurality of water distributing pipes arranged below conical sieve, center pipe being provided with converging circular row of water projecting spray jets arranged to discharge collectively conical jet of water toward axial center of conical sieve, and outer pipe being provided with circular row of radially arranged jet apertures arranged to project plurality of spray jets of water in circular body upwardly between pyramidal jet and chamber.

PANNING SLUICE BOX.—No. 801,289; J. F. Wiswell, Medford, Mass.



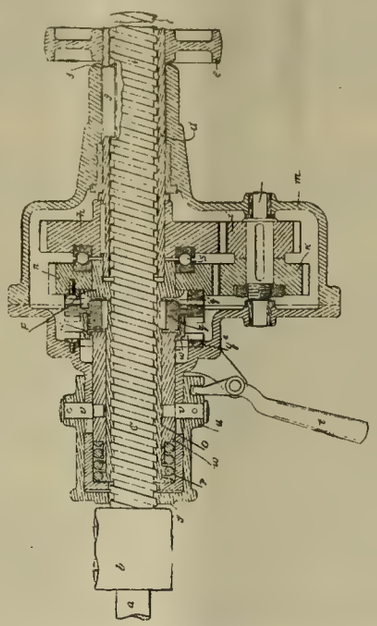
Apparatus for purpose specified, having platform, means for imparting orbital motion to platform, broad middle sluice box mounted in inclined position on platform and having in it low partition which divides it longitudinally, hopper at upper end of middle box, hopper provided with inclined baffles, two side sluice boxes, situated at respective sides of middle box and inclined in opposite direction, higher ends of sluice boxes being hinged to lower end of middle sluice box, means for varying inclination of respective boxes, and spouts connecting side boxes with middle box.

COMBINATION MINER'S CANDLESTICK AND MATCH-SAFE.—No. 801,465; J. B. Lindahl, Colorado Springs, Colo.



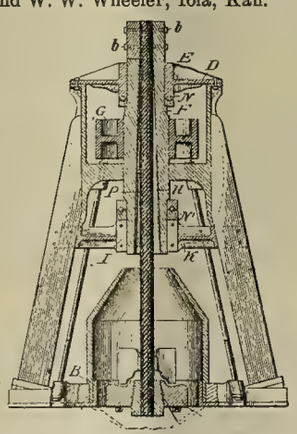
In miner's candlestick, combination of hollow handle, constituting match-case, removable cap inclosing one end of handle, opposite end of handle provided with threaded recess, spear removably positioned within recess, hook carried by spear, and candle-supporting member carried by spear comprising folded sheet of material provided with slitted end producing tongues of different lengths and of the same width, one of tongues provided with aperture, the opposite end of sheet provided with tongue having tapering end and body portion of same width as unapertured tongue formed upon opposite end.

MACHINE DRILL.—No. 801,805; W. Meissner, Charlottenburg, Germany.



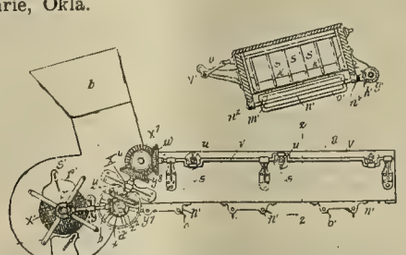
In drilling machine, combination with threaded member for supporting drill, of driving means for rotating member in single direction, threaded sleeve engaging threaded member, gearing interposed between driving means and sleeve for rotating sleeve in same direction with and faster than drill, sleeve being adapted when thus rotated to feed drill toward work, clutch rotating with sleeve, for connecting sleeve with and disconnecting it from gearing, and fixed clutch member adapted for engagement with aforesaid clutch and co-operating therewith to stop rotation of sleeve.

PULVERIZING CENTRIFUGAL MILL.—No. 801,592; L. Hunt and W. W. Wheeler, Iola, Kan.



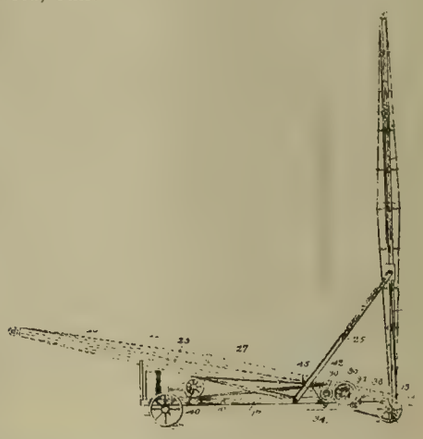
In pulverizing or crushing mill, roll shaft consisting of cable made of wire of suitable size and strength twisted into strands forming cable of proper diameter, in combination with roller body fastened thereto at lower end, and metallic tube or quill, having internal bore to correspond with curve or angle taken by shaft when rotating, shaft being suspended from quill at upper end, and rotating with quill.

ORE SEPARATOR.—No. 801,349; L. J. Vandervoort, Guthrie, Okla.



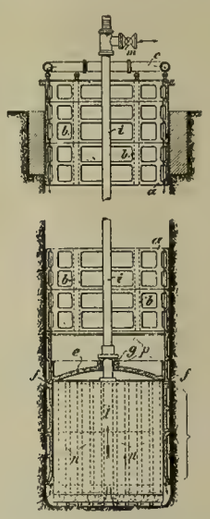
Combination, in ore separator, of inclined sluice-box having plane bottom provided with plurality of discharge openings, temporary closures for same, riffles rising from and inclined with relation to bottom and located below lower edge of openings, means for agitating contents of box comprising rotary beaters arranged at intervals below bottom of box and adapted to strike bottom, feed located at upper end of and above sluice-box, and means for delivering blast of air below feed and into upper end of sluice-box.

OIL WELL DERRICK.—No. 801,372; S. M. Foltz, Rawson, Ohio.



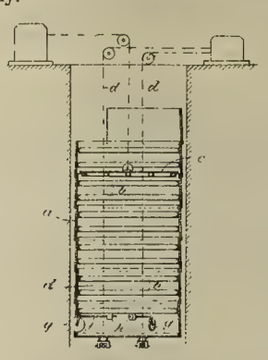
In portable derrick, wheeled frame, derrick member pivotally connected thereto and arranged to be lowered onto frame for transportation, slidable block carried by derrick, brace rod connecting block to frame, and means for pulling block downward toward pivot point of derrick to effect adjustment of latter to vertical position.

SHAFT SINKING APPARATUS.—No. 801,828; E. Frier and R. Nollenburg, Nordhausen, Germany.



In shaft sinking apparatus, combination with tubbing segments, channels or pipes therein, shoe at lower end of tubbing provided with perforations communicating with channels, projecting ring at lower end of tubbing, cover or lid bearing on ring, hollow boring rod extending to point near bottom of shaft, packing in cover and valve in boring rod above shaft.

SHAFT LINING.—No. 801,432; E. Albrecht, Hanover, Germany.



Shaft lining composed of series of superposed rings, weighted levers fulcrumed to bottom ring, rollers carried by levers that bear against shaft, and packing between shaft and rings.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

G. E. Roberts, the director of the mint, has prepared a statement of the world's production of gold and silver for the calendar year 1904. This statement shows total gold valued at $347,150,700, an aggregate of 168,493,538 fine ounces of silver, and a commercial value of silver totaling $97,726,300, the coinage value of which is $217,850,200. The figures submitted show an increase of about $22,000,000 in gold over the bureau's estimate for 1903. The United States shows a gain of about $7,000,000 and South Africa of $18,000,000. The director says that both of these countries are still upon a rising scale of production. Australia, on the other hand, is an important producer which shows a tendency to reduce its contribution, although the falling off is not large and may be temporary. Considering the development in well-known fields, it seems a reasonable forecast to put the world's output in 1905 to exceed that of 1904 by $25,000,000, with another gain probable in 1906. The report says that the most important goldfield in the world is that of the Transvaal, and for that the data for working costs and profits are incomplete. The output for 1904 was $78,130,728, produced by seventy-four companies. Their working profits, after paying the 10% tax on profits to the Government, are reported at $26,402,163. The amount actually divided in dividends was $19,114,784.70. Only thirty-five companies paid dividends, these producing 70% of the total yield.

The tabulated statement follows:

	Gold. Value.	Silver. Ounces.	Silver. Value.
NORTH AMERICA.			
United States	$80,723,200	75,786,100	$33,516,000
Mexico	12,605,300	60,808,978	35,269,900
Canada	16,400,000	3,718,568	2,156,800
Africa	85,913,900	486,408	282,100
Australasia	87,767,300	14,558,892	8,444,300
EUROPE.			
Russia	$24,803,200	172,912	$100,300
Austria-Hungary	2,117,300	1,987,797	1,152,900
Germany	64,700	5,799,133	3,363,700
Norway	.....	260,300	150.910
Sweden	40,200	23,702	13,800
Italy	44,000	757,777	439,500
Spain	.....	4,876,076	2,828,100
Greece	.....	895,172	519,200
Turkey	29,000	564,685	327,500
France	.....	609,638	353,600
Great Britain	102,400	174,517	101,200
SOUTH AMERICA.			
Argentina	$9,300	66,153	$38,400
Bolivia	3,000	6,083,333	3,528,300
Chile	636,900	868,067	503,500
Colombia	1,974,400	946,066	548,700
Ecuador	133,900	.....	.....
Brazil	2,043,500	.....	.....
Venezuela	300,000	.....	.....
British Guiana	1,608,800	.....	.....
Dutch Guiana	481,200	.....	.....
French Guiana	1,788,800	.....	.....
Peru	1,329,200	3,008,705	1,745,100
Uruguay	25,000	1,093	600
Central America	1,120,700	655,357	380,100
ASIA.			
Japan	$3,984 000	3,208,620	$1,861,000
China	4,500,000	.....	.....
Korea	3,000,000	.....	.....
Siam	51 800	.....	.....
British East Indies	1,392,400	.....	.....
Dutch East Indies	662,500	175,479	101,800

ALASKA.

The gold season of 1905 is coming to a close. Assayer F. A. Wing has been preparing the tri-quarterly account. The gold receipts from January to September, 1905, inclusive, at the United States assay office amount to $14,109,528.01. In 1904 the receipts for the like period were $10,512,601.17. There came from the Yukon this season gold worth $6,146,000; last year the receipts therefrom were $7,295,000, there being a decrease of $1,149,000. From Nome there came this season $3,047,000 against $1,918,000 in 1904, a gain of $1,129,000. From Tanana there came $3,323,000, against only $176,000 in 1904. The number of deposits this year so far was 2426; in 1904, 2045, a gain of 381. The weight of the gold this year in troy ounces was 821,433.98; in 1904 the weight in the like period was 623,712.59. The gain for 1905 was thus 197,721 ounces. The September receipts were $2,690,-315.28; in September, 1904, the amount was $1,980,013.70.

ARIZONA.

Cochise County.

The Princeton Copper Co., H. Hamburg president and general manager, is to resume work on its eight copper claims in Ramsey canyon, near Bisbee. Operations were stopped a year ago when 1500 feet of work had been done.

The new No. 3 furnace of the Calumet & Arizona smelter at Douglas has been blown in. The present total capacity of the smelter is 900 tons of ore. The new smelter will give employment to 75 additional men. It is not the intention of the smelter to accept custom business, the entire capacity of the plant being required to handle the company's own ore. The blowing of the third furnace at the Calumet & Arizona smelter marks the completion of four furnaces, it being necessary to keep one reserve furnace for overhauling and repairs. A fifth furnace is now on the ground ready for installation. But it will not be erected at present, and probably not until such time as the ore volume from the five properties is sufficiently large to require the services of four furnaces.

Gila County.

The Keystone Copper Co. is building a 25-ton testing plant at Globe which is to be in operation by the first of the year. This small plant is to prove whether the process is adapted to the ores. After the ores are reduced to fines and roasted, a pulp is made, which passes to a slowly revolving chlorination barrel, where it remains for three hours. The electrical precipitation of the remaining solution will be upon carbons at first, instead of copper plates.

The Five Points Copper M. Co. has been formed to work the Clark and Lockwood & Van Wagenen claims, 14 miles west of Globe. The incorporators are J. C. Britt, A. M. Lockwood, J. C. Clark, A. T. Hammons and G. R. Hill. The property is being developed under the supervision of J. C. Britt.

Maricopa County.

H. Bennett is opening up the Buffalo-Arizona mine, 10 miles northeast of Morristown.——H. Boline, custodian of the Grand Traverse and Arizona, on Gold Hill, near Cave Creek, is expecting a superintendent to continue development suspended for the summer. The machinery is on the ground, and most of it in place.——John and William Osborn have resumed work on the Ben Hur at Cave Creek.——J. F. Smith, superintendent of the Phœnix mine, at Cave Creek, has men prospecting.——A. A. Mills, superintendent of the Kentucky & Oriental Co., of Gold Hill, is doing exploratory work.

Mohave County.

(Special Correspondence).—The Santa Fe Railroad Co. has made the rate to Chloride on oil, lumber, hay, grain and machinery, the same as that to Kingman A rate of $6 on ore to San Francisco has gone into effect and is to be followed by a rate of $2 per ton to Humboldt. The rates are on ores under $35 value per ton, ore heretofore of too low grade to handle.

Kingman, Oct. 24.

(Special Correspondence).—The shaft on the Holmes mine, 6 miles east of Hardyville, has struck the vein at a depth of 280 feet.

Hardyville, Oct. 25.

The Lucky Boy mine, near Kingman, is being unwatered and it is probable that a mill will be put in to handle the low grade ore. Fred Stull is in charge. —— L. Hoffman, superintendent of the Samoa mine, near Kingman, reports that the mine is showing up good ores in all the new works and that the shaft will be sunk another 100 feet.

Pima County.

Superintendent F. R. Close, of the Helvetia Co., reports that there are 150 miners at work in the company's mines, and that this number will be doubled next month. The 200-ton smelter at Helvetia will be blown in as soon as coke arrives. The company has a large amount of ore blocked out, which will be ample to keep the smelter going all winter.——The Old Dick, which is down to a depth of 800 feet, and the A1 Royale are being worked. It is likely that the company will build a railroad from Vail's to Helvetia, as it is quite costly to freight the product to Vail's in wagons. The distance is 16 miles.

Pinal County.

(Special Correspondence).—On Ask creek, Saddle Mountain mining district, near Dudleyville, S. D. Gordam is opening up a gold prospect and taking out and sacking shipping ore.

Dudleyville, Oct. 22.

The Kelvin Reduction Co., Frank Sharpe manager, is to build a reduction plant at Kelvin. Part of the plant will be the leaching process of twenty-five tons capacity.

Santa Cruz County.

(Special Correspondence).—The 100-ton smelter being built at the Mowry mines, 12 miles from Patagonia, will be blown in Nov. 1. The ore at these mines carries values in gold, silver and copper. The output of the smelter will be hauled to the railroad station at Patagonia, but a survey has been made for a narrow gauge road, which the company will build during 1906.

Patagonia, Oct. 23.

Yuma County.

(Special Correspondence).—The Valensuela Copper M. Co. at Quartzsite are putting in a 30-ton water jacket smelter. Water is to be taken from the mine. Richard Darling is general manager. The property is 70 miles from the Southern Pacific Railroad and 15 miles from the steamer landing on the Colorado river, supplies being received by water. The country rocks are limestone and schist, showing two contact veins, carrying values in copper, silver and gold in malachite, azurite and oxide ores.

CALIFORNIA.

Amador County.

(Special Correspondence).—The Wildman syndicate, operating at Sutter Creek, has been reorganized and a large amount of money provided to continue the development of this large property. Work in the Emerson vertical shaft commenced several years ago and sunk to 650 feet is to be resumed at once and the shaft continued to the 2500-foot level, which will not only make accessible the ore bodies in the deeper portion of the mine, but also cheapen the cost of mining materially. As soon as the development work now planned is sufficiently advanced to justify it the milling capacity of the consolidated mines will be increased to treat 1000 tons of ore daily, the present capacity being about 400 tons. The consolidation embraces the Wildman, Mahoney, Lincoln, Stewart and several other mines, as well as considerable ground held under agricultural patent. At present the Wildman lowest level is at 1400 feet, the Lincoln being down 2000 feet on the incline. The Emerson shaft will be sunk at least 800 feet lower than the present deepest workings on the property.

Sutter Creek, Oct. 17.

Work is to be resumed on the McKee gravel mine, near Oleta, by a Placerville company.——The Clark tunnel, near Oleta, being run by T. Mahon, is in 800 feet. An upraise is to be made to the channel.——The Rhetta or Bay State mine, 4 miles north of Plymouth, has been started up under an arrangement with the employes, to whom the company is indebted, who will operate on some pay ore. It is hoped in this way to pay off the debts incurred by the company.

Calaveras County.

The Ballanponte M. Co. is running a tunnel to cut the Table Mountan gravel channel, 1 mile east of Vallecito.——At Douglas Flat, near Vallecito, W. Moyle is sinking a shaft to tap the gravel channel.

Kern County.

Atkinson Bros. are working the Sunshine mine, near Randsburg. They have put in an air compressor and will put in power drills. A 15-ton cyanide plant is being put in to work the tailings, of which there are about 1300 tons now on the dump. —— F. D. Mann, superintendent of the Gold Coin and Stanford mines, is working twelve men and is in a good body of ore on the 250-foot level. The ore is high grade and is being milled at the company's mill in Johannesburg, known as the Red Dog mill. The Butte and other mines which have not yet put in mills of their own have their ore worked at the Red Dog mill. —— In Mountain Springs canyon, near Randsburg, a Nissen mill has been put in for the Mount Vernon M. Co. The company has sufficient water and is developing more. —— The well being sunk by the Yellow Aster Co. at Squaw Spring is down 1200 feet and the prospect for a good flow of water is good.

It is reported that the deep well that the Grace Oil Co. is drilling in the Kern river field is down 2910 feet with a 4½-inch casing. This line of casing is stuck and the work has been stopped until smaller casing can be obtained. It is the intention to go on with the well as soon as this special casing is received, and it will be sunk as deep as possible in the hope of striking a profitable deposit of high-grade oil. The drill has passed through a thick stratum of shale that was impregnated with gas.

The California Mines Corporation, which has a bond on the Baltic mine, near Randsburg, E. R. Abadie general manager and superintendent, has two shifts sinking in the main shaft, which is down 185 feet. When the 250-foot level is reached they will crosscut. The shaft will be continued down to the 500-foot level and drifts and crosscuts run at each 100-foot level. A 50-ton cyanide plant to work the tailings now on the dump is being put in.

Nevada County.

The California Miners' Association has decided that instead of holding all the conventions in San Francisco, as heretofore, it will meet in the mining sections of the State. The Association came into existence when it was desired by the miners to rehabilitate hydraulic mining. Placer, Sierra, Amador, Nevada, Yuba, Tuolumne and other mining counties rallied with financial and moral support and the movement that resulted enabled the Association to secure appropriations from the National Government and from the State of California to have dams established on the Yuba river to restrain mining debris. The Caminetti Act helped the smaller operators by the hydraulic process in certain localities, but never enabled the larger hydraulic mining enterprises to resume. When it became apparent in the mining counties where hydraulic mining had proved to be very profitable to individuals that the Caminetti Act, which was accepted as a compromise in the first instance, did not work to full satisfaction, the financial support that certain mining counties had given dropped off and the principal source of support came from San Francisco. In course of time miners spoke unfavorably of this. To regain favor, by showing the mining counties that an organization is for the benefit of the mining industry of the entire State, it has been voted by the California Miners' Association to hold conventions at various points. The annual convention of 1905 will be held at Nevada City, November 22, 23, 24 and 25. Committees of the California Miners' Association have been appointed at Nevada City and at Grass Valley to co-operate with the local committee to make the convention as much of a success as possible. Fred Searles, W. F. Englebright and Nat. P. Brown are appointed by the Association for the Nevada City committee and George Mainhart, A. D. Foote and C. G. Church will serve as committeemen at Grass Valley.

Lack of water for power threatens to shut down many of the mines at Grass Valley and Nevada City.

Placer County.

D. B. Groff, superintendent of the Diamond Creek Mining & Development Co., near Emigrant Gap, reports satisfactory progress at the mine. The Diamond Creek is a gravel mine, and work is now being done on a wing of the main channel.——Work is being done on the Heridia tract, 8 miles northeast of Lincoln, by G. H. Wright of San Francisco and G. Gray.

San Bernardino County.

J. T. Kerr and J. C. Button of Colton have sold to the Big Lode M. & M. Co. of Los Angeles the Big Lode No. 1 and Big Lode No. 2, 3 miles east of Rock Springs and 1 mile north of Old Holcomb valley.

San Diego County.

After having been unwatered, the Stonewall mine, near Julian, has been closed down.

Shasta County.

The Jim Loage mine, near Centerville, 6 miles from Redding, is being developed by H. W. Weldon and H. V. Burleson.

Sierra County.

(Special Correspondence). — The Pilgrim mine, at American Hill, was examined recently by O. A. Daube of New York City.——At the Alaska mine, at Pike City, a new vertical 3-compartment shaft has been started and is down 50 feet. They intend to sink to the 700-foot level before doing any drifting.

Downieville, Oct. 23.

At the Mabel mine, at American Hill, 7 miles east of Alleghany, the new tunnel is in 150 feet, and the company intends to run ahead 125 feet more and then make an upraise to the channel. A. J. McCoy is foreman.

A gold brick, weighing 176 pounds and valued at $43,-000, is said to be the result of a thirty-two days' run at the Tightner mine, near Alleghany. The bullion came from specimen rock. Only three men were employed in extracting the rock that gave this result. H. L. Johnson is the owner.

Trinity County.

The lawsuit over the Globe mine, in the Canyon Creek mining district, near Dedrick, has been compromised.

Tuolumne County.

A steam hoist is being put in at the App mine at Quartz. —— A station has been cut at the 1720-foot level of the Dutch mine at Quartz and a crosscut will be run east to the vein.——The Mt. Eden mine, near Tuolumne, has been bonded to Holland & Williamson.

COLORADO.

(Special Correspondence)—The mines in the higher altitudes are preparing for the winter campaign by taking in the necessary supplies. Already a heavy snowfall is reported from various districts, and it will not be long before the roads are impassable to some of the mines. By this means the mines are able to operate during the winter months, especially where they are under cover. ——A number of arrests have recently been made in the Cripple Creek district for high grading. If some means could be devised for meting out the proper punishment for the guilty ones, it would undoubtedly have a good effect on the remainder of the individuals who make a business of stealing or receiving the stolen ore. It is the opinion of some that there is an organized gang of the thieves working in that district. ——A strike was called on the Gold King mine and mill at Gladstone, in the Silverton district, a few days ago. After calling the strike the leaders of the strike are trying to effect a compromise with the management. What the outcome will be remains to be seen. Some months ago, when there was talk of a strike on this property, Superintendent Kinney gave the men to understand they could strike if they desired; if they did strike, there would be no compromise; the mine and mill would be closed indefinitely. The reports from that district are rather vague as to the cause of the strike, but it is understood that one of the agitators was requested to "move on." In order to "get even," the men were called out. The owners of the Gold King are also heavily interested in the Gold Prince, where a large concentrating mill is now being built. It is not known at this writing whether the strike will spread to that mine or not. During the stormy times in Telluride and Cripple Creek two years ago the Silverton camps were not molested, although there was some talk of calling the men out at that time. From information received here it is believed to be a personal affair, rather than among the men.

Denver, Oct. 23.

Boulder County.

The Wolf Tone M. Co. is putting in a hoist and 50 H. P. boiler on the Oregon shaft. This company is operating a number of mines and is operating the mill at Nederland on its own custom ores. The mill is equipped with twenty stamps. The concentrates are dried before shipping and the mill is reported to be doing a share of the reduction of ores from the local section. William Loach is manager with William Todd in charge of the mill. —— Manager C. F. Lake has closed down the Boulder County mill owing to the demoralized condition of the tungsten market. A recent decision in the courts, whereby the free importation of crude tungsten ores is permitted, has made the market rather unstable, and Mr. Lake prefers to close down the property rather than take chances with his product. It is reported that the tungsten producers of Boulder county will ask for protection on crude ore. —— W. I. Scott and associates, who are operating Graham lease No. 1 on the Rogers patent, have received a 20 H. P. double-friction hoister and a 30 H. P. boiler at Cardinal, which is being delivered to their lease. They will put up a new shaft house. They have made a 50-ton shipment to the Nederland mill. —— Manager T. L. Wood of the Cashier M. & M. Co., operating at Camp Albion, near Breckenridge, is on a visit to Boston to consult his associates regarding future operations of his company. He takes with him the report of the summer's work and expects to return authorized to make immediate arrangements for the erection of a 50-ton concentrating mill at Camp Albion. The mill will be built near the portal of the Snowy Range tunnel.

Clear Creek County

I. B. Nichols is operating the Josephine property at the base of Kelso mountain, near Silver Plume. He expects to increase the force. It is probable that a winze will be sunk on the ore body now being opened, and if water should be found in sinking an electrically driven pump will be put in, as the power line for the Stevens mill runs close to the mine.——Retimbering of the ore chute in the Pelican mine has been completed near Silver Plume, so that the mill can be again supplied with ore. The chute was lined with iron, and the work has been delayed on account of inability to get the iron from Denver as fast as it was needed. A chute will be built from the mouth of the Zero level to the foot of the dump so that the mill dirt can be run out of that level, loaded into wagons and hauled to the mill as an auxiliary supply.——Work has been commenced on the Mexico property, near Silver Plume, in which C. H. Morris is interested. Work is being done through the Diamond tunnel, from which a drift is being driven west on the Selkirk vein to get under former workings.——Jewell & McCall have started work on the Maine-Phœnix property, near Silver Plume, and are cleaning out the tunnel that was driven in early days to cut the Maine at a point east of the shaft.

The tunnel being driven by the Joplin M. Co. of Georgetown, of which B. J. O'Connor is superintendent, is in 125 feet. The drift is being run on the Washington lode, and according to surveys it will be necessary to drive 600 additional feet before the objective point will be reached. At that time a crosscut will be run for 100 feet to cut under the Gambetta workings. This tunnel will furnish an increased depth of 380 feet over the upper workings.

The Silver Plume Standard reports that ore shipments from the Stevens mill have been resumed and several teams are hauling the concentrates. The concentrator at the Wilcox tunnel is also in operation, making two mills on the Waldorf properties for handling the milling material in addition to a large force taking out smelting ore at the Tobin, Kitty Owsley and the Wilcox tunnel, so that the completion of the railroad now being built into the East Argentine district will enable large shipments to be made.——The Lorella M. Co., operating in East Argentine district, is reported to be meeting with excellent results in the development work that is being carried on. The Silver Edge vein has been cut 110 feet from the portal of the tunnel and a good body of smelting ore found. Drifts have been started east and west on the vein, which continues to make a good showing. The property will soon be equipped with a plant of machinery for more rapidly prosecuting work during the winter.——A temporary shutdown of the Dives Pelican mill at the portal of the Burleigh tunnel was rendered necessary last week, in order to retimber an ore chute in the mine through which the milling dirt from the upper workings was sent to the mill. This work is being carried on by three shifts of men, working eight hours each, and it is expected to soon have it completed. Considerable work is also being done in the mill to put it in shape for continuous operation as soon as it can be supplied with material again.——Preparations are being made to commence operations on the Mexican group.——The power plant of the St. Paul M. Co., which was recently put in, is reported to be in successful operation and a progress of about 5 feet per day is being made in the crosscut tunnel, which is being driven to open a number of lodes at various depths. It is expected to drive this tunnel about 2000 feet.——Manager William Stephens of the Indiana G. & S.M. & M. Co. expects to get work started on the company's property within a short time.

Custer County.

The new shaft to be sunk on the G. P. D. claim of the Valley M. Co., near Silver Cliff, will soon be under way, the location having been selected and the surveys made. It is proposed that the new shaft will tap the south drift of the Dakota Bill.

Gilpin County.

At the After Supper mine, near Black Hawk, the Banzai M. Co. have sunk the shaft 410 feet, and it is to be sunk to a depth of 435 feet, where drifts will be driven for sump purposes The drift at a depth of 240 feet is to be connected with the 140-foot level. L. R. Tatum of Denver is manager and A. Watters of Nevadaville is in charge of the underground workings.——J. F. Hopkins of Denver has started operations on the Sleepy Hollow property, in Gregory district, which has been idle for years. The main shaft is down 800 feet, and as soon as it has been retimbered another 100 feet will be sunk.—— The Castleton mine, at the head of Virginia canyon, is being operated by Cleveland, Ohio, parties under a lease and bond, under the management of W. M. Kirk of Russell Gulch. Operations have been delayed by water. Work is now being carried on in the 425-foot levels. The shaft is to be sunk 200 feet deeper.

The Black Hills & Denver G. M. Co. is driving its Park tunnel, which is now in over 700 feet, with one shift, using electric drills. M. H. French of Denver is manager and J. A. Bush of Tolland is superintendent. The company is also driving the Grant tunnel into Mineral hill. This tunnel is in over 400 feet.——Sinking has been stopped at the Chicago-Carr property on Bobtail hill, in the Gregory district, at a depth of 560 feet, where levels are being extended on both sides of the shaft, with prospects of soon getting into some good ores, reports Manager B. M. Myers. The intention is to commence sinking again.

The Eagle mill in Black Hawk, which was leased from the owner, F. Came, by the Eagle Mill & Ore Co., has been making test runs with a new process for low grade ores. According to a statement made by J. G. Eversman of Denver, the tests that have been made at the mill on low grade ores have proven satisfactory.—— An air compressor and other machinery is to be put in at the Ingram mine in the Pine Creek district, near Central City.——The Rochester, at the mouth of Pine creek, is being operated with a small force.——The Boston-Occidental Co. are working the Mascot mine and mill at American City, near Central City. The company is also shipping smelting ore over the Moffatt road to the smelter at Denver.

The Gower Mines Syndicate, who have been working the Clay County mine in Lake gulch, near Central City, have made a rich strike in the 350-foot west level of the property. The main shaft is 650 feet deep, but where the large body of ore has been cut is in a winze in the 350 west level. This winze has been sunk 14 feet and shows a body of ore 4 feet wide, which carries a very high percentage of gray copper and also lead and copper.

Gunnison County.

Idaho capital has a lease on the Volunteer mine, near Gunnison, and the water is being pumped out preparatory to extensive development.

Lake County.

The Morocco shaft in Leadville is being cleaned out preparatory to shipping ore. Sinking has been started on the Bohn shaft, and the 350 feet that will be opened should be completed by the end of the year. This shaft is being sunk to catch the Penrose ore shoot to the south. Both drifts of the Cloud City are in the line, the south drift just entering the parting quartzite. Small streaks of iron are found in both drifts.

At the 500-foot level of the Flagstaff mine at Leadville, after driving a drift 300 feet from the shaft a good body of lead carbonate ore has been opened.——The shaft on the Porter claim at Leadville is down 200 feet and a drift has been run to the southwest.——A new shaft is being sunk on the Yankee Doodle and is down 150 feet.

Park County.

(Special Correspondence).—The London mine is shipping two cars per day of high-grade ore.——Other shippers are the New York, Wheeler, Moose, Russia and Shelby. This last is a zinc producer and is shipping to the Empire Zinc Co. at Canon City. There are other mines that could furnish a fair grade of zinc ore, and by the use of the magnetic concentrator possibly become dividend payers.——The Snowstorm placer has quit hydraulicking for the season. They have one drill testing gravel and 20 men with four teams enlarging ditches, repair work, etc., making ready for the season of 1906.——The Cincinnati P. M. Co. has one drill at work testing gravel from the mouth of Sacramento creek up the Platte river, preparatory to putting in dredgers.

Alma, Oct. 23.

Rio Blanco County.

The gilsonite veins of Utah are said to enter the western part of Rio Blanco county and considerable of the product has been mined and shipped. Near Rangely elaterite exists, W. C. Miller having lately discovered three veins on Piceance creek in seams 4 inches wide. Nearby are deposits of sand asphaltum. Meeker capitalists have spent $75,000 in developing petroleum in Raven park, but their wells have not yet reached the main deposit. Of the seven holes put down, each has seepage oil that would pay all development expenses if it could be saved and marketed. The Union Oil Co. of Meeker and the Requena Syndicate of San Francisco, Cal., will do considerable new work this fall and winter on their Raven park oil holdings. Skull creek basin and Blue mountain contain paying quantities of uranium and vanadium. These rare ores are found in sandstone formation, the veins being from 2 to 4 feet wide.

Routt County.

The gravel beds of the Jack Rabbit springs, 20 miles northwest of Craig, are being worked by Blivins Bros. They are tapping the subterranean flow of the Jack Rabbit springs and using a steam dredger of 65 H. P. with a capacity of 1000 cubic yards per day.——North of the Jack Rabbit springs the Board Gulch springs are the water supply of 1100 acres of placer ground belonging to Howard Bros. and C. C. Merrill. A steam dredger will be put in on these properties in the spring. North of the Board Gulch springs T. Emerson has 800 acres of placer ground, with a maximum bedrock depth of 18 feet. With a 6 H. P. gasoline engine he is developing a bedrock pay streak. Improved machinery is to be put in next year.

San Juan County.

The Saratoga mill, between Silverton and Ouray, will be converted into a matte smelter for the treatment of the ores from the Ironton district. The Saratoga mill was one of the most complete and costly establishments of the kind ever built in the San Juan country, but failed to satisfactorily treat the ores of the section in which it was located, and was shut down several years ago and has remained idle ever since.

The Silverton M. Co. will develop their property on Sultan mountain, near Silverton, during the winter. The crosscut tunnel being run is in 3800 feet, 1300 feet of this distance having been run within the past year. The main tunnel is being pushed to cut the Belcher vein.

The Little Ida claims, in California gulch, north of Silverton, in the Animas Forks mining district, has been sold by Fisher, Carlow & Triplett, to Denver parties, for $10,000, and as soon as Surveyor W. C. Marshall of Denver has finished a resurvey and replatting of the ground and the process of patenting the claims is started, the first payment of $2500 will be paid.——The 5000-foot tunnel started by Richard Winnerah on the property owned by the Frisco Mines Co., on Houghton mountain, which is to be completed within two years, and cost $82,000, is expected to cut forty-six leads in Houghton mountain.

San Miguel County.

The Tomboy shaft, near Telluride, is down 300 feet, and it is the intention of the management to sink it 300 feet deeper. From this shaft a level is being run on the Argentine and Cincinnati vein. The Red Cloud, owned by the company, is on the same lead, and when the tunnel gets under this claim it will be 1500 feet vertically beneath the surface. The company's 60-stamp mill is running steadily.

Summit County.

The enlarged and improved concentrating mill on the Washington Joilet property, on Nigger hill, near Breckenridge, is ready for crushing, stamping and concentration. Originally the mill was 56x71 feet and contained twenty stamps, four Wilfley tables, engine, boiler and other necessary appliances for treating lead-gold ore. The new addition to the mill building is 28x71 feet, which brings the structure up to 84x71 feet. The added machinery consists of three Wilfley tables, three hydraulic sizers, one Callow settling tank and one Sperry slimes saver. C. S. Newson is manager. —— The Dunkin property, on Nigger hill, has been leased and will be operated by J. C. Baird.

Teller County.

The Dillon shaft at Cripple Creek is to be continued from the 800 to the 1000-foot level. —— A depth of 430 feet has been reached in the shaft of the City of Cripple Creek G. M. Co. of Cripple Creek. Considerable water is being pumped. At a depth of 500 feet crosscuts will be started. The company is operating under a 20-year franchise, which gives it the right to mine beneath the streets and alleys of Cripple Creek. —— Operations have been resumed at the Camilla mine on Beacon and Guyot hills, Cripple Creek. —— Drifting has been started by F. T. Caley, lessee in the Arapahoe claim of the Jerry Johnson Co. on the north slope of Ironclad hill, Cripple Creek, at a depth of 450 feet. He is following the vein cut by the shaft recently. —— The Sioux Falls Milling Co. of Cripple Creek is successfully treating Copper mountain ore with cyanide. The value varies from $2 to $10 in gold per ton. It costs $1.60 a ton to mine and treat it and it is understood that the percentage of extraction is high.—— An ore house is being built at the Midway mine, on the saddle of Bull and Ironclad hills, by O. Fogleman, lessee.

IDAHO.

Blaine County.

State Mine Inspector R. N. Bell has returned from a trip to the upper Salmon river country At the Dollar Hide mine, 24 miles northwest of Ketchum, twenty-five men are at work. This is a zinc and silver-lead mine, and carries one of the strongest ore shoots in the Wood river region. One of its ore shoots is 250 feet long, with an average width of 2 feet. Another ore shoot is 150 feet long, and a third 100 feet long. The principal development consists of two crosscut tunnels, with drifts along the vein and raises connecting the two main drifts. The ore is a heavy mixture of zinc, iron and lead sulphides, with quartz, and carries from forty to sixty ounces in silver. This property is being operated by C. C. Rutherauff of New York, who has built a 30-ton concentrating mill on the Warm Spring side of the divide.——In the Boyle Mountain mining district, 14 miles west of Ketchum, the Lucky Boy mine is being operated by the Lanyon Zinc Co., under lease, with Owen O'Rourke in charge.——The new Payette district, in Omaha gulch, is reached most easily from Stanley, from which there is a wagon road 7 miles to Stanley

lake, which is 7 miles by trail from the mines. Claims already opened up give fine values in lead and zinc.

Idaho County.

Twenty men are employed at the Anaconda mine, 12 miles from Newsome. A new 5-stamp mill will be ready soon. The Graham & Ross Co. is in charge.

Cyanide plants are being put in at the Dewey and Sunnyside mines, near Roosevelt.——The State wagon road from Council to Big creek is almost completed.——Roberts & Stonebraker have formed the Crooked River M. & M. Co., to work mines on Crooked river, 4 miles from Big creek.

The Comstock M. Co. is working the Comstock mine near Dixie. The 4-stamp mill and cyanide plant are in operation.——The McKinley M. Co. is putting in a mill at its mines on Salmon river near Lucile.——A double-compartment shaft is being sunk at the Anaconda mine near Newsome by the Ross-Graham M. Co., under the superintendence of W. H. Hill.

Kootenai County.

The Echo M. Co. is developing claims west of Sandpoint. Wm. Elsasser is manager.——The Panhandle smelter at Ponderay, on Lake Pend d'Oreille, is to be started about Nov. 1. The initial capacity will be 100 tons of ore daily. The water-jacket lead-silver furnace measures 36x120 inches at the tuyeres. The steel stack is 125 feet high. The dust chambers, built of stone, are 8x10x160 feet.

Owyhee County.

The Stormy Hill M. Co. has been formed by C. W. Hill of Silver City, M. A. Carton, G. S. Ballard, J. G. Slauson and W. E. Hayes, all of Utica, N. Y., to develop the War Eagle and Stormy Hill mines, near Silver City.——The Potosi M. Co. is building a new shaft house and putting in pumps and machinery at its mines in Silver City. W. F. Sommercamp is superintendent.

Shoshone County.

Work has been resumed on the Little North Fork M. & M. Co.'s copper claims, near Wardner, with J. Kalbenback in charge. In the upper tunnel crosscuts will be driven until both walls are reached and the width of the ledge determined. In the lower tunnel the main ore body was not reached by the work carried on this year.

Work has been commenced on No. 4 tunnel on the Snowstorm mine, near Mullan. It will be run 3100 feet to reach the ore body. This will give a depth of nearly 2000 feet on the dip of the vein. The present lowest workings have a depth of 1000 feet. The company and the lessees are working nearly 150 men. A raise is being made from No. 3 to No. 2 tunnel and a shaft is being sunk from No. 2 to meet the raise. Besides the 3100-foot tunnel, T. L. Greenough advocates putting in electric power and other improvements.——The first zinc concentrates to be shipped from the Cœur d'Alenes will be sent to the Iola, Kan., smelter this month from the Success mine, formerly the Granite. Preparations are now being made at the mill to load two cars of concentrates. A wagon road half a mile long is being built to the Northern Pacific's Nine-mile branch. When the experimental tests at the mill proved to the satisfaction of H. F. Samuels, manager and principal owner, that the process installed would save zinc as well as lead values, machinery was put in. The mill has been working satisfactorily.

The Mayflower Mining Co. is developing its property, 2½ miles east of Wallace. J. H. Foss of Mullan, one of the owners, is in charge of the work, and is running two shifts on a long crosscut tunnel.——The Hunter mine and mill, near Mullan, will resume operations. Work on the new deep level tunnel has been stopped and with the resumption of work in the mine will be pushed ahead as rapidly as possible.——The management of the North Franklin Co., at Mullan, has decided to purchase new equipment for the mine.

KANSAS.

A recent report of the United States Geological Survey states that the production of spelter in the United States in 1904 amounted to 186,702 short tons, valued at $18,670,200, as compared with a production of 159,219 tons in 1903. The principal increase in the production of zinc has taken place in Kansas, where new plants were started by the Caney Zinc Co. at Caney; by the Chanute Zinc Co. at Chanute, and by the Cockerill Zinc Co. at Altoona. The La Harpe Smelting Co. at La Harpe, which started in 1903, had a full year's production. The plant of the Granby M. & S. Co. was enlarged. The large works of the Edgar Zinc Co. at Cherryvale, controlled by the United States Steel Corporation, reached their full product in 1904. In Illinois the Illinois Zinc Co. built an addition of 120 retorts; and the Mineral Point Zinc Co., controlled by the New Jersey Zinc Co., is building large new works at Depue. During 1904 the new works of the Graselli Chemical Co. of Cleveland were started at Clarksville, W. Va.

MICHIGAN.

Houghton County.

The Mass Con. M. Co.'s new shaft C is ready to operate at its full capacity. The track of the spur which the Mineral Range is running to the opening is completed. The shaft will be fully equipped by January 1. The sinking has reached the sixth level.

MONTANA.

Jefferson County.

The concentrator of the Cataract C. M. Co., 8 miles from Basin, at Bullion, has been started. The company has twenty-two claims in the Cataract district showing argentiferous and auriferous chalcopyrite. M. L. Hewett is manager and G. H. Bartlett the millwright in charge.

Lewis and Clarke County.

By the first of the year the Whitlach M. Co., which is operating the Whitlach-Union mine at Unionville, south of Helena, expects to have the new 20-stamp mill running. The Whitlach is down 500 feet, and the miners are developing on the 500 and 400-foot levels.

Madison County.

On account of cold weather the cyanide mill of the Watseca G. M. Co., at Rochester, has closed down for the winter, it being impossible to operate to advantage. The mill ran three months.

A. H. Wiseman of Ruby, who is interested in the Conrey Placer M. Co., which is operating several dredgers near Alder, states that the company began operations, working one dredger, in 1900. In 1902 they built and put in operation another dredger and now have in course of construction another dredger. The capacity of dredger No. 1 is 50,000 cubic yards of dirt per month; that of No. 2 is 65,000 per month, and that of the dredger now building, or No. 3, is 90,000. The work is in Alder gulch, 1½ mile east of Alder. The values in gold run from 15 to 20 cents per cubic yard on the sides of the valley and from 60 cents to $1 per yard in the center. They claim to save 95% of the values. Each dredger has an endless chain of forty-one scoop buckets which will dig into the earth at the rate of nine per minute. Each bucket on No. 1 has a capacity of 7½ cubic feet of dirt, on No. 2 of 10, and on No. 3 the capacity will be 12 cubic feet.

Missoula County.

H. J. Rossi and H. J. Read, who have made a $25,000 payment on the Monitor mine, near Saltese, have men at work under the foremanship of Theodore Brown. The shaft is being enlarged and retimbered and a large hoist will be put in.

Silver Bow County.

The Butte Cyaniding Co. has been formed by Gus Nickel, C. Riehl, D. P. O'Connor, A. C. Evans, W. R. Young and W. R. Evans, to take over the plant of F. W. Link & Co., who have been operating on Lexington tailings. Link and his associates have been using six 20-ton wooden tanks, but an iron tank having a capacity of 40 tons has been added, and another of the same size is to be added, making the total capacity 200 tons. During the year there have been treated in the plant 8000 tons of tailings, from which a little less than $4 in gold and 2 ounces in silver per ton were saved. The company has leased the tailings from the Alice mills, and will begin treating them at once. There are about 10,000 tons in the pile.——The Reins Copper, operating the Combination mine, east of Butte, is sinking its shaft and is down 900 feet.——Sinking is in progress at the Minnie Healey, a United Copper property adjoining the Leonard, in Butte.

Reconstruction of the North Butte Co.'s Speculator shaft will be completed by the end of the year, when the contract with the Amalgamated for the use of the High Ore shaft will cease. It is now necessary to tram the ore about 1000 feet to get over to the High Ore shaft. The North Butte has developed and is now working two veins, which are approximately parallel and separated by about 800 feet. The principal vein is the Edith May, originally developed on the company's Edith May claim. The Edith May vein has been opened nearly 900 feet and there still remains over 900 feet to go before the boundary limit of the property is reached. This vein is opened on the 1000-foot and 1200-foot levels. The Jessie vein is reached through a crosscut 800 feet long from the Edith May vein. The North Butte will seek greater depth in its shaft as soon as the reconstruction is completed, driving it down from the 1600-foot level to the 1800-foot level.

MISSOURI.

A recent bulletin of the United States Geological Survey states that in southeast Missouri further progress has been made by an increased activity among the older mines. The St. Joseph Lead Co., the largest individual producer of lead in the country, has gained in output by enlarging the old Bonne Terre mill, by putting into operation a new mill at the Hoffmann shaft which will be capable of handling 1000 short tons of ore per day, and by adding to the smelting facilities at the Herculaneum works. The Doe Run Co., which is closely allied with the St. Joseph Lead Co., has operated to full capacity. The Desloge Lead Co. has sunk a new shaft and has increased its mill capacity 50%. The Central Lead Co. produced only 3812 short tons of lead in 1904, as compared with 5536 tons in 1903, the falling off being due to the fact that the mines and works were idle for three months as the result of a strike to force a recognition of the first miners' union organized in the district. The effort failed. The Central Lead Co. has been sold to the American Smelters' Securities Co. The National Lead Co. now ships the product of the Derby mines to the new smelter at Collinsville, Ill., which went into operation during 1904. The Federal Lead Co. produces considerable quantities of ore and smelts large amounts of ore on toll. The Mine La Motte Co. did not produce as largely in 1904 as in previous years. The old Shibboleth Lead M. Co. of Cadet, Mo., has passed into the hands of the American Lead & Baryta Co.

NEVADA.

Douglas County.

B. F. Livingstone, superintendent of the Mammoth mine, near Carters station, near Gardnerville, intends putting in a mill to be erected to work the ore.

Esmeralda County.

(Special Correspondence).—The standing and wealth of this district have not been overstated. Two years ago the site which Goldfield occupies to-day was a brushy blank on the map of Nevada and the camp now has a population of 7000. There are some good stone and frame buildings, but the greater number of people live in tent houses and tents. Many substantial buildings are being erected. At Diamondfield some valuable showings are being made. The Reilly lease on the Florence expired recently and the claim is made that it returned to the leasers $750,000. Work on the lease commenced July 1, three and one-half months ago.

Goldfield, Oct. 23.

Eureka County.

Grading has been started on an extension of the Eureka & Palisade railway to the mines on Ruby hill.——Men in the Consolidated and Richmond mines at Eureka are examining the condition of the old workings, which were abandoned on account of the litigation that ruined the old company. As soon as this examination is made, the abandoned workings will be cleaned out.

Humboldt County.

At the Nevada-Superior properties, 20 miles northwest of Humboldt, Manager C. D. Rooklidge has put in a hoist and pumping plant. This shaft is down 125 feet, and is to be sunk to the 200-foot level. A station is to be cut and drifts run to the north and south from the 125-foot level.

Lincoln County.

Active development of the Santa Fe, near Searchlight, has begun after a long period of underground prospecting. A 25 H. P. hoist, a Cornish pump with a capacity of 6000 gallons an hour, an air compressor and drills are being put in. C. Leonard of Los Angeles is president, Geo. C. Mitchell vice-president, and B. Macready general manager.——Excavation has been started for a 10-stamp mill at the Cyrus Noble mine at Searchlight.——Sinking for the 600-foot level has been resumed in the Good Hope mine, near Searchlight. The company has let a contract for the first 100 feet to Wm. Allison and P. Williams. The sump in the 400-foot crosscut is complete, and catches the water from the vein, so that the new section of the shaft is comparatively dry.——Sinking has been resumed from a depth of 220 feet on the Parallel vein at Searchlight.——The Southwest M. Co. is working three shifts on the Techaticup mine at El Dorado. The station has been cut at the 450-foot level, and the shaft is being continued to the 550.

Nye County.

The rates for transportation of ores from Tonopah to Murray, Germania, Pallas, Bingham Junction, West Jordan and Sandy, Utah, and to California smelting points as shown by the rate sheet, are as follows: On ore of an actual value not exceeding $25 per ton, $6.50; over $25 but not exceeding $40, $8 per ton; $40 but not exceeding $50, $9.75 per ton; over $50 but not exceeding $100, $15.45 per ton; over $100 but not exceeding $150, $17.10 per ton; over $150 but not exceeding $200, $17.50 per ton; over $200 but not exceeding $300, $18.50 per ton. The haul from Goldfield to Tonopah is additional and is as follows: On ores not exceeding in value $25, $1.50 per ton; over $25 but not exceeding $50, $2 per ton; over $50 but not exceeding $75, $2.25 per ton; over $75 but not exceeding $100, $2.50 per ton; over $100 but not exceeding $200, $2.75 per ton; over $200 but not exceeding $300, $3.50 per ton. In addition a flat rate of $10 per ton is charged for smelting all ores.

Washoe County.

D. M. Harvey, superintendent of the Keystone-Nevada mines at Olinghouse, is working fifteen men. They are developing water rights and a stamp mill will be built south and east of the Ora mine.——H. Lincoln will develop the Golden Eagle, near Olinghouse.——The Buster mines, near Olinghouse, will be operated soon.

In the Pyramid district, 40 miles north of Reno, the Pacific Con. M. Co. has been developing their copper properties under the superintendence of R. W. Parry. The main tunnel is in 2000 feet.

NEW MEXICO.

Lincoln County.

It is reported that work is to be resumed on the Vera Cruz mine, near Nogal, by J. H. Canning.

Luna County.

(Special Correspondence).—The Deming smelter operated by the Luna Lead Co., of Deming, has been blown in. The management of the Deming smelter has made rates to small lead mines that permit the mining and shipping of low grade ores, which were heretofore considered unprofitable.

Deming, Oct. 23.

McKinley County.

The American Fuel Co. has established a new coal mining camp near Gallup, which will be known as Heaton. A new mine has been opened, a large number of men are employed and new men are being added daily. The camp is a short distance from the old camp of Gibson.

Otero County.

Men have been put to work on the Excelsior at Jarilla by O. D. Warnock, general manager. A 4-foot vein of sulphides is being exposed.——The Southwestern Co. announces that it will have its smelter at Jarilla completed and blown in by January 1.——The Jarilla Development Co. has given order to its secretary, Paul Ream, to begin work on the Ferro Oro property, on the west side of the Jarillas.——Work is being pushed on the 500-foot level of the Nannie Baird at Jarilla. The level is being driven toward the west and is in good ore.

Sierra County.

A $10,000 concentrating plant is to be built on the North Percha, near Kingston, for the Virginia, Templar and Keystone mines. The capacity of the plant is to be 100 tons daily. Some of the old dumps are to be treated. The mines are owned principally by A. W. Harris, and J. H. Moffat is superintendent.

Socorro County.

E. C. McDermitt, acting for a corporation of which David Moffat of Denver, Colo., is a director, has purchased the property of the Helen M. Co. at Graham and Mogollon, and has ordered the machinery for a 75-ton reduction plant. The plant will be put up at Graham to treat the tailings from the mill, after which ore from the Confidence mine will be treated as an experiment. The main shaft of the Confidence is down 600 feet. The mine is lighted by electricity and has an electric hoist.

OREGON.

Baker County.

Manager R. E. Norton of the Golconda mine, near Bourne, has increased the working force and has started the power plant to furnish electric power to the Columbia mine.

The double-compartment shaft of the Indiana mine, 20 miles from Baker City, is down 330 feet, and drifting is being done on the 100, 200 and 300-foot levels. W. J. Mesner is manager.——It is reported that a reduction plant is to be put in at the Strasburg mine, near Alamo,

next year. W. H. Remington and F. Clarno of Portland are interested.

Crook County.

Development work is to be resumed at the Red Jacket mine, near Ashwood. D. W. Leech of Woodburn is interested. A 10-ton furnace, recently completed 28 miles from Prineville, was put in commission for a test run recently, and, while handling the first charge of ore, turned out two flasks of quicksilver. Work was then suspended while the superintendent constructed a drier, which had not been provided when operations were commenced.

Grant County.

The Dixie Meadows mill, near Comer, has been enlarged, and hereafter crushing will be done with fifteen stamps and auxiliary rolls. Manager Reese has developed the ore shoot to a depth of 350 feet.

At the Bull of the Woods mine at Susanville, another ore shoot has been opened. The old shoot was stoped to a depth of 200 feet. The tunnel on the 200-foot level of the shaft, from which rich ore was mined, has been extended 500 feet farther on the ledge, where another rich body of ore has been opened.

Josephine County.

The Gold Standard copper mine, 4 miles from Merlin, has been sold by H. E. Booth to Metzger & Haviland of Toledo, Ohio.——On the Silver Creek properties, near Merlin, F. E. Metz, manager of the mine, is tunneling 1500 feet to tap gravel.——At the Lucky Queen mine, 2½ miles from Merlin, a 10-stamp mill is in place ready for operation.——The Baby mine, on Jump-Off-Joe, has a 5-stamp mill in operation and the Mount Pitt mine is said to be opening up a body of rich ore.

The Takilma smelter has closed for the winter on account of the condition of the roads. An air compressor is being put in and a second matting furnace is expected to be in place for next season's run. Development work will be continued all winter at the Queen of Bronze, where rich copper ore was uncovered recently. Since the people of the district are made to feel that this important industry is compelled to suspend work because of bad roads, greater interest is aroused in the work of affording the smelter every possible convenience for steady work. Assurance is given that the smelter could have run for a considerable time yet, possibly all winter, if it was closely connected with the railway. The investigations made for installing a traction engine outfit on the road proved that this was impossible, for the bridges and culverts were too weak to sustain the weight.

The Frank Sickels placer mine, at the mouth of Deer creek, southern Josephine county, has been sold to J. C. Anderson and R. D. Morris of Los Angeles. The property consists of old channel bars as well as river bottom, the low bars being from 8 to 10 feet deep and the high bars of the old channel from 8 to 40 feet. The new owners will dig a large ditch, which will furnish abundant water for the greater portion of the year.

Lane County.

Manager C. H. Park, of the Treasure mine at Blue river, has finished the aerial tram which is to connect the milling plant with the mine workings, and November 1 is the date set for the commencement of operations. The tram extends from the main drift a distance of 1500 feet down the mountain, covering a difference in elevation of 400 feet. The new plant consists of twelve rapid-drop stamps and no concentrating tables. The maximum depth attained in the present workings is between 500 and 600 feet, but the ore is thoroughly oxidized to the deepest level and all values are expected to be caught on the plates.

SOUTH DAKOTA.

Lawrence County.

The Imperial M. Co. of Deadwood, owning mines in the Terry's Peak region and a mill at Deadwood, has bought the McGovern group, near Portland, which they have been working under bond for a year past. It is stated that a good portion of the money paid the sellers of the property came from the net results of operations during the year.——Near Maitland A. J. Simmons is sinking a shaft on the Echo property. It is reported that the shaft is already in good ore, with indications for a large body of good mineral, the further development of which will soon call for milling facilities.

Pennington County.

R. J. Truax, who is interested in wolframite prospects, has leased the custom mill at Keystone, and will make a test of wolframite ore.

James Cochran is overhauling his milling plant at the Cochran mine, 3 miles from Rochford.——The Montezuma Co. at Rochford is endeavoring to get its business in shape to continue the development of the mine, and to perfect arrangements whereby a suitable milling plant may be provided.——The development of the Blue Lead copper property, near Sheridan, is proceeding. A winze is being sunk near the face of the main drift, to determine the character and extent of the ore in depth.

UTAH.

Juab County

Irwin Spriggs, A. E. Larson and O. Baker have filed a suit against the Bullion-Beck M. Co. of Eureka. They were leasers at the Beck mine, and in following a small stringer of ore broke into a stope from which a great deal of rich ore had been taken apparently by the Eureka Hill Co. There is considerable rich ore left in this stope, but the Bullion-Beck Co. refused to allow the leasers to continue work until suit was brought against the Eureka Hill M. Co. for the amount of ore which has been unlawfully removed. A suit has been brought by the leasers to recover damages for a share of the ore now remaining in the stope. If the Bullion-Beck Co. receives damages for ore which they did not know existed until the leasers made the discovery, it might be presumed that the leasers will be entitled to their share of the money. —— G. W. Riter of the Eureka Hill mine has leased a large portion to local people. Practically everything down to the 800-foot level is now open to leasers. Recently the Eureka Hill M. Co. tried leasing in the upper workings of its mine, and the results have been so satisfactory that it was decided to give the leasers a chance in the lower levels. The hoist is to be started.

Salt Lake County.

At the Fortuna of Bingham, Superintendent J. Start is working principally in the Freedom level, a drift from the upper working tunnel. A new gasoline hoist has been put in. A shaft is to be sunk from the Keystone.

Dispatches from Boston state that American Smelting & Refining Co.'s interests have bought in the open market between 30,000 and 40,000 shares of the Boston Consolidated Co.'s stock. Private negotiations are declared to be under way for the purchase by the smelter interests of control of the company to make it part of a consolidation of Bingham mines. The ultimate object is to make Bingham a rival of Butte as a copper camp, and of Salt Lake valley the greatest smelting center in the world. The mines it is proposed to take into the combination, with their approximate estimated market value, are as follows: Utah Copper Co., $10,000,000; Ohio Copper Co., $750,000; Boston Consolidated, $10,000,000. To these may be added the Newhouse mines in Beaver county, with an estimated market value of $10,000,000, making it require $30,750,000, roughly estimated, to swing the consolidation. The first two companies named are already under bond to the American Smelters Security Co., the smelting company's mining corporation. When the new concentrating mill and smelter now being constructed at Garfield are completed and in full operation, it is expected that not less than 12,000 tons a day of ore will be coming from the Boston Consolidated and Utah Copper mines, and that the annual production of copper two years from date and thereafter will not be less than 150,000,000 pounds, having a value of $20,000,000 to $25,000,000. This is in addition to the output of other Bingham companies, which exceeded 31,000,000 pounds last year. The total production of the Amalgamated Copper Co. in 1904 was 240,000,000 pounds, and it is decreasing, while the entire State of Michigan, second on the list of copper producing States, turned out 142,153,171 pounds, or less than this one company can place on the market annually after two years. This production means sending 600 big cars of ore a day from the consolidated mines. Estimates of the number of men to be employed are roughly made as follows: Mining and shipping ore, 4000; milling and smelting, 3,000—total, 7000. Annual wages, figured at average of $2.25 a day, $5,748,750.

H. S. Joseph, manager of the Silver Shield Co. at Bingham, has bought from the Boston Con. Co. land near the mouth of the Shield tunnel for a millsite. The mill will have a capacity of fifty tons of ore a day.

In his report to the stockholders of the United States Co., President Evans says that the company has purchased the Mammoth mines in California, and has built a modern smelter there of 500 tons capacity. They have also built a lead smelter of three furnaces adjoining its copper smelter in Utah, to which it is now adding three more lead furnaces. It has added two copper furnaces to its Utah copper smelter, is about to build a third copper furnace and has built a reverberatory furnace for treating flue dust, etc., which is working satisfactorily. Its subsidiary companies own the group of mines in Bingham, the Centennial-Eureka mine at Tintic, a lime quarry believed to be large enough to supply all the lime rock needed for smelting in Utah, the Mammoth mine in Kennett, California, a copper and lead smelter in Utah, a copper smelter at Kennett, and a controlling interest in the DeLamar refinery at Chrome, New Jersey. All these properties are in active operation, except the Kennett smelter, one furnace of which has started. The net earnings of the companies for the sixteen months from March 1, 1903, to July 1, 1904, were $1,045,719.78, and for the twelve months from July 1, 1904, to June 30, 1905, were $1,092,987.82. The net earnings during the last twelve months were affected by the break down of the blowing engines and by several stoppages incident to improvements made at the Utah plant. Managing Director A. F. Holden, in his report to the president, stated that the condition of the Telegraph, Old Jordon, Centennial-Eureka and Mammoth mines is satisfactory and that the ore reserves are being developed to take the place of the ore removed. The quarries of the United States Lime Co. have been furnishing the smelter with its entire supplies of lime. A crushing plant costing $30,000 is the only requirement at this plant. At the United States smelter they are running six copper furnaces and three lead furnaces in addition to ten roasters and one reverberatory furnace. The entire plant is working smoothly. Five additional roasters are being completed for the lead plant and five more will be built. Orders have been given also for doubling the number of lead blast furnaces. During the year from Oct. 1, 1904, to Oct. 1, 1905, the smelter produced 71,445 ounces of gold, 2,107,956 ounces of silver, 14,965,438 pounds of copper and 10,200,826 pounds of lead. Much improvement has been made in controlling our flue dust losses, thus eliminating a large factor in the so-called smoke trouble in Salt Lake Valley. The large supply of custom ores will necessitate building a third sampling mill. The following board of directors were elected: Frederick Ayer, William H. Coolidge, R. D. Evans, Eugene N. Foss, Albert F. Holden, Nehemiah W. Rice, James J. Storrow, E. C. Swift, S. W. Winslow.

Summit County.

No more water is being tapped in sinking the King Con. shaft at Park City.

Tooele County.

In a drift on the 200-foot level of the Consolidated Mercur Co.'s mines a fine body of oxide ore was broken into recently.

Utah County.

The Whirlwind M. & M. Co. of American Fork, operating the Whirlwind mine in American Fork canyon, has resumed work.

Washington County.

A. L. Adams, owner of the Paymaster mine, 18 miles west of St. George, has shipped eighty-one bars of copper bullion from the 150-foot level. He intends to sink on the vein to a depth of 450 feet, where he will cut the workings of the Dixie and use the tunnel.

WASHINGTON.

Ferry County.

The British Columbia Copper Co., operating the smelter at Greenwood, and the Mother Lode mine, in Deadwood camp, B. C., has taken a bond on the Napoleon, at Boyds, 6 miles from Marcus. The Napoleon was originally bonded by P. Burns & Co., who have been shipping for some time from their First Thought mine, near Orient, to the Northport smelter. The Napoleon ore, containing an excess of iron and sulphur, besides other values, was useful for mixing with the siliceous ore of the First Thought; but with the closing of the Northport smelter, P. Burns & Co. had made arrangements to sell the bond on the Napoleon to the British Columbia Copper Co., and that company now has Harry Johns at the property in charge of the work and shipments of about twenty tons daily are being made to the company's Greenwood smelter.

Franklin County.

Gold in paying quantities has been discovered at Richland, 8 miles north of Pasco, by John Prentice, and engines and machinery have been purchased to begin operations.

Okanogan County.

Ore recently taken to Loomis shows a high percentage of tungsten. Ore concentrated and sent to Philadelphia gave 73% tungsten. Henry Bahrs, manager Copper World Extension Co., and C. D. Baldwin report that there is a well-defined 3-foot vein traceable on the surface, which in several places where it was opened carried tungsten. Log cabins have been built and arrangements made for development during the winter.——H. G. Cupples with ten men has commenced the survey of the Methow-Barron State wagon road, for which the last Legislature appropriated $10,000, contingent upon Okanogan county appropriating one-half of that sum and completing the survey. After spending the entire summer in making preparations, the county commissioners, after the attorney-general had filed suit against Okanogan county to compel the acceptance of the appropriation, made an order for the survey of the road and an appropriation to cover the county's portion of the expenditure. Okanogan county will expend $5000 along with the State fund of $10,000, and it is estimated that the survey will cost between $1500 and $2000. The Methow-Barron road will extend from the mouth of the Methow river to the summit of the Cascade mountains, where Okanogan joins Whatcom. Barron is west of the summit in Whatcom county and is the center of the Slate Creek mining district. The road will be 65 miles long.

Pierce County.

The Tacoma Smelter Co.'s new stack is 307 feet 6¾ inches high, and cost $28,000. The stack was built to carry away the poisonous fumes from the smelting works at Tacoma. In its construction 1225 barrels of cement were used, in addition to which the structure contains 105,000 pounds of T iron, 705 cubic yards of sand and 231 cubic yards of gravel. The concrete foundation is 36½ feet square and 6 feet thick. For the chimney proper the mixture was one part cement and three parts sand. The chimney is constructed in two parts. From the foundation to a height of 90 feet there are two distinct shells, one built within the other, while for the rest of its height it is built with a single shell. The purpose of the double shell is to protect the structure from cracks due to extreme variations of temperature. The inner shell, which is separated from the outer one by an air space of 5 inches, is designed to shield the outer shell from the direct effect of the intense heat at the base of the chimney, while the outer serves as a like protection to the inner shell, by shielding from cold weather, which might cause it to crack by cooling too suddenly.

Stevens County.

The Review M. & M. Co. will resume work on the old Mountain View property, near Northport. W. E. Harris is president and manager.

FOREIGN.

AFRICA.

The September gold production of the Witwatersrand mines was 416,487 fine ounces. This was 12,094 ounces less than the August and 3,018 ounces less than the July production. This may be accounted for by the fact that September had but thirty days, while July and August had thirty-one. There are fewer Kaffir laborers and the supply of Chinese does not keep pace with the Kaffir falling off.

CANADA.

BRITISH COLUMBIA.

Boundary District.

The properties which the British Columbia C. Co. is developing on Copper mountain, near Chesaw, have been closed down for the winter. Work will be resumed in the spring.

The tonnage from Boundary mines for the week ending October 21 was: Granby mines 16,448 tons, Mother Lode 4160 tons, Providence 30 tons; total for week 20,638 tons, total for year to date 709,492 tons.——Arrangements have been made by the Dominion C. Co. to take 100 H. P. from the Cascade works to operate the company's compressor now in use with steam at the Brooklyn mine in Phœnix. A larger and more modern compressor plant is to be put in by the Dominion C. Co., which will also be driven by electricity. The management of the Dominion C. Co. has been considering the advisability of operating the company's present smelter at Boundary Falls, which was blown out last May by the Montreal & Boston Con.—this company's predecessor in ownership—but lack of adequate slag dumping ground has stood in the way. This week, however, this matter has been arranged and dumping ground has been secured, and it is now the intention to blow in the smelter.

Work has been resumed on the Rathmullen group,

near Grand Forks, under the direction of R. H. Hewes. ——The I. X. L., on McKinley mountain, near Franklin, is to be worked this winter by F. MacFarlane.

East Kootenay District.

The work of repairing the damage done by the recent fires at the St. Eugene is being pushed. The blacksmith shop is up and everything is in readiness for building the shaft house. A new hoist, a duplicate of the old one, has been ordered. In the meantime a temporary hoist will be brought from Rossland and will be used until the new one arrives. Sinking the shaft an additional 160 feet will be commenced. The mill will be closed down and no shipments will be made until everything is in shape again. The cause of the fire is unknown.

Rossland District

The Rossland Miner reports the tonnage of ore shipped and crushed at the Rossland mines for the week ending October 21 and for the year to date was as follows:

Mine.	Week.	Year.
Le Roi	1,650	95,926
Le Roi (milled)	630	3,030
Center Star	1,710	81,450
War Eagle	1,260	55,550
Le Roi Two	180	6,652
Le Roi Two (milled)	....	8,230
Spitzee	....	4,809
Velvet-Portland	....	1,977
Gopher	....	180
Homestake	....	30
Lily May	....	90
Inland Empire	....	30
Cascade-Bonanza	....	90
White Bear	....	1,100
White Bear (milled)	....	2,920
Crown Point	....	270
Jumbo	200	8,629
Totals	5,630	270,963

The Center Star shaft, which is being extended down from the tenth level, has reached a point 100 feet below that level, and is to be extended farther. The tenth level has not been opened. At the west end of the Center Star a large glory hole has been made. The ore is blasted out and falls through a shaft to the first level, from where it is trammed to the main shaft and hoisted to the surface.——A new wire cable is being put on at the main War Eagle shaft.——The secretary of the Le Roi Two Co. has issued a circular from the London office of the company stating that permission had been obtained from the directors of the Le Roi Mining Co. to explore the deep levels of the Le Roi Two from the lower levels of the Le Roi. Probably the workings on the 1350-foot level of the Le Roi, which are closest to the Le Roi Two ground, will be used. As the Le Roi and the Le Roi Two shafts are started from the same level, the workings of the Le Roi 1350-foot level extended into the Josie ground will be practically on the 1350-foot level. The deepest workings in the Le Roi Two at present are 900 feet, and the proposed work when done will give a depth of 450 feet below that level.——The Spitzee pumps are kept in operation and a few men are at work around the mine, pending the reorganization of the company and the readjustment of its financial affairs.——Development of the ore shoot on the 1550-foot level of the Le Roi continues with good results. The ore shoot on the 1450-foot level is also receiving attention. The Black Bear shoot, which has been found on the ninth level, promises to yield a more than ordinarily large tonnage. All of the ore from the Le Roi, amounting to 1650 tons, was sent to the Canadian smelting works at Trail, this being the first week that the entire output of the mine has gone to Trail.——The Trail copper furnaces were kept in full blast on ore from Rossland, the Boundary and Larson, Idaho. The work of installing the additional copper furnace is being pushed as rapidly as possible. The lead stacks are kept in operation, although there threatens to be a shortage, which will occur before the St. Eugene begins to again produce its lead concentrates.

Vancouver Island.

Manager Kiddie of the Crofton smelter, which was closed for six months this year, will blow in in November and will treat the Britannia mine's ore thereafter. Custom work will also be taken and the amount of ore treated gradually increased. The Britannia output may be 500 tons a day.——The Van Anda mines on Texada island are starting up again.

YUKON TERRITORY.

Consul-General Foster of Ottawa, Ontario, writes that an order in council, dated July 27, and recently made public, abolishes for ten years the royalty on gold produced from any quartz claim or group of claims in the Yukon Territory in respect to which an expenditure of money has been made to the amount of not less than $25,000 within five years after the date of the order in council or within five years after the date of issue, hereafter, of the patent for such claim. The royalty on the gross output of copper mined in the Yukon is permanently abolished in respect to those claims upon which an expenditure of money has been made to the amount of $50,000 within ten years after the date of the order in council or after the issue, hereafter, of the patent for such claims. The royalties previously payable were 2½% on all gold shipped from the Yukon Territory and 5% on all copper mined in said Territory. The gold, for the purpose of estimating such royalty, was valued at $15 per ounce.

MEXICO.

The Treasury Department has issued complete mining statistics to Dec. 31, 1904, from which the following figures are compiled. On that date there were in existence 19,471 legally registered titles. The classification of these properties consists mainly as follows:

Mineral.	No. of Properties.	Hectares.
Gold	1,478	20,187
Gold-silver	5,208	53,409
Silver	5 153	44,454
Gold-silver-copper	861	16,198
Gold-silver-lead	913	12,072
Gold-copper	234	3,572
Silver-copper	671	10,798
Silver-copper-lead	254	4,379
Silver-lead	2,924	30,639
Copper	768	20,269
Copper-iron	176	3,619
Copper-lead	21	532
Iron	351	14,472
Lead	67	1,073
Mercury	160	5,749
Tin	30	632
Sulphur	105	4,069
Antimony	45	2,087

In addition to the foregoing there are titles for manganese, bismuth, granite-tourmaline, opals and turquoise properties. The situation of these properties in the various States and Territories is:

Northern States—	No. of Properties.	Hectares.
Coahuila	455	8,580
Chihuahua	3,319	40 971
Nuevo Leon	475	9,395
Sonora	2,670	45,767
Totals	6,919	104,715
Central States—		
Aguascalientes	202	1,116
Durango	2,827	25,024
Guanajuato	784	10,216
Hidalgo	753	6,489
Mexico	414	4,972
Morelos	52	650
Puebla	150	1,929
Queretaro	130	2,060
San Luis Potosi	375	8,865
Tlaxcala	2	18
Zacatecas	1,502	14,525
Totals	7,191	76,869
Gulf States—		
Tamaulipas	99	2,540
Veracruz	55	1,006
Pacific States and Territories—		
Baja California	641	5,513
Colima	39	985
Chiapas	19	293
Guerrero	629	14,067
Jalisco	1,039	8,338
Michoacan	455	13,433
Oaxaca	1,273	11,489
Sinaloa	866	7,580
Tepic	246	1,938
Totals	5,207	63,638

Chihuahua.

There is being shipped from the State of Chihuahua to the smelters in the United States 1600 tons of zinc ore per month. The Calera M. Co. is shipping 1000 tons per month from the mines at Minaca to the Empire Zinc Co. at Pueblo, Colo., and McDonald & McKenzie are shipping 600 tons per month from San Sostenes to La Harpe, Kan. Interest is being shown in zinc mining in that State, and the prospects are that the industry will be developed during the coming year. It is stated that a new zinc sampling works may soon be established in Chihuahua to facilitate the handling of the ore. At present all of the ore has to be shipped to the smelters for sampling, greatly delaying settlement.

It is reported that a New Haven, Conn., company is examining mines belonging to Tiburcio Garcia, in the Mina district, near Guadalupe y Calvo. A. E. Roberts of Mexico City is interested. The group is known as the Galeana group. The mines are on the Humayo river. ——La Fayette Bros. of Chetopa, I. T., have opened up gold properties northwest of Guadalupe y Calvo.

Guerrero.

Superintendent G. D. Case, of the Mitchell M. Co. of New York, operating the La Dicha mines, near Acapulco, states that a run of the furnace for twenty-one days gave a gross return of $131,600. They are getting out twenty-eight tons of 65% matte each day. This result is brought about by the self-fluxing nature of the ore, which requires no barren flux to run it through the furnace. Plans and specifications are being made for the building of a 2500-ton plant, and this will be put in as rapidly as it can be built and shipped to the mines.

Mexico.

H. P. Lewis, general manager National Metal Co., expects to be able to start the company's new separating and refining plant at Noalco by November 1st.

Sonora.

A controlling interest in the Refugio copper mines, near Cananea, has been bought for Archibald & Marshall of London, who will develop the property after prospecting with diamond drills.

Zacatecas.

A cyanide plant with a daily capacity of 100 tons will be put in at the El Bote mine, near Zacatecas, to work the tailings. The ore from the El Bote mine is being treated by pan amalgamation, and it is said that 18% of the silver and 25% of the gold assay values are lost. The average ore runs 1½ kilos silver and 15 grams gold to the ton, and at the present time the reduction plant is handling about 2000 tons monthly. If the cyanide treatment proves satisfactory, the plant will be enlarged. The El Bote was opened twenty years ago, and one shaft is down 900 feet. There is another shaft 800 feet deep, and a ventilating shaft extends for the same distance. A Cornish pump has just been put in at the 800-foot level. J. S. Pattinson, the manager, is employing 700 men.—— It is reported that W. C. Palmer of Zacatecas is arranging to form a company to work the Mala Noche mine, 3 miles from the Zacatecas capital.

SOUTH AMERICA.

Bolivia.

In 1904 the Oruro district produced 8000 tons of metallic tin. The Tres Cruces district is being opened up with satisfactory results. Bolivia is the largest tin producer in America.

Books Received.

The United States Geological Survey has issued "Columbia River and Puget Sound Drainage" as a report of stream measurements during 1904. It is No. 135 of the Water Supply and Irrigation Papers.

"A Handbook of the Mineral Resources of the State of Jalisco, Republic of Mexico," by T. E. Smith. Price 50 cents. It contains descriptions of the leading mines and districts of the State. A map would add to its usefulness.

Personal.

J. T. MARRINER is in Korea.

J. E. SPURR is at Mexico City.

G. W. MAYNARD is at Tucson, Ariz.

T. A. RICKARD arrived at El Oro, Mex., on the 20th inst.

J. B. HASTINGS is returning to Denver from Guerrero, Mex.

R. H. ANDERSON has been examining mines in Jalisco, Mex.

J. L. WARNER has charge O. K. mine at Rossland, B. C.

H. C. SANDIFER has returned from New York to Mexico City.

A. W. BUTLER is superintendent Matoon M. Co., near Baker City, Or.

J. A. LEWANDOWSKI is manager Savage G. & C. Co. at Paradise, Ariz.

R. T. HILL has changed his office to 807 Trinity building, New York.

GEORGE SCHROTER is examining the Pelegrina mine at Guanajuato, Mex.

R. L. EDWARD is manager Kittie Burton Co. at Ulysses, Lemhi Co., Idaho.

OTTO WILL has resigned as manager Eureka mine at Bullion, near Hailey, Idaho.

A. J. BRENT, interested in Humboldt county, Cal., mines, is in San Francisco, Cal.

J. M. GOODWIN of Silver City, Idaho, is examining mines in Humboldt county, Nev.

A. H. GRACEY has resigned as manager Oyster-Criterion mine, near Camborne, B. C.

J. A. VEATCH of Napa, Cal., has gone to Magdalena, Sonora, Mex., on mining business.

H. S. DRINKER was installed as president Lehigh University at Lehigh, Penn., on Oct. 12.

W. C. HOWARD, superintendent Pyramid mines, near Kingman, Ariz., is in San Francisco, Cal.

H. B. STURTEVANT has been appointed superintendent Lincoln Con. M. Co. of Tucson, Ariz.

V. G. HILLS, who has been examining mines in Arizona, has returned to Cripple Creek, Colo.

J. H. HINDRY, manager La Esperanza at El Oro, Mex., is taking a holiday at Santa Barbara, Cal.

J. H. MCKENZIE, consulting engineer Le Roi mine at Rossland, B. C., has been in San Francisco.

C. H. DOOLITTLE, manager Bingham & New Haven mines at Bingham, Utah, is in New York City.

JOHN SEWARD of New York City has been examining the Caballo mine at Inde, Durango, Mexico.

J. H. DRISCOLL, manager Santa Fe mines at Hopewell, N. M., has returned to Salt Lake City, Utah.

MARTIN HOUK, manager Trilby M. Co., near Silverton, Colo., has returned to the mine after a trip East.

F. K. BAXTER has accepted a position on the staff of the Mammoth Copper Co. at Kennett, Shasta county, Cal.

R. D. RHODES has charge of the Mammoth smelter of the United States S. & R. Co. at Kennett, Shasta county, Cal.

J. J. HOBAN of Idaho Springs, Colo, manager Sterling M. & T. Co., is in Scranton, Pa., on company business.

J. J. CASE, manager Cerro de Pasco smelter, has returned to Peru from an extended visit in the United States.

E. C. KNIGHT has been given the management American S. & R. Co.'s new smelter at Velardena, Durango, Mexico.

E. J. WILSON, manager Arizona Smelting Co., with headquarters at Prescott, Ariz., has been in San Francisco, Cal.

J. L. MADDEN of the San Juan Mining Co., operating about 40 miles southwest of Austin, Nev., is in San Francisco, Cal.

JOHN CHAMPION, superintendent Yak tunnel, Leadville, Colo., is visiting Calumet and other mining camps of Michigan.

W. J. MORPHY of Chicago, and interested in the Granite Hill mines, near Grants Pass, Or., is in San Francisco, Cal.

N. C. BONNEVIE of Denver, Colo., and Chas. Janin of San Francisco, Cal., have returned to Denver from Gunnison county, Colo.

R. B. MCCONNEY, manager Denver, Colo., office of Allis-Chalmers Co., Milwaukee, Wis., is in Chicago, Ill., and Milwaukee, Wis.

FRANKLIN R. CARPENTER of Denver, Colo., is in Nova Scotia, investigating the commercial possibilities of large deposits of pyrite.

KUNO DOERR has been appointed manager American S. & R. Co.'s smelter at Aguascalientes, Mexico, in place of O. A. Westlund, resigned.

W. A. PRITCHARD has left San Francisco, Cal., for an extended tour of the mining districts of Mexico. He expects to be absent several months.

H. L. HUSTON has accepted the position of consulting

engineer of the Ohio-Tonopah M. Co., with headquarters at the Overland mine, Gold Hill, Nev.

W. S. DILLON has resigned as manager American Mexico M. & D. Co., at San Lorenzo, Coahuila, Mexico, and has been succeeded by G. E. Fitzgerald.

B. H. BENNETTS has been named as superintendent of the Garfield smelter of the American S. & R. Co., near Salt Lake City, Utah, with F. C. Knight as assistant.

THEO. VAN WAGENEN, who since his return from South Africa has been engaged in mine examinations in Mexico, is now examining mining property near Globe, Ariz.

GOVERNOR GOODING of Idaho has announced the following list of appointments as delegates to the American Mining Congress at El Paso, Texas, on November 14: J. W. Alshie, I. N. Sullivan, J. J. Deming, Charles S. Himrod, A. B. Crusen, T. J. Jones, August Paulson, E. H. Moffatt, F. Steadman, Al Page, R. W. McBride, W. O. Page, Lyttleton Price, E. R. Dewey.

COLORADO delegates to the American Mining Congress at El Paso, Tex., are: R. W. Bonynge, J. B. Grant, Denver; W. A. Haggott, Idaho Springs; I. Howbert, Colorado Springs; W. W. Davis, Leadville; V. C. Alderson, Golden; B. A. Langridge, Boulder; F. M. Woods, Victor; J. F. Callbreath, Jr., George Leyner, Denver; Charles Cavendar, Leadville; W. Z. Kinney, Silverton; E. M. De La Vergne, Colorado Springs; E. A. Colburn, Denver; T. B. Burbridge, Cripple Creek; S. D. Nicholson, Leadville; Frank Peck, Colorado Springs; Wm. Bainbridge, Cripple Creek; E. R. Hendrie, Denver; William Lennox, Colorado Springs; J. M. Downing, Aspen; Regis Chauvenet, Denver; L. H. Wygant, Jr., Deaver; Nelson Franklin, Victor; L. R. Johnson, Boulder; E. L. Davis, Telluride; B. B. Lawrence, Denver; Frank Bulkley, Denver; George Keener, Colorado Springs; W. J. Cox, Ouray; G. S. Newman, Aspen; Benj. Ferris, Pueblo; J. W. Finch, D. W. Brunton, E. L. White, Denver; Wm. Loach, Nederland.

Trade Treatises.

The Angels Iron Works of Angels Camp, Cal., in their "Guide Book" describe the Pacific battery stem guide, having no bolts, nuts, set screws, wedges or keys.

The Westinghouse Machine Co. of East Pittsburg, Pa., has issued a neat booklet illustrating the construction of Westinghouse storage batteries for signal service.

The Mine & Smelter Supply Co., of Denver, Colo., has issued two interesting illustrated bulletins on "Copper Converting Machinery" and "Smelting Machinery," No. 11 and No. 12, respectively. Besides picturing apparatus they contain much relevant information.

Of interest to every assayer and chemist is the 342 page, standard size catalogue of the Denver Fire Clay Co., Denver, Colo., illustrating and describing furnaces, scorifiers, muffles, crucibles, and general laboratory supplies. It will be sent on request to any address.

Bulletin Number Ten of the Jeffrey Mfg. Co. of Columbus, O., is a beautifully illustrated text describing the construction of the Jeffrey electric mine locomotives. It pictures many types for various purposes, and shows both surface and underground installations. The book will form a valuable addition to a library devoted to the problems of ore transportation.

The Allis-Chalmers Co. of Milwaukee, Wis., sends a number of handsome bulletins. No. 1402 describes in detail the construction and operation of their steam shovel. No. 1403 portrays the Hancock jig and includes pictures of a plant where the jig is successfully used. No. 1404 shows the McDougal roasting furnace, an inclosed firebox type. No. 1607 and 1608, from the pumping engine department, illustrate, respectively, a high duty, horizontal, double acting, crank and fly-wheel, plunger pump driven by cross-compound, Reynolds Corliss engine, and a single-stage centrifugal pump, motor driven. Catalogue No. 123 pictorially details sawmill carriages and accessory machinery.

Commercial Paragraphs.

THE Westinghouse Machine Co. of East Pittsburg, Pa., have received recently thirty-six orders for gas engines, ranging from 10 B. H. P. to 1000 B. H. P., and aggregating 6647 B. H. P.

THE Eel River Power & Irrigation Co. of Ukiah, Cal., write to the Rix Compressed Air & Drill Co. of San Francisco, Cal., as follows: "We have been using your Torpedo drills exclusively this summer in driving our 7x7 tunnel. In July we drove 362 feet in one heading, and 389 feet in August. This was all in standing ground. —WARREN EGBERT, Supt."

THE DeRemer Water Wheel Co. of Denver, Colo., have closed contracts for the following water power installations: High Creek Electric Light & Power Co., Richmond, Utah, two 400 H. P. DeRemer water wheels with governor regulation; Marguerite M., M. & L. Co., San Luis valley, Colo., one 100 H. P. DeRemer water wheel; Bourne G. M. Co., Bourne, Idaho, to equip a 11-foot 6-inch foreign wheel with twenty-four 18-inch DeRemer water wheel buckets.

THE Broderick & Bascom Rope Co. of St. Louis, Mo., write that they were awarded gold medals by the Lewis & Clark centennial exposition at Portland, Or., in the following seven groups: Wire ropes, cables for transmission of power, aerial cables for transportation of ore, hawser steel cables for marine use, wire ropes for hauling timber and logging purposes, wire rope and aerial cables for mining purposes, and also a gold medal for originality of design and practical demonstration of entire exhibit, besides a gold medal for tramways.

THE Wellman-Seaver-Morgan Co. of Cleveland, Ohio, has just been awarded the contract to furnish for the Wheeling & Lake Erie Railway at Huron, Ohio, a complete ore handling plant, consisting of four Hulett ore unloading machines, equipped with the Hulett patented excavating bucket. These machines will be able to span four tracks, having cantilever at the rear of the machines and folding boom at the front or water side of the machine. The plant is to be completed by May 1, 1906. The Wellman-Seaver Morgan Co. have recently closed a number of important contracts for steel works machinery for Great Britain, and mining outfits for Nevada and Mexico.

Latest Market Reports.

SAN FRANCISCO, October 27, 1905.

METALS.

SILVER. — Per oz., Troy: London, 28⅛d (standard ounce, 925 fine); New York, bar silver, 62¾c, refined (1000 fine); San Francisco, 62¾c; Mexican dollars, 51c, San Francisco; 48c, New York.

This week's silver quotations show an advance in the market price of the metal, having gone from 62⅝ cents last week to 62¾ cents, the present quotation. Even these small additions to the value of the white metal are very welcome to the producer of silver.

COPPER.—New York: Standard, $16.37½; Lake, $16.37½@16.75; Electrolytic, $16.32½; Casting, $16.00@16.37½. San Francisco: $16.75. Mill copper plates, $17.50; bars, 18@24c. London: £71 15s spot per ton.

The copper market remains firm and practically unchanged from the quotations of last week. The price hovers around $16.50 and $16.75, with no indication that it will move either up or down in the immediate future.

LEAD.—New York, $5.40; St. Louis, $4.50; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £14 17s 6d ℔ long ton.

SPELTER.—New York, $6.25; St. Louis, $6.00; London, £28 12s 6d ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¼c.

TIN.—New York, pig, $32.35@32.65; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔ lb., 40c. London, £148 12s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $16.35; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10¼c; 10 oz. stearic, 40s, 9¼c. 100-case lots and over, ¼c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ¼c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¼@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw, bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING OCTOBER 10, 1905.

801,564.—MUG—H. H. Allen, San Francisco.
801,707.—POCKET CALCULATOR—F. S. Beckett, San Francisco.
801,567.—CANE—H. H. Bernhard, Chico, Cal.
801,710.—SPECULUM—I. C. Carstensen, Oakesdale, Wash.
801,360.—OIL BURNER—E. Christensen, Portland, Or.
801,369.—DOOR FASTENER—Dickson & Ely, Castlerock, Wash.
801,775.—TRIPLE VALVE—J. Dellander, San Francisco.
801,584.—CHANDELIER—T. D. Greene, Davenport, Wash.
801,830.—ORNAMENTAL STRUCTURE—T. F. Hall, San Jose, Cal.
801,831.—SIPHON BOTTLE—D. Landau, San Francisco.
801,463.—CRATE—J. G. Lettelier, Los Angeles, Cal.
801,464.—CRATE—J. G. Lettelier, Los Angeles, Cal.
801,532.—WHEEL ADHESION—R. C. Lowry, Seattle, Wash.
801,741.—BICYCLE FORK—M. McIntyre, Canyonville, Or.
801,601.—HARROW—L. M. Morrow, Wasco, Or.
801,549.—BOOT HEEL—U. Santini, San Francisco.
801,553.—ROTARY ENGINE—N. B. Smith, Seattle, Wash.
801,617.—TYPEWRITER—T. C. Smith, Spokane, Wash.
801,410.—DISK PLOW—G. Spaulding, San Francisco.
801,414.—WEIGHING MACHINE—F. Stebler, Riverside, Cal.
801,346.—EVAPORATOR—H. C. Tabrett, San Francisco.
801,751.—SPARK ARRESTER—E. Tomer, Hanford, Cal.
801,493.—DEAD CENTERS—J. Whittington, Baker City, Or.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

TOILET SEAT ATTACHMENT.—No. 802,106. Oct. 17, 1905. J. Y. Matteson, Fruitvale, Cal. This invention consists of an improved toilet seat having in combination a hollow annulus having a diaphragm or partition across the rear portion, arms fixed to said annulus extending rearwardly and having hinge pins about which they are turnable, one of said arms being hollow and forming a swivel joint, a supply pipe connected with said joint and having a controlling cock, and a discharge passage upon the opposite side of the partition whereby a heating medium at the rear of the seat at one side of the partition is caused to circulate to the front of the seat and thence to the rear again before being discharged, said passage having a smaller capacity than the inlet passage.

GUN MOUNT.—No. 802,123. Oct. 17, 1905. M. C. Taylor, San Francisco, Cal. This invention consists in a gun mount, a shield convergent to the front, open at the rear, a yoke or frame having upturned ends in which the ends of the shields are journaled, a floor within the shield having parallel ribs between which the rear ends of the gun are fitted whereby the parallelism of the gun is maintained, mechanism by which the shield may be tilted in a vertical plane and mechanism by which the yoke and shield may be tilted in a vertical plane transverse to the first-named plane.

GOLD SAVING APPARATUS.—No. 801,968. Oct. 17, 1905. J. A. Clark, Yankee Hill, Cal. This invention is designed particularly for use in hydraulic and other placer mines. It consists in the combination with a sluice and a concentrating table upon which the sluice delivers, of a screen frame on the table comprising upper and lower side plates between which the screen is removably clamped, said upper plates having drop portions extending over and beyond the inner edge of the lower plates and rigid connections between the plates on the opposite sides of the frame, and means for securing the screen to these connections. There are other details of construction combined and adapted to bring about the desired result.

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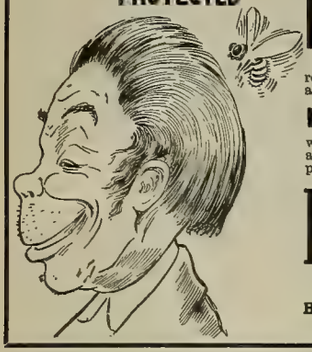

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Whole No. 2363.—VOLUME XCI. Number 19. SAN FRANCISCO, CAL., SATURDAY, NOVEMBER 4, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Trials of the Amalgamator.

The average gold millman has ideas of his own and his personality usually asserts itself in his mill work sooner or later. Many gold mine superintendents have a firm belief, probably established by experience, that a man who has acted in the capacity of amalgamator in a silver mill has no business in a gold mill. In certain individual cases this is, no doubt, a well founded prejudice, but that a man may not be as good an amalgamator in a gold mill as in a silver mill seems absurd—possibly, however, he would be a somewhat better millman if he were to learn the art in the plate mill before coming in contact with what seems to the gold millman the extravagant use of quicksilver, as practiced in the silver mill. The methods of amalgamation are wholly different in the two classes of mills, and the transferring of a silver millman to a gold mill is sometimes followed by curious results. Whatever the silver mill amalgamator may do in a gold mill, he is scarcely likely to do any worse than the gold millman who religiously feeds a given amount of "silver" to the battery at stated intervals, regardless of the condition of the plates. He is the "rule of thumb" man, and to him all exterior signs of the mill battery do not appeal. He feeds quicksilver by the watch, and not by the condition of the plates. It is true that the silver millman in the gold mill, unless he has had special training, is likely to overfeed the quick. An instance occurred some time since at a well-known mine in the tropics. An American amalgamator was engaged to take charge of the mill. He was an experienced gold millman. On the day of his arrival he found his predecessor, ably assisted by two or three natives, on their knees on the plates. The mill foreman was plowing up ridges of amalgam, silver plating and raw copper, with the aid of an old axe, while the natives industriously endeavored to emulate his good example with steel chisels. The newly arrived amalgamator looked upon the proceeding with some misgivings, and inquired if that was about the regular thing. When he took charge of the mill the following day he at once introduced the methods of mill practice with which he was familiar, and which he knew to be successful under ordinary conditions. Before noon the superintendent appeared, and at once told him that he would have to do differently if he expected to accomplish results. He was told that the retired millman was a very competent man — an old and experienced silver millman—and that his mill practice was of the best and up to date. The new man was astonished to find that he was not using one-fifth enough quicksilver, of which there was abundance—no need to be afraid to use it. He called attention to the fact that he had the plates in good condition and that evidently things were going well, and finally asked permission to run the mill in his own way, for a day or two, at any rate, and then if results were not satisfactory he would willingly adopt some other method. For three days he was allowed to work in his own fashion, but the morning of the third day the superintendent again appeared in a greatly disturbed frame of mind. He said the whole thing was "going to the dogs," that the ore contained no values, for there was nothing in the tailings, whereas it was customary to get at least $5 to $6 per ton in them. The new millman called attention to the amalgam accumulating in the safe from the daily dressing of the plates, and this tangible result of his mill methods compensated for the lack of values in the tailings. This circumstance is in no manner exaggerated, but it illustrates two important phases of mining—the first, that the superintendent chosen to look after the business of this company knew so little of its practical operations, and the other is that a silver millman is prone to overfeed the battery of a gold mill unless he has had special training in the latter branch of the business.

The Tebekwe Mine, Rhodesia, S. A. (See Page 313.)

A Woodland Scene in Nova Scotia. (See Page 311.)

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THE use of crude petroleum as a fuel in power and metallurgical operations is increasing yearly, and in some districts, at least, promises to displace all other classes of fuel. Its successful application to reverberatory furnace practice was a long step in the right direction, and has stimulated the endeavor to apply this class of fuel to blast furnace operations. Several ingenious inventors have already attempted this difficult task. One type of furnace may be described as intermediate between a cupola and a reverboratory, the hearth being inclined at a high angle. The other type of furnace, although a stack, to all intents and purposes, is, in its operation, a radical departure from the ordinary blast furnace practice, being what is known as the "downdraft" furnace. In this device the ore is reduced to a fine granular condition, and is fed at the top and comes in contact with the intensely hot flame of the petroleum-steam jet which is projected downward from near the top of the furnace. The theory of the operation is in the belief that the ore particles will be oxidized and reduced to liquid condition before reaching the crucible of the furnace. The volatile elements will pass off to be condensed in several chambers, each being precipitated at a different temperature, which it is hoped to regulate so as to effect a differential separation of these several products. These include zinc, arsenic, antimony and other readily volatile minerals. The metals such as copper, lead, iron, etc., together with gold and silver, if present, are expected to be found in the lower part of the shaft, where they may be tapped in the usual manner. This process, although, as yet, in the experimental stage, indicates clearly the trend of modern furnace experimentation, and it is probable that something tangible may yet result from these efforts.

Motive Power at Mines.

The principal motive powers now employed in mine operations are either steam, water, or some form of gas or other type of explosive engine. By means of these, power is generated and applied in other ways —by ropes, by compressed air, or by electricity. When deciding upon what means shall be adopted to supply power to a mine, the problem should always be solved by selecting that which will afford the best economic results. In many situations no one of these several methods will supply every requirement. Either of them will operate a mill or a hoist, but there are generally pumping problems and traction problems to be worked out. Underground haulage is an important matter with all large mines. For this purpose, men as trammers, horses, rope-haulage, electric, steam, and compressed air motors are employed. The question which each manager is required to decide is, which system will give the most satisfactory and economical results. If the mine workings are large and well ventilated, and fuel is cheap, the ordinary type of mine steam locomotive would operate satisfactorily, no doubt. If the amount of material to be handled does not appear to justify a motor of any kind, horses or mules may be what is required.

As between compressed air and electric motors, the choice must be determined by the first cost of installation, the situation and the convenience of either system. On the Forest Hill divide, in Placer county, Cal., are two noted drift mines, the Hidden Treasure and the Red Point. These mines are situated similarly in many respects, the former being opened from the south side of the ridge and the latter from the north side. The haulage in the Hidden Treasure mines is accomplished by electric motors, and has proven eminently satisfactory. In the Red Point a compressed air motor was in use and was found equally satisfactory. The advantage in point of installation probably lies with the Red Point, as the plant was less expensive than that of the Hidden Treasure—due largely to the incidental relative situation. The water from the tunnels of the Hidden Treasure Co. is conveyed in pipe lines to a reservoir about 3 miles distant, where it is employed to develop power under 850 feet head. The water wheel is attached to a dynamo, and the electric current operates the motor cars and lights the mine workings and buildings.

At the Red Point mine the water flowing from the mine drives ventilating fans, and is again used at a lower elevation to drive an impulse wheel which supplies power to run a large air compressor of special design. This air is charged into the receiver of the motor which hauls the empty cars into the mine. The loaded cars run out on the grade in trains, being controlled by brakes, the motor not being required for the purpose of hauling out, though attached to the train. The system worked satisfactorily, and was similar to compressed air haulage elsewhere. The Red Point mine is at present being operated only in a small way, by leasers.

The two instances above cited are typical, and the situation at the two properties, though not very unlike, seems to have been met in each instance by the adoption of the method best suited to each case. There are many good things that may be said of the use of electricity or compressed air in and about mines without disparagement to the other. Both are good, and it is merely a matter of decision which to employ under conditions as they exist.

At the Homestake mines in South Dakota, compressed air haulage is in use both underground and on the surface. In former years steam locomotives were used to haul cars from the large open cuts to the mills, a portion of the route traveled being underground. The compressed air motors were introduced on account of ventilation.

In the Cripple Creek district of Colorado many of the larger mines are equipped with electric motors, and these are found to give inexpensive and satisfactory service.

In mine pumping operations the Cornish pump, at one time the most extensively used device for unwatering mines, has largely been displaced by direct acting steam or electric pumps, though in certain districts the Cornish pump still continues in favor. Where this is the case the plants are in position and have been there for years. They have been found efficient and satisfactory. The amount of water is not greatly variable in these mines, and never exceeds the capacity of the pumping plant, therefore there is no marked incentive to change to any other system. In cases where constantly increasing amounts of water are met with as the development of the mine becomes daily more extensive, some more expansive and readily applied system of pumping must be installed. To meet these requirements, the compact steam or electrically driven pumps are utilized, and both are satisfactory. In some districts bailing has almost wholly superseded pumping operations in mines, and some engineers do not hesitate to express the opinion that when properly equipped a mine may handle its water more cheaply by bailing than by any system of pumping.

Hoisting is one of the most important of all mine engineering problems. Here are found a greater range of power appliances than in any other department in mining. Hoisting is successfully accomplished by geared, friction and direct acting steam engines; by the same methods of application employing water power; by the use of compressed air—usually with electrically driven compressors — the initial power generally being water; and by electricity direct. Gas, gasoline and heat engines are also used largely in some districts where water and fuel are expensive.

Compressed air hoisting plants must necessarily be less efficient than where the power is applied direct from the motor, whether a water wheel, a steam engine or an electric motor, but this loss of efficiency is in some measure compensated for by the greater expansibility of the compressed air system. Should anything occur to interrupt the initial power, there is usually sufficient air in the receivers to enable the engineer to haul a cage or skip in transit to the surface. The electric motor, though having a higher efficiency than the compressed air plant, must stop immediately the current is interrupted. Still the electric hoists are growing in favor, and seem well adapted to certain districts and conditions. Many improvements in electrical hoisting machinery may be anticipated. With most managers it is not so much the question of water, steam, electric or other power, as which will be the most satisfactory and economical at any particular place. With this question in mind a consulting engineer may advise a water plant for some portions of California, a steam plant for the Black Hills, a gas engine plant for Arizona and electricity for Colorado, depending upon the mine's environment and the cost of power.

THERE appears to be an increasing tendency to attempt the treatment of raw auriferous sulphides by means of the cyanide process, or some modification of it. Experience at some mines has demonstrated that solution of bromo-cyanide is usually more effective for this purpose than the ordinary solution. The most important factors in the operation of this method of treatment appears to be abundant time of contact, with the solution and in some instances a repeated contact. The results obtained at various places is extremely variable, but a fair extraction seems possible in many cases where the material is ground sufficiently fine. Complete aeration of the sulphides after each contact with the solution appears to also be very important. In Western Australia various methods of treating the sulphides have been tried, but it has been found that by careful roasting before cyanidlng a very high percentage of extraction was generally obtainable — up to 99%. Although the roasting of the ores was an additional expense in the treatment, the increased saving of values more than offsets it.

THE needs of rapid transportation for passengers in the deserts of southern Nevada have resulted in the introduction of motor cars. A company owns a line of these vehicles, twenty in number, which make schedule trips between Goldfields and Bullfrog, in addition to which there are numerous private cars running on the same road. A good highway has been constructed between the most important towns, and traffic vehicles are not allowed to travel on it. The result is that one may now travel between these desert camps in comfort and in a surprisingly short time. The success of these auto-cars suggests the feasibility of their more extended use for traction

purposes, by means of which the expense of transporting mining supplies, machinery, etc., may not only be greatly facilitated, but cheapened. The energy being put into the development of these southern Nevada mining districts is likely to find a way out of every difficulty.

Pyritic Smelting.

With this number is concluded the abstract of the interesting paper on the "History of Pyritic Smelting," by Robert Sticht, manager of the Mount Lyell mines, Tasmania. In this contribution to the science of smelting the author has reviewed the ups and downs of one of the most useful and eventually successful accomplishments of metallurgy. One of the most interesting features of the entire proposition was the fact that after all the years of expensive experimentation and the numerous failures, when success was finally accomplished, it was along lines previously laid down in Europe many years ago. Even at that time the old operators were only a step from the success which they so earnestly desired, and strove to attain. Dr. Carpenter, who, as stated by Mr. Sticht, did so much for the science of pyritic smelting in his practice at Deadwood, South Dakota, says in his article on pyritic smelting in the Transactions of the American Institute of Mining Engineers, Vol. XXX, that he based his operations largely upon the operations as practiced at Kongsberg, Norway, and at Mansfield. The conditions at Deadwood were perhaps the most unusual attending any large operations in the world; but ingenuity overcame all of these difficulties and the result was complete success. Unfortunately, Mr. Sticht gives little space to the interesting practice at Mount Lyell, where he has made an unqualified success of the difficult metallurgical operations and reduced the smelting of those low grade and rebellious ores to an exact science.

In an official report the operations at Mount Lyell are thus briefly described: "The quantity of coke used in the blast-furnace smelting, when calculated on the ore, is about 5% in current work for the two-fold furnacing, and 6% on the ore, including all incidental coke for glowing-in purposes and similar occasional use, while on all the material fed to the furnaces (less coke itself) the percentage is only 3½% for the double smelting. It can hardly be maintained that so small an addition of coke has any vital bearing on the furnace reactions, from a heat point of view, and it is commonly remarked that the coke simply serves to keep the tuyeres from becoming too hard. It is fed along the long walls of the furnace with this special object in view. Such low percentages of coke are only possible owing to the application of the oxygen of the atmosphere to the ore mixture under conditions which make the oxygen perform a function somewhat different in its effect from that which it exercises in ordinary blast-furnace smelting, where a larger percentage of carbonaceous fuel is necessary. In all stages of the process the material (ore or matte) is constantly subjected to an oxidizing action, and not a reducing one. The process, therefore, in this respect is the direct inverse of ordinary smelting operations in the blast furnace. * * * * It may be said that the Mount Lyell ore smelting is nothing more than a bessemerizing of ores, or matte therefrom, direct in blast furnaces, but so managed as to be continuous and not intermittent, as is the bessemerizing operation (in converters), and also under perfect control, both as to the composition of slags and mattes, and the proper mechanical separation of these two products."

With such operations as those conducted at Mount Lyell, at Granby, B. C., at Cananea, Mexico, and formerly at Deadwood, S. D., there need be little fear of metallurgical problems arising in the treatment of pyritic ores which will long remain without a successful solution, if the ores themselves contain the elements of success.

THE complete destruction by fire of the surface plant of the Lightner mine at Angels, Cal., on the 30th ult., involving a loss of $150,000, accentuates the necessity of adequate fire protection about mines. A small percentage of the loss sustained would, it would be supposed, have afforded ample protection against fire. As usual, however, in the late summer and fall season in central California, the water supply is low, and many of those mines, ordinarily well protected by a sufficient fire service, are now deprived of it, and many of the mines are closed down for lack of power, where water is depended upon alone. In past years the mining companies have suffered heavy losses owing to the same cause. Fires originating many miles away from the mines have swept unresisted over hill and dale, enveloping forests, grass land and brushy slope alike, and destroying hoisting and milling plants unfortunately lying in its course. In Tuolumne county alone, several years ago, fifteen mines had their plants swept out of existence by fires which covered several hundred square miles of territory. It has become an old story in the central mining counties of California, and yet, as the years roll around, no adequate provision is made to impound sufficient water during the spring months to last throughout the summer and fall—until the rains of early winter set in and replenish the supply. The conservation of mountain water for mine use is a subject which receives only a tithe of the attention which it deserves.

The Theory of Concentration.

Mining men often remark the great number of concentrating machines that are on the market, and observe with some surprise that the number of devices for separating mineral of relatively high specific gravity from that which is low continues to increase. Scarcely a week passes that does not see a patent issued for some new device, the object of which is concentration of ores.

Naturally the inquiry presents itself: Why is there so great a variety of concentrators? There are oblong, square, circular and polygonal shapes in concentrators. There are buddles, jigs and bumping tables galore, beside a variety of other kinds too complicated in design to be readily described. There are end-shake and side-shake machines and those which oscillate. Vibratory motion is communicated in a variety of ways—by cams, cranks and other devices. Some have slow motions, others run rapidly—in fact, almost every conceivable device to effect a separation of heavy mineral from the light can be found already in existence, and others continue to arrive with astonishing frequency.

The most interesting thing about it all is that any one of these numerous makes of machines will do good work when in competent hands. An experienced and unprejudiced operator can effect a fair separation of heavy from light material with any of these machines, and some of them seem to lack little of perfection itself.

Beyond a doubt, the incentive which has resulted in such abundant evidence of the ingenuity and skill of the inventors is a belief on the part of each one that he can devise a machine which will make a perfect separation of the valuable minerals, usually of high specific gravity, from the less valuable and comparatively low specific gravity.

Unfortunately for the inventors and makers of concentrating machines generally, here lies a physical impossibility, for it has been repeatedly demonstrated, long since, that it is impossible to separate a coarse and an extremely fine particle of heavy mineral from a relatively light gangue at a single operation, with the same grade of machine, the same vibration and same amount of water. The combination of movements and volume of water which will accomplish the saving of the coarse particle will permit the fine particle to escape, and vice versa. The grade, vibration and flow of water which will carry off the sands and slimes of the gangue will also carry away with it the finest of the sulphides, and usually the richest. A concentrator man points with just pride to the clean concentrate his machine is producing. Examination shows it to be almost wholly free from gangue minerals. But what of the tailings? An equally careful examination may show them to contain considerable slimed sulphides—the richest portion of the ore. When the machine is set to save a reasonable percentage of these rich slimes, sands are also saved, and the concentrates are no longer clean.

The cause is readily discovered. A moment's thought will convince any reasonable person that it is a physical impossibility to save all the values in a pulp by passing the material over a single machine. The grade and volume of water which will carry away the coarse grains of sand will, in all probability, hold in suspension the microscopic particle of pyrite, galena, blende, or chalcopyrite. While this is true, it is equally true that when the fine particle of sulphide is saved, the grade and consequent force of the current of water will be insufficient to carry away the coarse grains of quartz, or other gangue mineral.

This being the case, the necessity for classifying the pulp from the crushing machines, before concentration is attempted, is evident. This can be accomplished by sizing screens or by the employment of hydraulic classifiers. In the case of some ores, both devices may be resorted to with success. At some of the largest concentrating mills, the crushed ores pass through sizing trommels, and from these screens the several sizes go to jigs set to treat each particular class. Further hydraulic classification is then followed by concentration on machines of some make. The result is that little of value eventually escapes. The entire scheme of concentration is arranged to operate automatically, and requires overseeing only.

In the treatment of most gold ores a much less elaborate plant is required. The ore is first sent to classifiers, and from these the discharge from beneath goes to one machine, the overflow going to another and sometimes entirely different make of concentrator. Here, again, is an opportunity to carry the concentration of values to a refinement exceeding the economic results, but, although there is little use in going to the latter extreme, it is self-evident that in order to effect successful concentration the pulp must be subjected to a classification of some kind. The concentrating of pulp from batteries direct, and the recleaning of the resulting concentrates on another machine, is simply another form of classification, but is not the best practice. If satisfactory results follow this method of treatment, it is almost a foregone conclusion that a more rational course would produce a closer saving at a reduced cost, which should be sufficient to recommend it to all who are in need of suggestions along these lines.

THE operation of machine drills is a matter which concerns almost every hard-rock miner. The great number of makes of drills of the various kinds—air, steam, electric, gas and hand-power machines—and the endless variety of conditions which the miner finds in his daily work underground, makes the operation of drills a constant study to the careful and observing man. Elsewhere herein is an article on the operation of machine drills on the Rand, in which the author calls attention to many important points. The suggestion that the pressure under which the drill operates be increased to somewhere near 100 pounds per square inch is one which will meet with universal approval among those who have operated drills under pressures below 70 pounds. Whatever may be the pressure indicated by the gauge in the compressor room, it will not be found to have the same pressure at the drilling face in the mine. Friction in pipe lines and leakage will reduce the pressure to an extent determined by existing conditions. The statement in the paper referred to—that some miners object to drilling more than four holes during a shift—simply illustrates a local labor situation, for the amount of work represented by four holes under ordinary conditions would scarcely be considered more than half a shift's work. The reference to the faulty work of hand miners, who are proficient in drilling with the right hand only, is similarly due to local practice and would not long be tolerated in any country where skilled labor is obtainable. The stopes in the mines of the Rand are all of comparatively small dimensions—rarely over 6 feet in height—and the banket dips at low angles, so that the conditions described and the operation of machine drills there must be recognized as typical of economic and geological conditions on the Rand, and as not being of general application elsewhere.

THE second tunnel connecting New Jersey and New York City was recently completed. This work was commenced about 25 years ago, and considerable progress made, but the many difficulties encountered and accidents occurring, with the resulting loss of life, caused a suspension of operations, which were only renewed in recent years, when, with the aid of modern scientific methods, the great work has been successfully completed. These tunnels are each a little over a mile in length.

CONCENTRATES.

A TOWNSITE PATENT, where valid mining locations have been made, does not grant the minerals to the townsite.

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FLOAT in miners' parlance is the name given to pieces of ore which have become detached from the ledge and lie upon the surface, or mixed with the debris between bedrock and the surface.

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APATITE is calcium phosphate. It occurs in many rocks, particularly in dark basic rocks like norite, where it appears in the form of slender needles. It is also found in good sized six-sided prisms in pegmatite dikes.

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FORMERLY the size of quartz mining claims in the Black Hills of South Dakota was 300 by 1500 feet. So many broad lodes were discovered that the law was amended, and the claims since located are 600 by 1500 feet.

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THE cost of breaking ore or rock in a mine or quarry is entirely dependent upon the conditions under which the mining or quarrying is done. It would be impossible to give even an approximate figure without a full knowledge of these conditions.

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THE Federal laws expressly provide that lands within forest reserves, which are shown to be mineral in character, may be located under the mining laws. This, however, does not apply to the national parks. Claims so so taken in a forest reserve may be patented.

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WORK performed upon an unpatented mining claim by leasers may be applied upon the annual assessment work by the owner of the claim, but work done by a trespasser, even though paid for later, may not be so applied. The work must be done by the owner, or at his instance.

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THERE is no book or pamphlet containing the mining laws of the State of Nevada and California separately. "Lindley on Mines" contains the mining laws of the several States. "Morrison's Mining Rights" also contains an epitome of the Federal and State laws, land office rulings, etc.

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WHERE mine pipes for either air or water have to be bent around corners, the flange joint will in every instance be found superior to screwed connections. The saving in time in making connections or disconnecting the same will save several times the additional cost of the flange fittings.

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THE basis of valuation of a mine must be naturally the amount of gross value it contains as referred to the cost of extracting the ore and turning it into money. A mine with a million dollars' worth of ore in sight which careful calculation shows will cost two millions to turn it into money is worse than worthless.

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THERE is no law specifically entitling the locator of a tunnel site to any surface ground for the purposes of dump, buildings, etc. The locator might proceed, however, under the mill-site law, by the terms of which he would be limited to a surface of five acres. This suggestion, however, is tentative. There is no decision or Land Office ruling on this subject.

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IN some districts the fire insurance companies refuse to write policies on mining or other industrial concerns using petroleum for fuel, where the tanks are set on an elevation so that the oil may run to the burners by gravity, as they claim the damage in case of fire is likely to be much greater under such conditions than in those instances where the oil is pumped to the burners.

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CHLORIDE OF SILVER is readily soluble in solutions of potassium cyanide, but the cyanide solutions must be considerably stronger than those required for treating the usual run of gold ores. Where the ore contains chloride of silver alone, with little or no gold, solutions of hypo-sulphite of soda are usually employed in the lixiviation of such ores, or they may be treated by pan amalgamation.

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THE courts generally have decided that the true measure of damages in the case of mine trespass, and the extraction of ore, depends upon circumstances of aggravation, and ranges from the net profits of working the ore, to the gross value of the ore after breaking it down in the stope. In all cases where there has been neither intent to defraud, or culpable negligence, the cost of mining should be deducted.

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GOOD AMALGAMATION can be done at almost any temperature between 35° and 100° F., but those who have experimented on the relation of results in amalgamation to the temperature of battery water say that the best results are obtainable at a temperature of 52° to 55° F. A certain amount of heat is always produced in the mortar by the falling stamps, but to what extent this raises the temperature of the battery water is not known.

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THE watt is the unit of electrical power and is 1–746 of one horse power. It equals the mechanical energy represented by 44.24 foot pounds. One ampere of current moving under the influence of one volt pressure, or any combination of volts and amperes, and that will make unity when multiplied together, is the equivalent in the expenditure of energy to the work a man would do in lifting one pound 44.24 feet high, or any work—any weight—raised any distance, in which the weight and the distance multiplied together make 44.24.

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ZINCBLENDE is not infrequently mistaken for galena, and it has been taken for tellurium when occurring in quartzose gold ores. It can usually be determined by its streak, which is always brownish, the streak of galena being the same as that of the ore itself. A drop of hydrochloric acid on blende causes an evolution of the hydrogen sulphide, which can readily be detected by its odor, resembling that of addled eggs. Zincblende is sometimes rich in gold and silver, but, like galena, its appearance is no index of its value in precious metals.

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WHERE A, B and C are partners in unpatented mining claims and A contracts debts of a personal character, it seems reasonable that A's interest in these claims may be attached for such debts, without prejudice to B and C. In such cases the law is usually plain, but the facts are often difficult to establish. It would be impossible to give a comprehensive answer without being acquainted with all the facts, and even then it may require the services of attorneys and the courts to reach a final decision. This is not a question of mining law but an ordinary civil case.

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IN drifting the machine bar should be placed horizontally and the machine clamped directly to the bar, as the arm is not necessary. The machine may be turned either above or underneath the bar. By boring the upper part of the round first, the muckers may remove any debris from the last round of holes. While this is being done the upper holes may be drilled. The rock removed, the bar may be taken down and placed in position for the lower holes of the round. This saves time for all hands engaged in the work and cheapens the cost of driving the drift.

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CONCRETE FOUNDATIONS for water or solution tanks are all right, but much more expensive than those of timber. There may be situations where the concrete would prove the most satisfactory. No wooden tank should be built so low as not to admit of passage beneath it for the purpose of inspection and repairs when necessary. Tanks may be provided by excavating in the ground and lining the pit with concrete, after the manner of cisterns. The tailings may be removed by mechanical excavator, hydraulic ejector or by sluicing out through a passage built underneath the tank.

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A MINE differs from a quarry in that the former is usually an excavation underground, where artificial light is used, while a quarry is open to the sky. Many mines consist of open excavations as well as those underground. In the Western United States are numerous ore deposits lying nearly horizontal, on the summits of hills. The excavations on these deposits, through open-like quarries, are usually referred to as mines, so that the material produced in a measure influences the name. Deposits producing metals and some earthy substances, such as magnesite, calcium borate, gem stones, etc., are called mines, regardless of the character of the deposit, so long as it is rock in place, while workings producing structural materials—granite, marble, sandstone, etc.—are called quarries. Deposits of clay, gravel, sand and similar substances, when opened by excavating, are called pits.

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MINERALS as constituents of rocks undergo many changes, due to oxidation and chemical alteration. Hornblende is altered from a dark green, compact crystal to a bunch of fibrous mineral, the outline of the original crystal being usually indicated by a border of black grains of magnetite. Augite alters to hornblende (uralite), but this may often be distinguished by means of the microscope. When augite has altered to hornblende, the latter takes the characteristic cleavage of hornblende, while the outline of the augite crystal remains unchanged. Often in the center of the crystal may be seen an unaltered core of the augite, with its characteristic cleavage lines. By shearing and pressure the hornblende is drawn into flat, disconnected filaments and gradually passes over by further alteration to chlorite, and chlorite to epidote. Greenstones undergoing alteration usually afford examples of these several phases of the alteration of augite and hornblende to other minerals.

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THE distribution of power in a quartz mill is a matter requiring as much attention as any of the other details of construction, or much power may be wasted by the employment of unnecessary shafting, belts, etc. All shafting, whether on blocks or hanging, should be kept in perfect alignment. Often the timbers placed in mill frames are unseasoned, and in time warp badly on drying. Shafting placed on such timbers will be thrown out of adjustment, and this necessitates watching the lines of shafting and occasionally lining them up with a transit. The transit is far better for this purpose than a chalk line. Rock breakers and concentrating machinery should not only have shafting separate from the other machinery of the plant, but each should be driven by a separate wheel or motor. Where a large engine runs the machinery of the mill, the breaker may be run from a pulley on the line shaft, but it is better to have a separate engine for the concentrators in any case, as on the steadiness of the operation much depends.

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WHEN water issues from the mouth of a mining tunnel and finds its way down a hillside, no one lower down on the hillside can acquire any permanent right to have this water continue coming down to him, if the mine owner chooses to stop it later. But if the water coming down from the mouth of the tunnel reaches a natural stream, it becomes part of the natural stream by accession, and may then be appropriated by others together with the water of the stream from which it can no longer be distinguished. The mine owner cannot thereafter take it out of the stream against prior appropriators of the stream, nor can he stop it before it reaches the stream to the injury of such appropriators. This is the best rule upon the point. Water coming from a mine tunnel cannot be appropriated by others, until it reaches a natural stream, but then it becomes a part of the stream and belongs to the appropriators of the stream. It is presumed that the correspondent from Phillipsburg, Mont., referred to water from a mine tunnel, and the above answer is made accordingly. The matter will be found discussed in "Water Rights in the Western States," Sec. 131.

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THE life of the electric furnace depends mainly on the durability of the lining used, the best of which principally consists of silicon carbides, such as carborundum, siloxicon and crystallized magnesite, themselves products of the electric furnace. For ordinary furnace kilns, carborundum is ground fine, and mixed in the proportion of three parts by weight of carborundum to one part by weight of silicate of soda (water-glass). After thoroughly brushing the freshly set firebrick to get rid of the dust (the mixture does not stick readily to a surface which has been already fired), the carborundum is painted on to the depth of half a millimetre. It is left for twenty-four hours to dry; afterwards the fire started up gradually, when a layer of carborundum becomes cemented over the whole surface of the firebrick lining, and if properly done it adheres soundly. Where basic slags or basic materials have to be taken into consideration, fireclay is employed as a binder instead of the waterglass, the proportion being usually six parts by weight of carborundum to one part by weight of fireclay. Although to a certain extent self-binding when heated to a high temperature, in commercial work it is advisable to add some form of bond to siloxicon.

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AFTER many years running of a 25-stamp mill, there is naturally a considerable accumulation of magnetings, that is, iron scraps and dust, due to the wearing of shoes and dies in the mortars, which are separated by magnet from amalgam and pyrites during each cleanup. The gold adhering to the larger particles of iron is easily recovered by heating, pounding and amalgamation; but that associated with the finer particles and dust can not be as easily extracted. The presence of a high percentage of metallic iron beds renders any attempt at grinding out of the question. It may be mixed with a little less than six times its weight of pyrite concentrates and the whole roasted in a reverberatory furnace. The sulphur thus liberated from the pyrites, combined with the metallic iron, forming a sulphide of that metal, and this, in its turn, as roasting proceeded, is reduced to Fe_2O_3, which is amenable to grinding, and the gold is consequently liberated. A small quantity of bichromate of potash may be added when the pulp is charged to the pan; and, after grinding for six hours, the muller raised and mercury introduced. For two hours, although the mercury remains bright but somewhat sluggish, no amalgamation will take place. On the addition of a little dilute sulphuric acid, however, the gold will be immediately taken up, the actual extraction approximating 95% of the assay contents.

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MILL AMALGAM contaminated with babbitt metal, lead, etc., may be freed to a great extent of these impurities by placing the foul amalgam in a pot containing sufficient quicksilver to readily float the contaminated mixture. Stir this well and allow to settle for several hours, or, better, a couple of days. The lead alloy will float on top of the mercury and the gold will settle to the bottom of the pot. By skimming off the dross and straining the quick, the gold may be recovered. If the process be repeated with the lead alloy it may be rendered quite free of mercury and gold. This lead may then be fused with a suitable charge in a crucible, when a lead button containing gold and silver will result, the tin, antimony, copper and other metals going into the slag. The lead button may then be cupelled to get rid of any base metal, the gold and silver only remaining. When the amalgam contains a quantity of nails and other metal scraps to which the amalgam clings, the mass should be treated some hours in a cleanup barrel, or, lacking this useful auxiliary to the mill, the mass may be ground or stirred in an iron mortar with an excess of quicksilver. This will soften the amalgam adhering to the metal, and the greater portion will become detached from the nails, etc., and drop to the bottom, while the nails will float on the surface of the mercury, from which they may be removed by the hands or a perforated strainer. This scrap should then be placed in a box and sprinkled with salt and allowed for several months to rust. In time this can be placed in the cleanup barrel or pan and ground with quicksilver for a day, when the gold will be recovered in the quicksilver.

Electric Smelting.

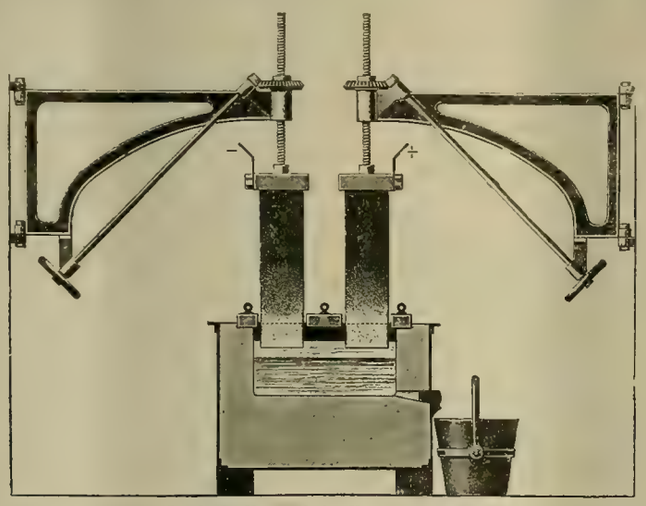
The smelting of iron ores by electricity will doubtless be successfully and economically accomplished in the near future, but the process is practically still in the experimental stage, although plants are being built for the purpose—one in Germany, one at Syracuse, N. Y., and one at the Sault Ste. Marie, Canada. As by the electric process it is thought iron sands and fines can be smelted without first briqueting the material, should the experiments now in progress prove commercially satisfactory, the electric method will become an important factor in the iron industry.

Dr. Heroult is possibly the best living authority on the smelting of iron ores and the manufacture of steel by the electric method. He has invented the process which is named after him. The works at Syracuse, N. Y., are being erected by the Holcomb Steel Co., who have obtained a license from Heroult to use his invention. The cost of the works will be $1,000,000 and the output will be from 80 to 100 tons daily. The company propose to manufacture tool steel and also high-class billets. The Holcomb Co. will be the first concern on the American continent to use electricity in connection with the making of steel. It will be produced by the ordinary method and the electricity will be applied to a purifying or refining process. Dr. Heroult has undertaken to superintend experiments in the making of pig iron and steel at the plant now in course of construction at Sault Ste. Marie, and for which the Canadian Parliament voted $15,000. Associated with him will be Dr. Haanel, superintendent of mines.

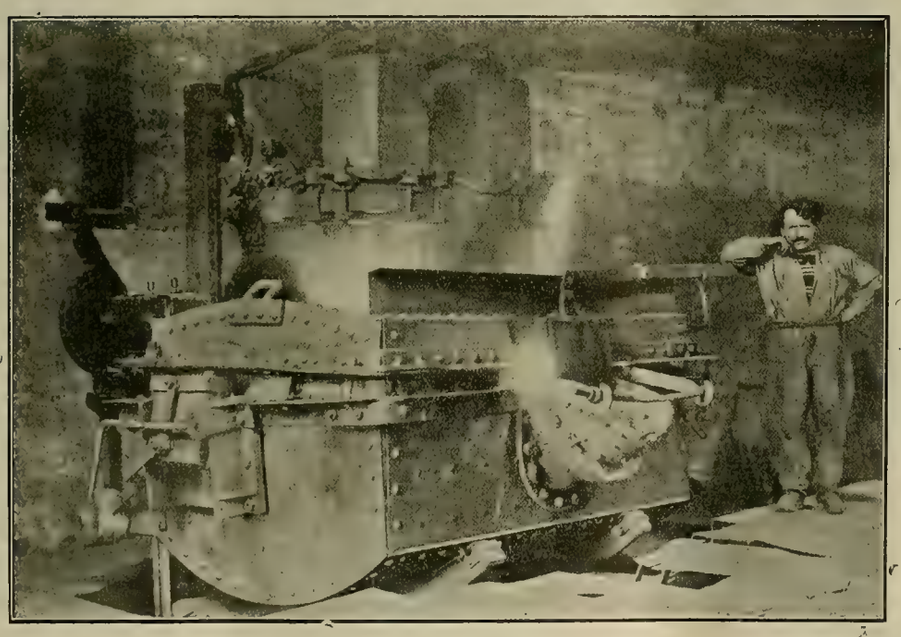
In the Heroult process the metal to be smelted is only brought indirectly into the electric circuit, and at the same time is introduced a layer of slag, or of an electrolyte, to act as a heating resistance between the electrodes and the metal. In this way all direct contact between the metal and the carbon electrodes is avoided. W. G. McMillan's translation of Dr. W. Borchers' treatise, "Electric Smelting and Refining, thus briefly describes the Heroult process:

The accompanying figure shows the arrangement of the electrodes in a diagrammatic sketch of the furnace, and the accompanying engraving illustrates the furnace in actual operation.

A bath of melted metal having been prepared either in the electric furnace itself or in some other suitable vessel, the material is treated electrically in a receptacle lined with a non-conducting refractory material free from carbon. In this vessel it is covered with a layer of slag or of other substance which only acts as a conductor at high temperatures. The electrodes are immersed in this slag to such a slight depth, and at such a distance apart, that the current is forced to flow from one electrode through the slag immediately beneath it to the metal below, and thence through the same layer of slag to the other electrode. This is arranged by regulating the proportion of the resistance between the electrodes and the sum of the resistances between the metal bath and the electrodes, respectively. Care must be taken that neither electrode touches the fluid metal. It is neither injurious nor necessary that arcs should be formed between the electrodes and the melted material in which they are immersed. It is, however, essential that the distance between the electrodes and the metal bath should be so regulated that the layers of slag in these spaces should, throughout the process, be hotter, and therefore a better conductor than the slag which lies between the two electrodes. Only in this way can the current be made to take the path indicated above.



Sectional View of the Heroult Furnace.



The Heroult Electric Furnace in Operation.

It is perhaps hardly necessary to say that the only way to act on the metal smelted in the above manner is by means of reagents introduced onto or into the metal, whether the object be to eliminate undesirable constituents or to add such as are desirable. The author has to thank Dr. P. Heroult for the following particulars of the composition of various samples of tool steel smelted in this furnace:

	Per Cent.
Sulphur	0.016 to 0.022
Phosphorus	0.006 to 0.011
Silicon	0.020 to 0.023
Manganese	0.092 to 0.138
Carbon	0.840 to 1.080

The percentage of carbon was designedly raised to the figures quoted; that it can be kept below this level is shown by the following composition of mild steel: S 0.008%, P 0.003%, Si 0.007%, Mn 0.000% and C 0.008%. The pig iron used for this charge contained: S 0.05%, P 0.129%, Mn 0.89% and C 0.31%.

The Heroult process can also be carried out on a comparatively small scale; and a current of 50 electrical horse power proved sufficient for the purpose of small demonstrations in the Aachen Metallurgical College.

With a 300 H. P. furnace, and starting with cold metal, Heroult has succeeded in producing 44 pounds of steel per electrical horse power in twenty-four hours. It is evident this figure would be considerably exceeded if the furnaces were charged, partly or wholly, with molten pig.

The success of this new process must be attributed to the fact that the electrodes are kept out of contact with the metal to be smelted. A simpler method than the one adopted is hardly conceivable, so long as a dynamo current has to be employed; but since that time a noteworthy method has been discovered, in which the use of electrodes is rendered superfluous, namely, the Kjellin method of generating the heating current within the metal itself by induction. The inventor of this process has favored the author with the following particulars:

"The furnace consists of a circular trough, with brickwork sides and bottom and covered top. In the center of the circle is a square core of thin, soft iron plates, enclosed in a bobbin of insulated copper wire. The core projects above the furnace chamber and forms a rectangle which occupies, in relation to the furnace, the same position as one link in a chain does to another. The bobbin is connected to the poles of an alternating current generator.

The passage of the alternating current through the bobbin excites the iron core and induces an alternating current in the metal contained in the annular bath. Since the bath is situated in a single plane around the core, the strength of current is equivalent to that produced in the generator, multiplied by the number of coils in the bobbin. The tension, of course, varies inversely with the strength of the current.

In this way use may be made of a generator of high tension alternating current to produce in the furnace a low tension current of increased strength, and that too without the use of wasteful electrodes and large copper conductors.

Cleaning and Agglomeration of Ore Dust.

A concentrating and smelting plant at Niagara Falls makes use of the Ruthenburg processes, says the Iron Trade Review. The ore concentrated is a fine dust containing sand, which must be got rid of before it is a valuable product. The tailings are also valuable from the copper content. The first step in the process is to remove the sand. This is done by means of a magnetic separator, which consists of a revolving electromagnet driven on a horizontal axis by means of an electric motor. Over this is placed a metal apron which, on one side, leads to a bin of the concentrates, and on the other to a shallow trough into which the dust is fed. The dust is stirred and pushed along this trough by means of a conveyor. When the magnet is revolved, the magnetic particles of ore are attracted by it, and, as each pole approaches them, rise, stand on end, and then fall flat in the other direction, rising again as the next pole approaches. In this way, by a series of somersaults, they march up the metallic apron in a direction opposite to the motion of the magnet, pass over the top, and fall into the concentrate bin. This concentrator is said to be very effective in removing siliceous matter and phosphorous impurities. After concentration, the ore, being in a powdered condition, requires special treatment before it is suitable for the smelter. This is accomplished by means of the Ruthenburg electric smelter, which has been described recently. In brief, it consists of an electromagnet having two cylindrical parallel electromagnets, the poles of which are cylindrical and arranged side by side. These poles also serve as the electrodes for passing heavy currents through the magnetic ore as it is passed through them. The particles of dust form bridges across the poles, through which the current flows, partially melting them, when they become non-magnetic and fall into a receiver placed below, in the form of beads.

Copper sulphide is said to be soluble in yellow sodium sulphide, says a writer in a German chemical journal, the solubility increasing according to polysulphides present. In the assay of copper in tin ores, by fusion of the oxides with equal parts of caustic soda and sulphur, and the extraction of the fused mass with water, large quantities of copper are dissolved in the solution according to Prost and Van der Casteele; this amount varies from 3% to 64% of the total copper present. Rossing claims that the copper will remain entirely insoluble in the fused mass if a current of hydrogen be allowed to permeate through the mass while being extracted with cold water. The author claims it easier to add sodium sulphite from time to time to the boiling solution of the polysulphides until the liquid becomes colorless, sodium thiosulphate and monosulphide being formed. It is claimed this method gives accurate results in the separation of copper from lead and antimony ores.

The Practical Operation of Machine Drills.*

Written by E. M. WESTON.

To say that an 8-inch deep vertical hole, bored with a Star bit of 3-inch diameter in homogeneous rock, represented truly the work to be done underground would be a mistake, because most holes bored in mines are nearly flat or inclined 45° on either side of the horizontal. The difference in conditions in boring a nearly flat wet hole 7 feet long in "sticky" ground on an "upper" inclined only a few degrees from the horizontal, and a short vertical hole, is enormous. In one case the drill has little or nothing to retard its rotation or to cause sticking and test the machine's power of recoil; in the other the drill is working in a long tube filled with grit and water, often, when too little water is applied, becoming a stiff mass. In the case of a dry hole also the tube is half filled with stiff sand, causing great friction and retarding rotation and recoil. The shallow hole is bored with a star bit having 6 inches of cutting edge, while a large proportion of a deep hole may be advanced by a chisel bit with only 2 inches of cutting face. Again, in shaft sinking the recoiling power of the machine is severely tested to lift 8 or 9 feet of heavy steel from a deep hole.

All types of machines will sometimes rifle badly in one hole, while boring the next truly cylindrical, and I believe "rifling" is almost always due to faulty alignment of the drill in the hole, causing friction on one side or other of the cutting bit or the steel itself. Quite a large number of holes are bored thus, owing to various causes, and the best machine will bore a hole while "laboring" to a great extent. Sometimes this is due to inattention of the boys in charge, and often the mere loosening of gig bolt or clamp will at once increase rate of boring. At other times it is impossible, owing to lack of room, to move the machine to properly follow the hole.

No deduction drawn from the tests before referred to appear so contrary to practical experience as the alleged advisability of using air at 60 pounds pressure for underground boring in ground of the average hardness found in this district. In actual work nearly 40% more work can be done in a given time with the pressure at 80 pounds than at 60 pounds. I have often gone below and had difficulty in boring 3½-inch holes when the pressure was low; while in the same ground I could bore five holes when it rose to about 75 pounds. In West Australia I have seen 100 pounds pressure kept on the receiver when working in hard quartz; and as far as I can compare the difference in ground, the number of feet bored per shift compared favorably with that shown by the same machine here. I am of course aware that in some cases this pressure would be excessive owing to blunting and breaking drills and the trouble in securing bar and connections. It appears strange that more advantage has not been taken of the facilities for forming large and cheap air reservoirs in drives underground that would be of value also in freeing the compressed air from injurious oil and other impurities. The necessity of preventing leakage in the underground pipe circulation has always been insisted upon. I should like only to point out that a mistaken desire for economy may force the miners or pipe repairer to use really worn out piping and hose for connections. This leads to frequent stoppage to repair breaks, and to more or less constant loss by leakage. Hose and pipes showing signs of deterioration should be at once condemned for air service and taken out of the mine or used for lagging to ensure their not being again used. I also think plug taps should not be used below. My experience is that they are always either too tight to turn or leaking badly. The wheels of wheel valves are too liable to get lost or damaged and it would be an advantage to get a special type of these with a handle like a plug valve ½-inch square that can be opened and shut by a spanner. I shall not soon forget the experience of trying to turn one of the ordinary ones (whose wheel had been lost), by means of a spanner while clinging to the foot wall of a stope having an angle of about 10° from the vertical. I remember being struck by the maze of pipes and right angle bends in the air service of a Broken Hill mine, where the square set method of timbering caused difficulty in supplying the many floors between levels with air, and wondering what pressure a gauge set before each machine would show under the circumstances. Conditions here are not so bad, but elbows are often seen put in where bends should have been insisted upon. The need, however, of a periodic test with a pressure gauge at each working face in a mine seems apparent from the following incident.

During one month the air pressure in our stope was good, during the next we could make no progress, and not being able to find a cause we put it down to something wrong with the compressor. Finally it was discovered that a stone had lodged in an old stop valve in the pipe line along a level some distance from our working face. In mines there is always a possibility of something of the sort happening, and I think in some mines surprising falls of pressure in some places might be detected by means of a gauge test at regular intervals. Some pipe men and their Kaffir assistants have a bad habit in making joints. When it is necessary to join up two pipes by means of a coupling having right and left handed threads a washer of rubber packing is inserted to stop leakage. I have seen this put in a 2-inch or 1½-inch pipe with a hole barely 1 inch diameter and cut in the center. This must greatly increase pipe friction to the passage of air.

In many quarters the advantage of using the longest possible holes in large stopes has been recognized. Mines may, I think, still be found where the same steel is served out for stoping as for development in drives, where a hole about 6 feet long is generally used. It is the starting, and the first foot or two of hole, that occupy the time in boring. It might be worth while to inquire what is the most economical length of hole to be used in stoping over 42 inches high. We must remember that in big stopes in average ground it is seldom possible to bore more than four, or at times five, holes to advantage from one bar. Indeed many miners decline to bore more than four holes in a shift. It is a loss of time to take down machine arm and bar and rig again. The shift is from 9½ to 10½ hours long, and holes must usually

*Abstract Jour. Chem. Met. & Min. Soc., S. A.

Some Important Minerals.

There is a constant inquiry as to the properties, value and production of a number of minerals produced in the United States. The following tabulated statement will give this information in condensed form. Here is given the composition, value, color and production of the most important minerals produced in the United States in 1904:

ELEMENT.	Metal Value.	Principal Ores.	Approximate Analysis.	Per Ct.	Color Powdered Mineral.	Production 1904 Quantity.	Value.
ALUMINUM	$ .34 lb.	Bauxite	Alumina	74	White Gray	4142 tons	$ 2,477,000
			Water	26			
ANTIMONY	.08 lb.	Stibnite	Antimony	72	Gray to Black	3057 tons	505,524
			Sulphur	28			
ARSENIC		Orpiment	Arsenic	61	Lemon Yellow	Oxide 36 tons	2,185
			Sulphur	39			
		Arsenopyrite	Arsenic	46	Black		
			Sulphur	19			
			Iron	34			
BORON	.10 lb. Powdered	Colemanite	Boron	25	Colorless or White	Crude 45,647 lbs.	698,810
			Calcium	19			
			Water and Ox				
BROMINE		Sodium Bromide	Sodium	22	White	897,100 lbs	269,130
			Bromine	78			
BISMUTH	2.10 lb.	Tetradymite	Bismuth	52	Gray		
			Tellurium	48			
		Bismutite	Bismuth, Ox	88	Greenish Yellow		
			Carbonic Acid	07			
CADMIUM	1.00 lb.	Greenockite	Cadmium	79	Orange Yellow		
			Sulphur	21			
CHROMIUM	.80 lb	Chromite	Iron		Dark Brown	123 tons	1,845
			Chromium	52			
			Oxygen				
COPPER	.15 lb.	Chalcocite Covellite Bornite Chalcopyrite Cuprite Tenorite Malachite Azurite	(Copper glance) (Indigo) (Peacock) (Pyrite) (Ruby) (Black) (Green) (Blue)		Copper contents from trace to 88%.	812,537,267 lbs.	105,629,845
FLUORINE		Fluor Spar	Calcium	51	Pink Yellow	36,452 tons	234,755
			Fluorine	49			
		Cryolite	Sodium	33	Green White		
			Aluminum	13			
			Fluorine	55			
GOLD	20.67 ounce.	Native	Various Alloys		Yellow	4,090,176 oz	84,551,300
		Sylvanite	Gold	25	Steel Gray		
			Silver	15			
			Tellurium	56			
		Calaverite	Gold	45	Brass Yellow		
			Tellurium	55			
			Silver				
IRON	19 00 ton	Magnetite	Iron	70	Black	Pig 16,497,033 tons	233 025,000
			Oxygen	30			
		Hematite	Iron	72	Indian Red		
			Oxygen	28			
LEAD	.04 lb	Galena	Lead	86	Grayish Black	Metal 397,000 tons	26,402,000
			Sulphur	13			
		Cerussite	Lead Oxide	83	White		
			Carbonic Acid	16			
MANGANESE	2 75 lb.	Pyrolusite	Manganese	63	Black	Ore 3,146 tons	29,466
			Oxygen	37			
MERCURY	75-lb flask 4 0 00	Cinnabar	Mercury	86	Red Vermilion	34,570 flasks	1,503,795
			Sulphur	14			
MOLYBDENUM	2 75 lb.	Molybdenite	Molybdenum	60	Grayish Black		
			Sulphur	40			
NICKEL	.45 lb.	Niccolite	Nickel	44	Brownish Black	24,000 lbs.	11,400
			Arsenic, etc	56			
		Gersdorfite	Nickel	35	Black		
			Arsenic	45			
			Sulphur	20			
COBALT	Nickel and Cobalt are generally found together.						
SILVER	.60 ounce	Argentite	Silver	87	Blackish Gray	53,603,000 oz.	Coining value 69,303,319
			Sulphur	13			
		Pyrargyrite	Silver	60	Dark Red to Black		
			Antimony	23			
			Sulphur	17			
		Cerargyrite	Silver	75	Pearl Gray		
			Chlorine				
		Argentiferous Galena	Silver		Grayish Black		
			Lead				
			Sulphur				
TIN	.30 lb.	Cassiterite	Tin	78	Brown to Black		
			Oxygen	22			
		Stannite	Tin	27	Black		
			Iron	13			
			Sulphur	29			
			Copper	29			
TUNGSTEN	1.25 lb.	Wolframite	Iron Oxide	19	Black		
			Manganous Ox	05			
			Tungsten Ox	76			
		Scheelite	Calcium Oxide	19	White Brown Green		
			Tungsten Oxide	80			
URANIUM	3.50 lb.	Uraninite	Uranium	81	Brownish Black	Uranium & Vanadium 45 tons	10,600
			Oxygen	13			
ZINC	.06 lb.	Sphalerite	Zinc	67	Brown		
			Sulphur	33			
		Zincite	Zinc	80		186,702 tons	18,670,200
			Oxygen	19			
PLATINUM	20.50					200 oz.	2,600

be fired every shift. If, then, the miner is provided with steel that allows him to bore a hole no longer than 6 feet, it may often happen that he has finished his four or five holes, say 1½ hour before it is time to blast, when half an hour would be the time required to pull down machines and load up. Hence there is an hour's time wasted, which might have been profitably employed lengthening each hole. We would say, then, that the most economical hole is of such a length that four such holes can be bored on one bench, the machines removed, and the holes loaded and fired during one shift. This length may be anything from 5 feet to 10 feet, depending on the air pressure available, hardness of ground and facilities for working. For work in narrow stopes with small machines many consider that holes of 5 feet are as long as can be advantageously used. Holes 6 feet to 7 feet long can, however, be successfully used in such cases. It is possible to finish the hole with a chisel of ⅞-inch diameter, steel 8 feet long. This can be used even with a 2¾-inch machine in ordinary ground with air at 70 pounds pressure. I think it advantageous to use steel of different sizes for different lengths of chisels, as it is easy even in hard ground to get three chisels to follow one another if they are made of 1½ inch, 1 inch and ⅞ inch octagon steel, respectively. It is, of course, possible to make such a series from 1 inch steel, but in actual work the other arrangement guards against any mistake being made in sharpening, and allows a large shoulder margin on the cutting bit of the last chisel. Such details may appear trivial, but I know of one case here or elsewhere where such a method would have effected a great saving. A useful set of steel for 2¼, 2½ or 2¾-inch machines where the ground does not allow a longer hole being used is as follows: Starter, 2 feet long, 2½ inches face, star bit; chisel, 3½ feet long, 1⅜ inch bit, of 1⅛ inch steel; chisel, 5 feet long, 1⅜ inch bit, of 1 inch steel; chisel, 6 feet, 1⅛ inch bit, of ⅞ inch steel. Measurements are "more or less." The relative merits and defects of star and chisel bits applied in rock drilling deserves discussion. Compared with chisels, star bits have the advantage that in hard ground the wear on the cutting edge is halved for the same distance driven, and that the four shoulders opposed to wear allow a longer distance to be driven on a smaller difference of gauge between following drills. In ground full of heads and fissures in stoping or shaft sinking they will put down a hole where a chisel would certainly stick. They are, however, relatively heavier and oppose more resistance to turning, and in some grounds do not bore so quickly as a chisel bit. To what extent their use is advisable must depend on the circumstances of each particular case.

An objection to using ⅞ inch steel often urged is that it is impossible to get 1½ inch gelatine to the bottom of the hole, and that the last portion of the hole is thus rendered useless; while to do advantageous work the explosive should be concentrated in the bottom of the hole. Devices have indeed been proposed for enlarging the bottom of hole. If the direction of a stope hole is attended to this would be needless, and the smaller quantity of explosive in the end rendered effective in many cases.

Some notes on experience gained while working in large and small stopes on the Central Rand may illustrate this and other points. Firstly, the question as to the number of feet of working space advisable to allow to one machine deserves discussion.

We were usually working three machines on a face of 160 feet long. This I consider too crowded up for the best work. Each machine should be given 70 to 80 feet of space in a small stope, and 100 feet in a big stope where long holes are used and where there are many pillars to cut round. When we were able to work three machines on two faces east and west of a winze, we considered we could break from 3 to 6 fathoms more in a month than when we had to keep to one face. These figures refer to stoping when the whole round of four to six holes bored are not all loaded and blasted at the end of the shift. This, of course, is never done now where good results are expected; as the only proper system to use is that one miner loads and fires the front holes he has bored and the back holes left by his partner on his "bench," and he leaves his back holes in turn to be blasted by his partner. In this system the failure, if any, of the front holes to explode or "come" does not involve wasting the charge in the back ones. The reason a machine requires lots of face room is that it often happens that a "round" of holes may not have come well, leaving an awkward bench to bore, or one too narrow to make it worth while to put four or five holes in; while the time may not allow of boring three holes there and setting up again and boring elsewhere. When there is lots of room, however, another bench may be brought down to enlarge or deepen the poor one, and no time lost in setting up for a poor shift's work. If one could ensure that each time a machine was set up it had a face before it on which it was possible to bore a full "round" of holes to the best advantage and break a maximum area of ground, the efficiency of rock drilling would be so increased as to make it cheaper than hand stoping in stoping any width. To attain this ideal is perhaps impossible, owing to various causes; but it can be approached by giving machines lots of room. It would also be a great advantage in machine stoping if the miners were given the services of a few hammer boys whenever they required them. For instance, it often happens that there is a bench as shown in plan in Fig. 1 The machine A can bore a

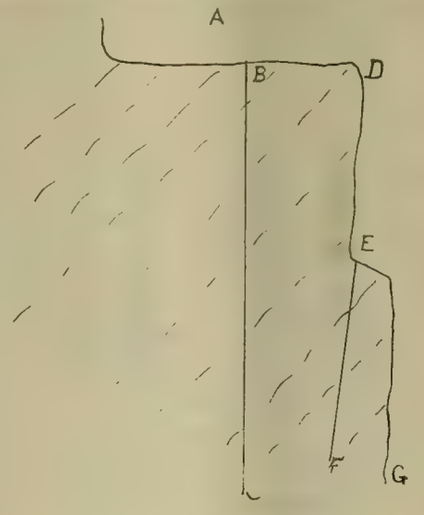


Fig. 1.

long hole; but the shape of the face B D E G makes it quite useless to put in a long hole, as the "toe" of rock E F G would prevent the bottom portion "coming." If, however, a hand hole or holes E F were put in and fired first, the hole B C would come out perfectly, and a bench 3 or 4 feet deeper could be taken out. It is obvious that it would not pay to set up a machine to bore E F alone.

In stoping, the direction of the hole in relation to the face is of vital importance. It is only by using the utmost care in alignment that long holes can be effectively used, and as many miners either do not know enough or won't take the trouble to do this, they prefer short holes. A very slight error in the direction of a hole will be the cause of its not breaking. Even in stopes worked by good miners it may happen that a considerable percentage of holes do not break well, either owing to unforeseen heads in the rock or to the tendency there is when on contract to put the last inch of ground on a hole and to make the hole "look in." This latter tendency is very noticeable in hand stoping where right handed boys have to work on an east face of a stope, and an examination of that side will always show a greater percentage of useless holes than a west one. For this reason, whenever it is practicable, boys should be kept working on west faces and machines on east faces.

Where the burden on a hole is small in comparison to the height of face, the direction of a hole is not of so much importance, but as the length of hole and the burden increase in proportion to height of face, the importance of a true direction increases. Looking at Fig. 2 and comparing the plan of the holes A,

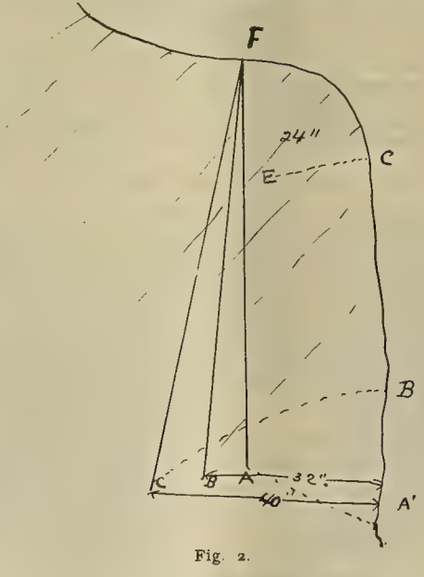


Fig. 2.

B and C, say 6 feet long, bored in a face 40 inches high, A when bored exactly parallel to the face A′ B′ C′ D will "come clean," bringing out the ground to A′ B will "come;" but will leave a foot of stump and break the ground to B′. C will do no good at all, the force of the explosion merely tending to form a volcano and break the ground near the mouth to C′. It is a question whether this would occur were the explosive concentrated at C, B and A; but the charge fills up between 2 and 3 feet of the hole. With high explosives the detonation and liberation of the gases is so sudden that the effects are localized, and so far as my experience goes, practically every cartridge has to be responsible for the shattering of the rock in front of it. If, then, an explosive cartridge at A, B or C is given more burden than another nearer the mouth of hole, and fails to move the rock in front of it on the first shock, its gases merely aid those higher up to break out, or they escape where the rock is already fractured. Machine holes in narrow stopes sometimes tend to "bull ring," i. e., break out at the bottom and leave the portion of rock round the mouth of hole, as E C′ D F. Where we expected this to happen—as in the case where, owing to difficulty in pitching the hole, it was impossible to give a 6 foot hole more than 15 inches or 18 inches of burden on a 38-inch face—we spread the charge as much as possible along the hole and so did not mind using ⅝-inch steel and boring with small bits. We used to place a few cartridges of ⅞-inch gelatine in the bottom of the hole, then 6 inches or 9 inches of sand packing in a paper cartridge, then insert a 1¼-inch cartridge and packing alternately until the hole was full to within 18 inches or so of collar. To do this takes time and trouble, and so again many miners prefer a short hole where the charge can be placed right at the bottom without trouble. Many miners fail to arrange their stoping holes in a rational way in relation to each other. The general plan is to put in the four, with two on top and two exactly below the others, and to load them with the same charge. I have seen a skillful miner put in two holes in a narrow stope, with about 24 inches "burden" on each, one being exactly below the other, and he placed five or six large cartridges in each. What happens in such a case is that the hole exploding first tears nearly all the burden off the other one, and one charge is mostly wasted. Holes should, when possible, be placed in zigzag order. In stoping a wide reef of 5 feet or over this is not always possible; as to get a sufficient burden on the back holes the machine has to be moved from the end of the arm on one side of the bar to the end of the arm on the other side. In that case about half the charge in the holes exploding last of the pair will be sufficient.

(TO BE CONTINUED.)

THE PROSPECTOR.

The mineral and rock specimens from Portland canal, Bear river, Alaska, are: No. 1, a felsitic dike rock, throughout which are scattered veinlets of iron and zinc sulphides. No. 2, diabase. No. 3, quartz containing much iron sulphide (pyrite), and should be assayed for gold and silver. No. 4 consists largely of barite (heavy spar), with sulphides of iron and zinc. A small amount of calcite is present. No. 5 is quartz containing a high percentage of granular iron sulphide and a small amount of copper sulphide. Arsenic is also present in this ore. No. 6 is composed largely of zinc sulphide in a gangue of spar. No. 7 is tennantite, a compound of antimony, copper, zinc and sulphur, with chalcopyrite. No. 8 is principally bornite (copper sulphide), with chalcopyrite, the latter also a copper sulphide, but of lower grade than the former. No. 9 is an amorphous sulphide of iron and zinc. No. 10 is a soluble sulphate of aluminum and magnesia, occurring as an efflorescence as the result of the action of sulphuric acid (resulting from oxidizing sulphides) upon the alumina and magnesian minerals in the rocks.

The mineral samples from Surprise valley, Modoc county, Cal., are much decomposed and in part iron-stained quartz porphyry, and may contain gold.

Of the two samples from Mineral Park, Ariz., the smaller one (No. 1) is flint. No. 2 is evidently from a dike and consists chiefly of quartz and feldspar. It contains some fine iron sulphide, a trace of copper sulphide and a little zinc sulphide. On one side is a scale of molybdenite.

The sample of material from Pearce, Ariz., is not mineral. It is pine gum with some remnants of bark, in which the tannin is still a prominent constituent. That which appears to be a deposit is evidently a fallen pine tree, the woody portion of which has long since decayed, leaving the resinous gum and fragments of the bark.

The samples from Lowrey, Tehama county, Cal., are: No. 1, altered greenstone containing pyrite and chalcopyrite. No. 2 is bornite, with a little quartz.

The rock from Elk City, Idaho, is apparently a much altered intrusive rock, consisting principally of quartz and feldspar. It contains a large amount of finely disseminated iron sulphide. It is not a typical rock of any class.

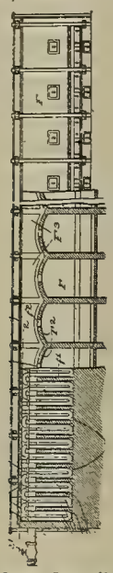
The minerals from Ibapah, Utah, are: The transparent crystals, topaz; the two larger crystals are silicate of aluminum, but are evidently pseudomorph after topaz, and are most unusual. The small tabular black crystals are illmenite (titanic iron). The light green mineral is jadite, a metasilicate of sodium and aluminum.

Mining and Metallurgical Patents.

PATENTS ISSUED OCTOBER 17, 1905.

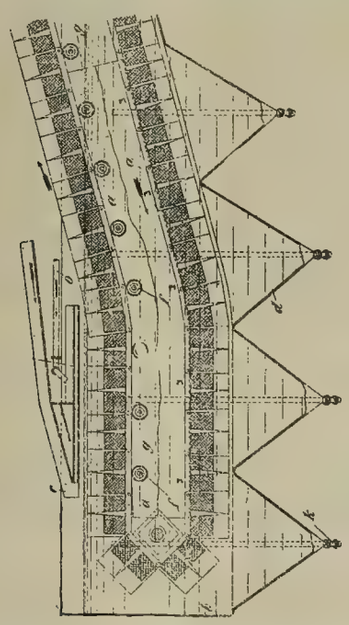
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

REHEATER FOR FURNACE GASES.—No. 801,318; H. Howard, Brookline, Mass.



In apparatus of class described, row of roasting furnaces, reheating chamber contiguous thereto, heated by conduction of heat from burning ore, two inclosed and continuous conduits extending longitudinally above reheating chamber, for passage of purified, cooled gases, and plurality of reheating units connected in parallel with conduits and extended into reheating chamber, whereby cooled and purified gases pass from one to other conduit through units, to be reheated thereby.

METHOD OF AND APPARATUS FOR TREATING COAL, ORES AND OTHER MINERALS FOR DRAINING THEM OF WATER.—No. 801,204; F. Baum, Herne, Germany.

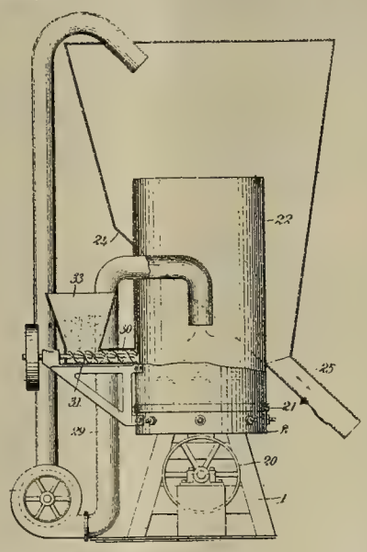


Method of treating washed coal and like for draining water therefrom, which consists in charging washed coal into draining buckets of transporting belt by causing it to descend through quiescent body of water in which buckets are immersed at one point of travel whereby the coal is deposited loosely in the buckets so as to facilitate subsequent drainage, washing water accompanying coal being at same time clarified in body of water by settlement of sludge therefrom, and deposited sludge being conveyed from body of water into buckets after these have received charge of coal while clarified water is conveyed back to washing apparatus.

PROCESS OF EXTRACTING TIN FROM TIN SLAG.—No. 801,290; C. A. L. W. Witter, Hamburg, Germany.

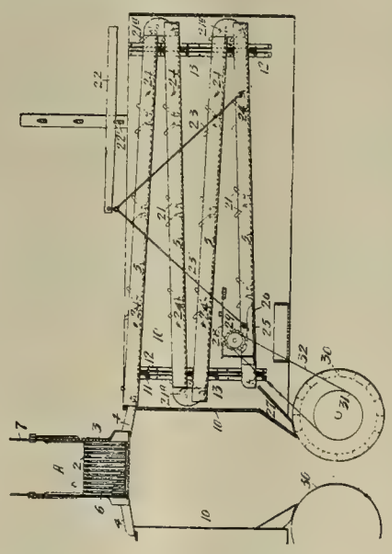
Process of treating tin slags containing iron, which consists in smelting them in presence of plumbiferous material and sulphur.

PULVERIZING MILL.—No. 801,572; J. H. Davis, Glens Falls, N. Y.



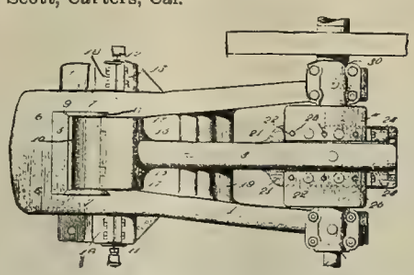
In pulverizing mill, outer support, annular die mounted in support, rotatable support also mounted in outer support, means operated by centrifugal force, due to rotation of rotatable support co-operating with die, for pulverizing material passed through mill, stationary casing extending above and surrounding pulverizing means, casing being open at top, means for directing blast of air downward toward center of pulverizing means, second stationary casing surrounding upper part of first casing, second casing being closed at top and having inclined bottom with chute attached for leading pulverized material out of mill, and suction pipe connected with top of second casing for removing dust in casing and directing it into blast for revolving member.

GOLD-SAVING APPARATUS. — No. 801,968; J. A. Clark, Yankee Hill, Cal.



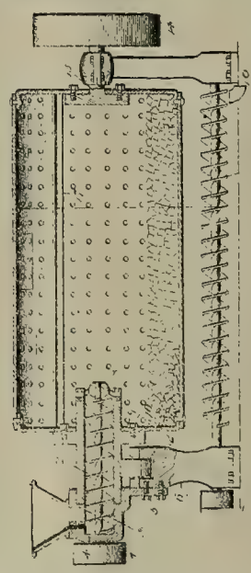
In gold-saving apparatus combination with sluice box, and grizzly in bottom thereof and comprising plurality of spaced bars extending in direction of current flow, and hinged closure for grizzly closure normally pendent beneath grizzly and including bars extending in direction of current flow and adapted, when closure is moved upwardly about hinged connection, to close interspaces between bars of grizzly whereby flow of current is diverted, means for raising and lowering closure and means for holding closure in closed position.

ROCK CRUSHER AND PULVERIZER.—No. 801,921; A. Scott, Carters, Cal.



Crusher comprising stationary crushing member, rocking crusher head, integral lever projecting outwardly from crusher head, crusher head being pivoted at point adjacent to stationary crushing member, gyrating bearing box mounted outside lever and below same, said lever being formed with vertical web and horizontal flanges projecting therefrom at lower edge forming broad bearing having movable engagement with gyrating bearing box, and cam member for operating gyrating bearing box.

MACHINE FOR GRINDING.—No. 801,854; W. and F. Dorey, Gananoque, Canada.

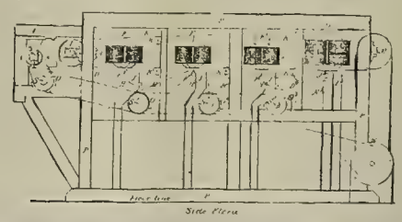


In grinding machine, combination with revoluble vessel having tubular piece secured to one end thereof and extending well within vessel, tubular piece mounted upon roller bearing, detachable bracket secured to support having tubular portion of same bore as tubular piece and carrying means, for feeding material to vessel, which extend through tubular piece.

APPARATUS FOR MINING.—No. 802,349; R. Baggaley, Pittsburg, Pa.

Apparatus for mining comprising passage other than mine shaft extending from surface of ground, tube therein for passage of filling material, and gated receiving hopper beneath tube.

MAGNETIC SEPARATOR.—No. 801,947; J. P. Wetherill, South Bethlehem, Pa., and H. A. J. Wilkens, New York, N. Y.



Magnetic separator for materials of low magnetic susceptibility, comprising series of magnets having highly concentrated magnetic fields, series of feed belts for several magnets respectively, feed belts discharging one upon other, receiver for heads in proximity to concentrated field of each magnet, and cleaner belt running past magnets in same general direction as feed belts.

In Nova Scotia.—III.*

Written for the MINING AND SCIENTIFIC PRESS by T. A. RICKARD.

The five fundamental occupations of man are agriculture, fishing, mining, forestry and the chase. Those who live far from tide-water may wonder occasionally why so much fuss, even to the point of diplomatic rupture, is made over the fishing rights off Newfoundland, Nova Scotia and the Great Lakes. A ton of gold ore outweighs a quintal of codfish, but the difference in value is not always one way. The fisheries of Nova Scotia (with a total population of half a million) make an annual output that is sold for $8,000,000; while the lumber, chiefly exported as "deal" to England, is valued at $20,000,000 per annum. These industries push the mining for gold into a subordinate place.

An Outcrop near Axis of an Anticline, Dip is to the North, Cleavage is South to the Left. In Nova Scotia.

The scenery of a country is largely determined by the underlying geologic structure; the soil, the drainage, the height of land, the sculpturing of frost and snow, the softening touch of atmospheric erosion are all traceable to the character and distribution of the prevailing rocks. In the region where gold mining flourishes in Nova Scotia, the prevailing formation consists of highly altered slate and sandstone of great geologic antiquity. These rocks are assigned to the Cambrian period, although, in the absence of the safe evidence of fossils, it is not certain that they are not pre-Cambrian, that is, Algonkian. The area they cover is estimated at 8500 square miles, representing the seaward half of the Province, their strike being roughly in agreement with the longer axis of the peninsula. Of this 8500 square miles, about 40% is occupied by masses of granite, which has intruded through the Cambrian sediments and underlies them. The distribution of these bosses of granite is shown on the map accompanying this series of articles, where it is apparent that the main body of granite is in the northwestern part of the mining territory.

In the eastern regions the houses stand in the valley, under the protecting shadow of the hills. In the west they are usually on the hill top; one might argue that in this case the owners were more fond of scenery or that the winds of that part of Nova Scotia were less severe; but the difference is due to geologic conditions. In the west glacial drift still crowns the ridges, the bedrock has not been bared, there is more soil. Much of the configuration is due to the position of glacial moraines; the lakes are frequently made by bars of drift, and marshes have been developed by the same cause. The granite especially is dotted with small lakes due to cup-like erosion. The main watershed runs northeast and southwest, and in running to the Atlantic the streams have but little grade, the height of land being only 500 feet, therefore they form linked patches of water, often held back by the debris left by the ice in its passage southward.

Between the Intercolonial Railway and Caribou there is an overlapping tongue of Carboniferous limestone; this marks the course of the Musquodoboit valley. The limestone has been eroded to rounded ridges with smooth slopes, making a neat landscape, diversified by hillocks surmounted with clumps of spruce and fir. In crossing from Country harbor to Antigonish the road traverses the Carboniferous and Silurian formations. The rocks of the latter are maroon colored sandstones, yielding a red soil and a richer vegetation.

In the gold-mining region one finds a succession of low ridges, a billowy land, without anything mountainous, wooded throughout and dotted with lakes connected by small streams which, as they approach the shore, expand into long estuaries. The Cambrian rocks are tremendously contorted, forming sharp anticlinal and synclinal folds. The compression they have undergone has developed a decided cleavage in the slate and has metamorphosed the sandstone into a hard quartzite. Many of the ridges are anticlinal crests. Bold escarpments frequently exhibit precipitous faces coincident with the cleavage, the bedding of the apex being flat. Where the cleavage is highly developed and vertical, it is well to look for the top of the saddle, for the planes of cleavage usually radiate toward the anticlinal axis. The quartz lodes are also found following the bedding planes for a couple of thousand feet on each side of the anticlinal axes. The valleys often follow lines of fault, thus, the estuary of Isaac's Harbor follows a fault (estimated by E. R. Faribault to have a throw of 1200 feet) for a distance northwestward of 4 miles and then passes up Branch brook toward the inlet of Country Harbor, until finally it cuts into the Carboniferous rocks, which it also dislocates.

No description of the region can proceed far without reference to the evidence of glacial erosion. Nova Scotia proper has no mountains. The highest land is about 600 feet above the sea. No rock mass has been strong enough to survive its lordly summit and snow-crested range; there are no proud peaks to throw their long shadows over dark ravine and sunlit plain, all such sculpturing of the earth's surface has been obliterated as by a ruthless hand; there remains only the basal wreck, not without beauty, clothed with forest, glad with lakes that give back the azure of the sky, but nevertheless disciplined and tamed from the larger contours of an earlier geologic period. The marks of the ice age are everywhere to be seen, the rocks are striated and glacial drift is scattered far and wide. The transport of rock is most marked in the case of the granite, boulders of it being found 20 miles from their nearest possible source, as at Bridgewater. The striæ run nearly due north and mark the general direction of movement southward; but local variations due to the topography are not infrequent. In considering the comparative freshness of this writing on the rock, of the grooves cut by the stone pulled forward under the advancing mass of ice, one is impressed with the extreme slowness of geologic action. These marks were made fully 10,000 years ago, and yet the effects of atmospheric erosion, of snow and sun, of wind and rain, have not sufficed to rub them out, although they never were deeper than an inch. No wonder the geologist asks for a blank check on time. These inch deep marks have survived 10,000 years, and yet the very rocks on which they are graven were at one time, on indisputable evidence, overlaid by several

Goldenville, Showing Old Workings.

Mouth of Indian Harbor, Nova Scotia.

Wine Harbor, Nova Scotia.

*See illustration on front page.

miles of sediment, all of which have been eroded and removed to the depths of the sea.

Incidentally, it is interesting to note that glacial action has robbed Nova Scotia of her alluvial gold deposits. The erosion of the Cambrian series must have yielded large accumulations of gold-bearing gravel, for these rocks are full of small seams of quartz containing gold. At the time of the first discovery of the veins, it was indeed supposed that important alluvial deposits would be found; when these did not become visible, it was supposed that they lay buried in the marshes and lakes. Attempts were made to drain some of these, but without profitable result. The patches of glacial debris, containing fragments of gold quartz, gave rise to false hopes until it was recognized that the region had suffered extreme denudation. The surface has been scoured by the ice, and the loose material which once lay upon it has been swept into the Atlantic ocean, where it will form the gold-bearing agglomerate of a geologic to-morrow.

Placer Mining in Alaska.*

NUMBER XII.—CONCLUDED.

On the Snowflake claim, a bench claim, worked by drifting, situated between Anvil and Dexter creeks, much of the gold sluiced from the winter dump was porous, occurring in lumps one thirty-second to one-fourth inch in diameter, resembling dentist's gold.

A peculiar riffle shown in Fig. 24 was devised, consisting of sawn blocks nailed to riffle strips.

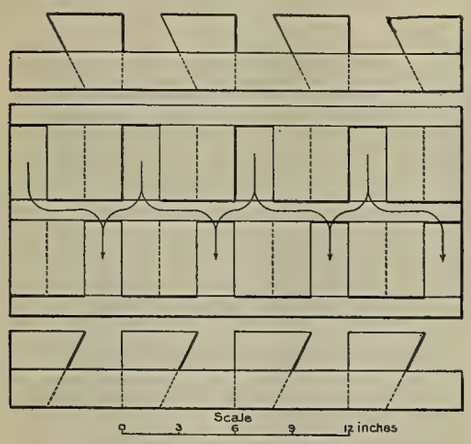


Fig. 24.—Special Block Riffle.

This riffle used on 14-inch boxes, on 8-inch grade, with 50 miner's inches of water, was said to be the only one of many tried which would catch this gold.

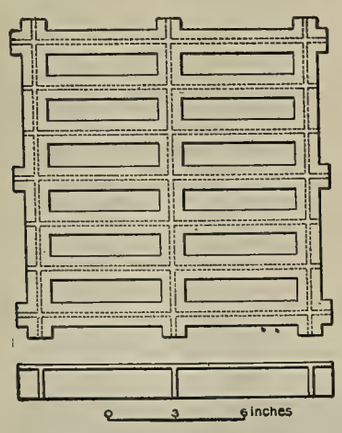


Fig. 25.—Iron Grate Riffle.

Fig. 25 shows an excellent iron riffle used in the smaller sluices of Seward Peninsula for saving gold of average fineness. The castings are light, can be easily handled, and can be set in the sluices so that the long dimension of the slots lies either transversely or longitudinally. The longitudinal arrangement has been found to be the better.

The use of quicksilvered copper plates is not likely to give increased saving to Alaska placer operations. Blankets, mats, or other fabrics are not generally used on account of their expense. H. W. Young has designed for the Waiwhero Sluicing Co., of New Zealand, a form of apparatus for the saving of fine gold which is used in New Zealand beach deposits where the gold is accompanied by an excessive amount of black sand. A few of Mr. Young's remarks are here quoted:

"The modern fine gold washing plant, as used on the West Coast, consists of three main essential parts. The first is the hopper box with stone shoot, which receives the water and gravels from the tailrace connecting with the sluicing face, and separates the stones and shingle from the water and sands. The second comprises the 'sand box' or 'boil box,' with its discharge ducts and other accessories, intermediate between the hopper and the tables. The third comprises the washing tables and their accessories. The three essential parts deal with the stuff from the face, and reduce it to concentrated gold and heavy sand ready for amalgamation."

The introduction of a sand box or agitation box, in which the material is kept in agitation by being made to pass over and under a system of baffle boards before passing to the tables, as described by Mr. Young, is of obvious advantage in connection with the plant described. The principle will undoubtedly be of use in some of the washing plants of Alaska, as it provides a moderate stirring action without the use of mechanical power. The quantity of water economical for a plant such as the one described, with material screened to seven-sixteenths inch size on the tables with a grade of 12 inches to 12 feet, is in the proportion of 40 miner's inches to each 10 feet of width of table. As at Oroville, the value of separate ducts from the feeding or sand box to each table has been proved.

The clearing of the gold from the accompanying minerals of high specific gravity is often difficult. In the creek workings on Bonanza creek, Klondike, for example, of the total weight of gravel handled, 1% of black sand, mostly magnetite, is caught with the gold in the cleanup. In American creek, Alaska, the cleanups are impeded by the presence of large quantities of barite pebbles. In the Fairbanks district red garnets and rutile, in some cases in quantity up to ⅓ of 1% of the total material washed, are caught with the gold. In the Birch creek district there is enough rutile in the auriferous sand to cause trouble in the cleanup. In Seward Peninsula the magnetite is in comparatively small amount. Garnets occur in the creek diggings up to 5 pounds to the cubic yard of gravel. In the beach and so-called "tundra" gold sands of the coastal plain from 3% up to as high as 61% of garnets occur.

The use of quicksilver in the northern operations of America is limited. Even allowing for the extra expense and time consumed in the use and recovery of quicksilver, it is surprising that this important agency for saving fine gold is not more generally employed. It has been shown that the proportion of fine gold in the interior fields is large. The neglect to use quicksilver in attempting to save such gold can be considered only as a penny-wise pound-foolish policy. It is needless to say that in all of the appliances above suggested for the saving of fine gold the use of quicksilver is imperative. Carelessness in the use of quicksilver, however, may result in increasing rather than diminishing the loss of fine gold. According to Bowie, float quicksilver containing microscopic gold particles has been taken from the surface of the water 20 miles from the place where the amalgam entered the stream. A single flask of quicksilver is ample for the needs of the average creek operation of the Klondike or interior Alaska, and even with wasteful handling would last a season.

Whether quicksilver is used or not, it will be found advantageous to get the gold and amalgam as clean as possible on the floor of the sluices or tables before removing the valuable product. The comparatively small amount of heavy concentrates accompanying the creek gold of Seward Peninsula makes this possible in the frequent cleanups of the tailrace. Skillful manipulation will accomplish the same result in the interior except where excessive quantities of magnetite occur. In one case on Bonanza creek, Klondike, the fine concentrates which could not be removed with the magnetite after drying were skillfully separated by dry-panning.

Black sand or other concentrates have occasionally been found rich enough to pay for sacking and shipping to smelters after cleaning. Exaggerated reports of high assays in gold obtained from black sand frequently find credence. Nevertheless, whenever this concentrate accumulates in the sluices or tables in any considerable amount, it should be sampled and assayed to ascertain the amount of finely divided gold which still remains in it.

CLEANING, RETORTING AND MELTING.—If amalgam is to be treated, it should be well stirred, either in buckets or large porcelain mortars, and the base material—sand, scraps of iron, etc.—which comes to the surface should be skimmed off.

"This residue (which holds considerable amalgam) is concentrated by washing in pans or rockers, and the concentrations ground in iron (or porcelain) mortars and treated with more quicksilver. Any base material which floats on the surface of the bath is melted by itself to a base bullion. The remainder is added to the fine amalgam. The amalgam is strained from the quicksilver through drilling, and the dry amalgam is retorted in iron retorts."

In cleaning the placer gold, when no quicksilver is used, a magnet inside a cotton sack passed through the dust will remove all the magnetite. Minerals of high specific gravity not attractable by the magnet are not easily removed by mechanical means. Rutile, garnets, and ilmenite are examples of these occurring in Alaska. In small operations the gold dust is roughly cleaned from these minerals by blowing and dry-panning. Where the amount of gold is considerable, a melting plant is advisable. In retorting amalgam, small hand retorts will in general be found adequate.

"Before the amalgam is put in the retort the interior is coated with a thin wash of clay, which prevents the amalgam from adhering to the iron.

"The amalgam should be carefully introduced and evenly spread. The iron pipe which connects the back end of the retort with the condenser must be clear of all obstructions, and under no circumstances should the amalgam be spread so that the pipe can possibly become choked, as in that case an explosion would probably ensue.

"To avoid any danger arising from this source after the cover has been put on, lined with either clay or a mixture of clay and wood ashes, and securely clamped, the fire is lighted and the heat gradually raised, a dark-red heat being all that is necessary to thoroughly volatilize the quicksilver. Toward the end of the operation the heat is raised to a cherry-red color, at which it is kept until distillation ceases. The retort is allowed gradually to cool, and when cold is opened."

A stream of cold water should be always flowing through the jacket which incloses the condensing pipe, so that by no possibility can mercurial vapor pass into the receiving vessel in which the lower end of the pipe terminates. The discharge end of the pipe should be kept under water during the retorting operation.

When gold accumulates in sufficient quantities to make the shipment of the dust inconvenient, the metal may be melted on the ground and molded into bricks. Both for convenience of shipment and facility in guarding against losses, this practice is to be recommended. A brief description of the essential features of this work follows.

In melting, a gasoline 2-jet furnace may be used. Gasoline under a pressure of 30 pounds enters a heating coil attached to the burner. The heating coil is so arranged and fed that liquid gasoline burning on the outside of the main feed vaporizes the gasoline which is used within the furnace. With the 30 pounds pressure used a very hot flame is the result. The gasoline supply should be stored without the building and brought in through pipes, so as to reduce the danger of explosion. An air barrel connected with the supply line and supplied with a small hand pump serves to keep the gasoline pressure as high as may be necessary. The furnace is made of sheet iron and lined with fire brick. A cover of asbestos and iron serves to retain heat. This should be so constructed as to allow the bolting on of new iron plates, as they burn off with the great heat generated. The operator should be supplied with asbestos gloves.

Crucibles are of various sizes. A No. 30 crucible, costing between $2 and $2.50, will hold from 900 to 1000 ounces of impure gold or bullion with the necessary fluxing charge. They are composed of fine clay and graphite, and to prevent breaking certain precautions should be observed. A new crucible should stand near the furnace, at least during two melts, and when first used should be heated gently. This precaution is not necessary when a crucible has once been used. After a crucible has been used five or six times it can not be depended on and it would be economy to discard it, as breaking during a melt is a source of great inconvenience and loss of time.

It is necessary to have an iron table near the furnace, upon which can be placed gold pans, shovels, tongs, etc.

Before the gold is placed in the crucible it should be accurately weighed and cleaned with a magnet, as above described.

In melting 900 to 1000 ounces, three-fourths of a pound of borax should first be melted in the crucible as a flux. After the dust is poured in, one-fourth pound of soda with one-half pound of borax should be placed on top. The soda unites with the silica of the sand, but in perfectly clean gold is not needed. The borax unites with the iron occurring with the gold. When the dust is mixed with considerable iron pyrite it is well to add a small quantity of scrap iron. This, in uniting with the sulphur, forms iron sulphide, which comes off in the slag. If this precaution be not taken, a hard matte, very difficult to remove, forms upon the brick.

During the melt it is necessary several times to skim the slag from the gold. A special instrument is used for this purpose, essentially a long rod bearing at its lower end an enlargement to which the slag will stick. After gathering a small quantity upon the skimmer it is brought out, and by rolling on the iron table is made into a smooth, disk-shaped mass upon the end of the rod. This operation is continued until the slag collected upon the skimmer becomes unwieldy, when it is cooled by plunging it in water and broken off. When the gold is reached it may be readily detected by its greater weight. A second flux of borax alone is then added, and when this has melted the product is ready for pouring.

Though the mold should not be heated too much, it should always be raised to such a temperature that oil will burn on contact with it.

On removing the bullion brick from the mold it is placed in a pickle of three or four parts of water to one of nitric acid, which serves to clean the gold of surficial deposit. By using a hammer and a steel slag brush the brick is made ready for shipment.

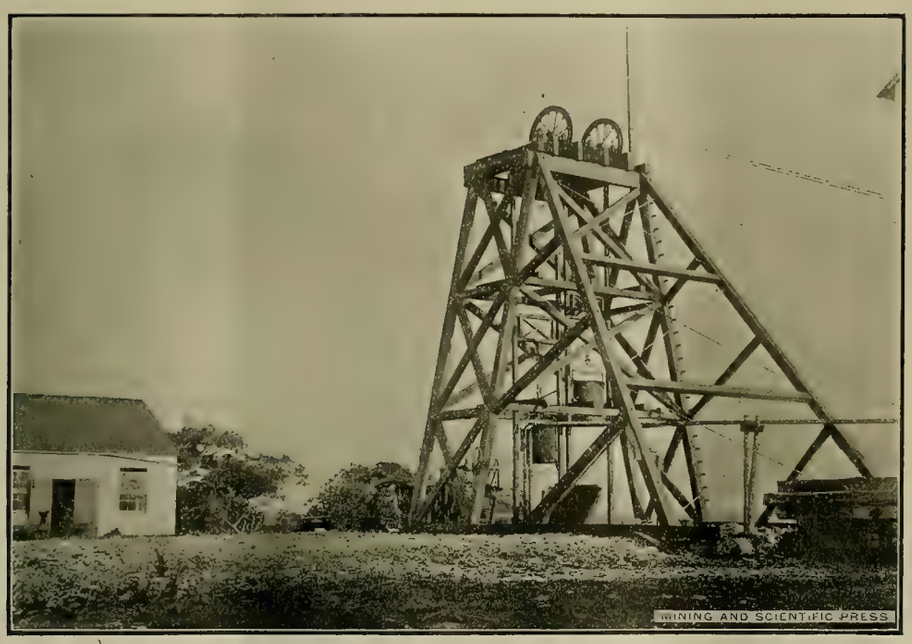
*Bulletin 263 U. S. Geological Survey.

Four Typical Rhodesian Gold Mines.*

Written for the MINING AND SCIENTIFIC PRESS by THEO. F. VAN WAGENEN.

THE TEBEKWE.—The Tebekwe is one of the two mines of Rhodesia (the other being the Globe & Phœnix) that have been dividend payers. The vein is apparently a true fissure between walls of schist, stands nearly upright, has a width of 5 to 12 feet, and the croppings—or what is left of them—are traceable on the surface for ½ mile or more. Along these croppings the mysterious "ancients" of the region had worked out nearly everything that was rich down to depths ranging from 50 to 150 feet, leaving deep trenches bordered on their lower sides by long dumps of cobbings, containing thousands of tons of low-grade quartz, the most of which has since been milled with profit by the modern owners of the ground. The vein filling at this mine is the usual hard, glassy and bluish tinted quartz of the region, that looks very cold and dead to an American. But in the Tebekwe it has yielded from $7 to $12 per ton, and in several places the stopes have been over 10 feet in width of such material. Explorations have been pushed to the depth of over 1000 feet on the mine, and so far with very satisfactory results, though the lowest level does not happen to show at the present time as well, for either quality or quantity, as some of those above it. The payable ore shoot is from 500 to ,600 feet long. Very little pyrite is to be found, even in the lowest workings, and very little visible gold in any part of the mine. The equipment consists of a well appointed 40-stamp mill and cyanide plant, which handles about 200 tons daily. The working force, when the mine is operating at full capacity, consists roughly of 100 white men and 1000 black laborers. The location is in the Selukwe hills, a bunch of elevations that rise perhaps 1200 to 1500 feet above the general level of the Rhodesian upland, which, at this latitude (about 18° south), stands about 4500 feet above the sea. A branch of the Rhodesian railway system approaches within a mile or two of the mine.

Bonsor Mill, Selukwe, Rhodesia, S. A.



Headgear of the Veracity Mine, Rhodesia, S. A.

Plant of the Wanderer Mine, Selukwe, Rhodesia, S. A.

THE WANDERER.—This is a quarrying proposition. It is located also in the Selukwe hills—which are in the eastern part of Rhodesia—and consists of a run of opaque white quartz, from 40 to 80 feet wide, that crops out for 600 or 700 feet on the slopes of one of the ridges. The material is moderately soft, shows little or no pyrite, and carries frpm $3 to $4 per ton in recoverable gold values. The process of treatment is by dry crushing, followed by direct cyanidization. About 400 tons are handled daily, at costs ranging from $2.50 to $3 per ton. Considered by itself, it is a magnificent gold proposition, that might be made as profitable and permanent as the Homestake; but the capitalization (nearly $2,500,000) is many times what it actually cost to equip the mine, or what it should have cost, and the general Rhodesian scale in the way of fuel, supplies, labor and supervision costs is so severe a handicap that, up to date, little or no profits have been realized. Ultimately, no doubt, the property will be reorganized, and the capitalization cut down to proper dimensions. When this is done, and when the general commercial conditions in Rhodesia are brought into line with those of other gold mining communities, the Wanderer will take a good position among the notable gold mines of the world.

THE BONSOR.—The Bonsor had an unusually long line of ancient workings at its surface, fully 1800 feet of them, and gave every promise of becoming a highly payable property. The vein (or reef, as it is called in South Africa, following the Australian nomenclature) stands nearly upright between schist and diorite walls, and carried from 5 to 20 feet of hard, glassy, blue-white quartz, that assayed from $5 to $7 per ton from the bottom of the ancient diggings down to about 400 feet. At this distance from the surface, however, it became very low grade and unpayable, except in spots, and up to date the company owning it has not had the means to push below this low-grade zone. This is an experience that has been met in gold-bearing quartz veins almost everywhere, and in every case the miner or the mining company has been compelled to work out their own salvation as best they could. In many regions the barren zone has been shown, sooner or later, to be underlaid by a second payable one, not so good, perhaps, as the surface bonanza area, but still highly profitable, because generally more extensive. In Rhodesia the ore bodies, in the vast majority of cases, are lenses of hard quartz lying in the bedding planes of Archæan schists, or between schist and diorite, and, while their extent laterally is rarely more than 1000 feet, and often much less, they have, in a number of instances, been pursued downward for that distance and farther, without any indication (so far as the quartz is concerned) of coming to an end. But, as in the case of the Bonsor, the gold values have often decreased notably, and at times almost disappeared, at depths ranging from 350 feet and downward, and where that has occurred there is no instance yet on record in the country where it has been possible to prove a return of values below, because working capitals have become exhausted, and the various processes of reconstruction have not yet come about. So the problem of what is going to happen in Rhodesia in depth upon its numerous and magnificent quartz ledges is still an unsolved one. The Bonsor is now under lease, and if the royalties that are slowly accruing are devoted to deep exploration the mine may yet be carried into the winning class. It is also one of the Selukwe hill properties, is conveniently situated for economical operation, but, like all the other Rhodesian gold mines, is handicapped with a capitalization many times too large.

THE VERACITY.—This is a good example of the Rhodesian variety of the "poor man's" mine. It is a comparatively narrow, but very rich, quartz ledge, with a short ore shoot. The pay will average 2 to 5 feet in thickness, and will assay $12 to $25 per ton. It was started as a company proposition, but could not be made to pay under those conditions. It is now under lease. It lies in a perfectly flat region that was originally densely covered with stunted trees and low, thorny brush. No American miner would look for a gold vein in such a place, yet the African "ancient" found the rich decomposed surface croppings, went down on them till stopped by water, and then disappeared. The jagged earth scar left was sufficient to draw the attention of the Rhodesian

*See illustration on front page.

company claim pegger, and in due time the little thing was capitalized and floated off the stocks with all the style and circumstances attending the launching of a battleship, when its proper measure was about that of a neat little fishing schooner. But if it, and the thousands like it in the country, had fallen into individual hands, and could have been worked with freedom, and the energy and resourcefulness that freedom brings out, the gold production of Rhodesia would long ere this have startled the world with its magnitude.

History of Pyritic Smelting.*

NUMBER III.—CONCLUDED.

By ROBERT C. STICHT.

Of Mount Lyell, and the introduction of the pyrite process there, it is not necessary to speak, except perhaps to say that the process was there yet to be put to the severest test it still had to meet. By the initiated the pyrites of the Mount Lyell mine could not but be regarded as a veritable metallurgical feast, but to the outside world pyrite smelting had still to prove its adaptability to copper ores pure and simple. Some anxiety had arisen in this regard in the minds of prominent authorities, but previous experience, aided by a few simple chemical facts, had inspired the writer with considerably greater confidence in the fidelity of copper to sulphur under nearly all circumstances, and, for his part, he could not call up any apprehensiveness that "the powerful oxidizing atmosphere of the pyrite furnace" would ever be quite powerful enough to shatter this strong bond of affinity. It was gratifying to observe that this question was practically settled by the very first slag that ran out of the first Mount Lyell furnace, though not a little amusing mystification was engendered by the extreme emphasis of the endorsement given by the furnace. It went even further than the wildest expectation could have gone, for the slag analysis revealed no copper at all. However, this ideal state of slag did not continue long, and a few shifts soon reinstated the ordinary imperfections of all mundane affairs, metallurgical ones included, and so it has remained since. Still, the powerful oxidizing effect of the blast has up to date not asserted itself, for it requires greater pressure and longer application of the blast than is ever likely to be exerted on a copper ore in a blast furnace operated up to 50% matte only. The process in this respect is far more reliable than the smelting of roasted copper ores.

Mount Lyell started with hot blast and pressures not exceeding eighteen ounces, in June, 1896, after a stock of only 150 tons of coke had been slowly accumulated, which, with all machinery and two furnaces and stoves, had to be painfully carted a distance of 26 miles over a barbarous mountain road. Fortunately for the continuity of the running, since no irrational hope was entertained of accomplishing the absolutely cokeless state of pyrite smelting within a few weeks, the railway into the reduction works valley was completed on July 18th, and the first train delivered an augmentation of the coke stock. In course of time the original two-furnace plant grew into six, in No. 1 plant, and later on No. 2 plant was added, with five more furnaces. The experience of Mount Lyell has demonstrated the perfect suitability of the process to high and low-grade copper ores, on a large scale, and the establishment still remains the largest pyrite plant in the world, with a total complement of eleven furnaces, the second five of larger size than the first six, and both sets originally supplied with hot blast. Matte concentration was resorted to at once, for though a converter grade of matte might have been produced in one smelting, this would have been less profitable than the two-fold smelting. The only drawback for several years was that, owing to the excessively basic character of the Mount Lyell pyrites, and the then apparently absolute lack of profitable dry ores in the locality, it was necessary to use barren silica. In due course, however, matters improved in this respect, through the opening up of the siliceous mines in the district, whose product was secured by purchase. Some attempts were made in the early years to run with cold blast, but under the conditions then obtaining they yielded no result.

The example of Mount Lyell started the Lake George United Co., which began pyrite operations at Captain's Flat, N. S. W., with five furnaces, in 1897, at first using cold blast, but subsequently hot blast. Notwithstanding remarkably economical work, operations could not remain continuous, largely owing to the unsuitable nature of the main ore.

Since 1896 it may be said that pyrite smelting has been on the regular plane of a truly recognized smelting method, adaptable to copper. A rather vast literature, for so short a life, has accumulated, much of it inconclusive, and of a contradictory character in respect of the salient features of the process — such, for instance, as the necessity of hot blast. Much that has been written about the latter, especially, is to cross-purpose, and the voluminous dis-

*Abstract of Proceedings Australasian Inst Mining Engineers.

quisition wants sifting and bringing to a common ground for comparison.

In 1895 appeared the seventh edition of E. D. Peter's work on "Modern Copper Smelting," in which the pyrite method is first treated comprehensively from an independent standpoint. This work also contains an essay by the writer. This was originally written for a group of business men familiar with smelting operations, and not as a purely scientific expose, so that it is not of as much service to the metallurgist as it might have been made.

The present day status of pyritic smelting owes much to Franklin R. Carpenter, not because of the perseverance with which he has remained faithful to the general process under the most difficult ore conditions, but also on account of the liberal and lucid manner in which his investigations and opinions have been laid before the profession. He has elevated this form of the general method, and incidentally the condition of pyrite smelting itself, as well as that of partial pyrite smelting, to a chemical perfection along certain lines which, but for him, it would not so readily have reached. He is largely eclectic, his sources being predominantly the work of the older Germans. But so are we all at the present day, and it is fortunate that there is an opportunity for learning from the past. The metallurgist who does not now look back to see what has been attempted and accomplished before may not hope to make much of an advance in so difficult a study, and can not obtain a proper comprehensive grasp of its manifold aspects. Dr. Carpenter's pyritic work at Deadwood, S. D., and in Colorado, has been and is a creditable triumph of modern metallurgy. It is the old Roharbeit still, but etherealized, if one may use this expression about so material a thing as smelting, into a distinctively new and far-reaching process. His treatment of excessively dry siliceous ores carrying up to 76% silica with the use of a scarcely basic pyritous concentrate as a vehicle, and the addition of dolomite, running 1000 tons of charge daily into only 10 tons of matte, has never been equalled. His conviction that there is much needless wet concentration and wet process treatment—i. e., amalgamation, chlorination, leaching, etc.—of siliceous pyritic and cupriferous ores, practically free from zinc and lead, together with much superfluous roasting to facilitate subsequent reduction smelting, is shared by most metallurgists holding broad views of the pyritic art, and it may safely be predicted that we shall in due time see the largest mining localities of the world, which now use mechanical concentration and the roast reduction process, follow this important suggestion.

At Mount Lyell the latter part of 1902 saw the gradual abandonment of the use of hot blast, with all the attendant economic and metallurgical advantages, such as a higher concentration, etc., and with no palpable increase in the cost of mechanical power or other drawback to offset this result. The departure was first made in the matte concentration operation and then extended to the ore smelting in No. 1 plant. In the early part of 1903 hot blast was finally wholly discarded at Mount Lyell in both plants. Increased experience has caused the number of furnaces in blast to be gradually lowered from six or eight in both plants to four in No. 2 plant only, to which the original blowing capacity of both plants is now being applied. The total tonnage capacity has remained the same, but a single smelting only is now performed to produce a converter grade of matte, which implies a concentration of about 18 or 20 into 1.

In 1902 the companies working the great pyrrhotite deposits of Ducktown, Tenn., finally also investigated the subject of pyrite smelting, and, independently discovering its great advantages, rapidly worked themselves fully into it. W. H. Freeland has published the very interesting experimental data relating to the first successful trials there, which were collected with exceptional care. More recently the ore of the Great Cobar mine also began to be treated by the pyrite process, for which pyrrhotite is an ideal substance.

The years 1901–3 brought an almost complete return to Mr. Hollway's experimental smelting of pyritic ore in lumps in a tiltable converter vessel. It is the process of E. Knudsen, carried out at Sulitjelma, Norway. The difference, however, lies in the fact that the vessel lining is basic, though this was spoken of even at Hollway's meeting, and the vessel is also, of course, of a special design. The pyritic ore itself is only slightly basic in composition. It is not easy to comprehend the advantage accruing from the converter, for the same ore would have an enormous tonnage at a very much lower pressure in the ordinary pyrite furnace. The capacity of the converter appears to be about forty tons a day and the power per ton 4 H. P. As an ordinary pyrite smelter need use only roughly from ½ H. P. to 1 H. P. per ton of ore with the same or a higher rate of concentration, it is difficult to see why blast furnace operations at Sulitjelma were abandoned in favor of a converter process.

Finally, the most important recent contribution to the discussion of the subject, dealing with it in that scientific manner which is theoretically the most absorbing and practically the most helpful, is a valuable review by Prof. A. Lodin, also in 1904.

The application of the pyritic principle to the metallurgy of copper, silver and gold, or, more properly, of that of rapid oxidation, has guided Barthold Kohler's old Roharbeit, in the hands of latter-day metallurgical artists, to consummations which even a quarter of a century ago were scarcely dreamed of. But while the modern devotee of the art may rejoice that so decided an advance has been made, he will not be able to suppress a feeling of regret that it should have required the unconscious wastes incurred during more than three centuries to bring us to such a point at last. He will also simultaneously apprehend that much more yet remains to be done. The encyclopedic Karsten (who died just two years before the first Bessemer experiments) in 1831 remarked that, "however greatly the state of metallurgy in a further 300 years might surpass that of the present, an outlook to which the rapid progress being made in the discovery of natural laws gave encouragement, it was not likely that the disparity between then and now would be as great as that between now and 300 years ago." Our modern disposition, it may be said, is not to the same effect, however modestly the thought was meant. The progress already made teaches us to look forward to scientific revelations in the future of which the applications will make the methods of today appear like those of the veritable dark ages, and will relegate the sixteenth, nineteenth and twentieth centuries into one common obscurity of mere semi-science.

Divining Rod as a Water Finder.

All miners are more or less familiar with the divining rod or gold finder, as it is used by the various "professors" who attempt to lead others to believe that they can locate with a fair degree of accuracy valuable mineral deposits. Some of these forked devices are elaborate and expensive, gotten up in fine style, with linen or silk-wound handles, various wires and insulating devices for mysterious purposes, but the operators of the divining rod have never yet been known to grow rich in the pursuit of their profession from the value of ore bodies located by them in this manner. There are, however, numerous fairly well authenticated stories of the finding of water by means of the divining rod. The Engineering News prints the following as an interesting instance:

Successful use of a divining rod is reported by G. Franzius of the German harbor construction bureau, associate director of the construction of the Kiel concrete drydocks, in the Zentralblatt der Bauverwaltung of Sept. 13, 1905. The occasion for a trial of divining rod performance presented itself a few months ago when it became necessary to sink additional wells on the grounds of the Imperial Navy Yard at Kiel for water supply. In this territory water is found overlying an impervious hardpan whose surface is very irregular. The conditions are such that at one point a borehole may give ample water, while a dozen feet away no water is struck, and at still other points artesian flows of low head may be obtained. In order to avoid, if possible, the expense of many trial boreholes, Mr. Franzius obtained the assistance of one Mr. von Bulow-Bothkamp, who had made a large local reputation as a water and gold finder. The appliance used by him is a piece of iron wire, about ⅛ inch or less in thickness, bent to the form of a loop, with long cross ends. This "rod" is held by grasping in the two hands its opposite ends, which thus serve as axis, and allowing the loop portion to project horizontally forward from the body. When passing over or near an underground flow of water (apparently Mr. v. B.-B. is able to indicate only flowing underground water), the loop of the "rod" flies up sharply, striking the operator's breast. Armed with this instrument, the expert first discovered a large underground flow, undiscernible from the surface, but well known to the engineer in location and direction, because it had been tapped in drydock work. The expert at once found its course and direction. Next, at a driven well which had been closed off with a plug some time before, the expert obtained no reaction, in spite of the positive statement of the engineer's assistant that this pipe had given an artesian flow. As proof of the expert's error, the plug was taken out of the pipe, when, lo! no water came. It was thought possible that a well driven some 60 or 70 feet away may have laid dry the flow supplying the first well. The next test, made at the second well—an artesian borehole—was for depth of supply flow. The expert guessed 43 feet, which was correct. He next discovered a large flow, suitable for an additional well, and, as the first discovered location was inconvenient, he followed its course some 100 yards to a point where he said water would be struck at 50 feet depth. Subsequently an excellent well was put down here, with a natural head of several feet above the ground surface. By this time the expert was visibly exhausted, so that work was stopped. At the discovery of the spring last noted he asked Mr. Franzius and others of the party to touch the "rod" which he held. The former and some of the others claim to have felt distinctly something like an electric shock, while others were insensitive. Mr. Franzius later was able himself to obtain reactions with gold and water, using a bent fresh walnut twig, and also found some among his acquaintances who could, in varying degrees of strength, detect the effects in question. Judging by his signed article above referred to, from which the preceding is taken, Mr. Franzius appears convinced that there is something in the matter.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The Anvil Hydraulic & Drainage Co., developing placer ground on Bourbon, East Bourbon, Holyoke, Saturday, Lake and Wonder creeks, near Nome, is draining the tundra by means of a 24-inch steel-banded circular pipe. Dredgers are to be put in and the ground worked from tide water toward Anvil mountain. E. E. Powell organized the company.

ARIZONA.

Cochise County.

(Special Correspondence).—At the Cole shaft of the Lake Superior & Pittsburg Co. of Bisbee excavations are being made for the foundation of the new gallows-frame. A sump has been finished at the bottom of the shaft, and when the new hoist is put in, it is understood the shaft will be sunk 400 feet from the 1100-foot level. This will make it the deepest shaft in the district. Shaft No. 3 is being put in order. A new road is being built from Don Luis to the hoist. The Cole shaft has been straightened, retimbered and enlarged from two to four compartments of full working size, 8x24 feet outside of timbers.——A new hoist has been put on the Denn mine, near Warren. At a depth of 575 feet the formation is still conglomerate.

Work has commenced on the Randolph mine, near Tombstone.

Bisbee, Oct. 30.

On the 700 level of the Shattuck-Arizona of Bisbee two faces in different workings are in ore 200 feet apart and from 75 to 100 tons are being placed on the dumps daily.——At Bisbee the Calumet & Arizona Co., the Calumet & Pittsburg Co., the Lake Superior & Pittsburg Co. and the Junction Co. are all preparing to put in new hoists.——A. Brackman has sunk a 100-foot shaft on claims 12 miles from Douglas.

Graham County.

J. F. Weber, manager of the Federal M. Co., reports that it has been reorganized under the name of the Gila Valley Copper Co. This company absorbs the Federal, San Juan and Great Eastern group of mines near Safford, in the Lone Star district. F. H. Wilson was elected president. A 50-ton concentrator is to be put in.

The tunnel of the Chase Creek Copper Co., near Clifton, is in 1040 feet.

Mohave County.

It is reported that W. H. Cushing of Topeka, Kan., intends putting a mill on the De La Fontaine mine, in the Stockton Hill district, near Kingman. The vein carries values in silver, lead and zinc.——Machine drills are to be put in at the Pinkham and Midnight mines, near Kingman. The Pinkham shaft is to be sunk deeper. R. G. Eckis is superintendent.——E. M. Carson is to develop the Bethel mine in Todd Basin, near Kingman, by driving the Green Linnet tunnel to cut the Bethel vein at a depth of 300 feet.

Yavapai County.

(Special Correspondence).—The Esmeralda M. Co. has bought a new hoist which is to be set up on the Penfield mines, near Cherry creek, recently bought from E. R. Hutsenpiller. Operations will be commenced on one of the claims, which has a shaft down 80 feet.——Sulphide ore, 4 feet in width, has been struck in the Shelton mine, near Walker, operated by the Metals M. Co. The company is running a crosscut tunnel from the Helwick tunnel to tap the vein on the Eureka mine.——E. Greenwood and E. Campbell have bonded from M. D. C. Putnam the Express mine, near Poland.

Prescott, Oct. 30.

(Special Correspondence).—The Octave mine at Octave has resumed active operations.——At the Rincon mines, near Congress, ore is taken from the 1100-foot shaft to run the mill. Two new Wilfley concentrators have been added to the plant in order to more economically handle the rich ores coming from the mine at this time, when the management expects to increase the production to nearly the mill's full capacity. The Rincon M. Co. has spent $150,000 on the mine and has now sixty-five men employed. The company owns its own freight teams and hauls its own freight, bullion and distillate, which latter is bought by the carload and stored in tanks built on the railroad at Congress Junction.

Congress, Oct. 30.

The 10-stamp Silver Flake mill at Groom creek is being moved to the Arizona Gold Mines property on Cherry creek. R. H. Burmister of Prescott is manager.——At Middleton the De Soto M. Co. has seventy men at work.——A two-compartment working shaft is being sunk by the Tiger Gold Co., near Crown King.——J. J. Shaw continues to remove the ores from the fire district in the United Verde mine at Jerome. The part of the mine where this work is now being done is known as the Hampton stope and is known to contain a body of ore. There are now employed under ground in the United Verde mine 540 men. Superintendent Taylor has the United Verde smelter working to almost its full capacity.

A rich vein of gold and copper ore is said to have been discovered near Black mountain, in the Bill Williams Fork range, 14 miles northwest of Wendon, on the Arizona & California railroad. It was found by T. J. Carrigan and J. E. Rogers, of the Clara G. & C. Co. The district may be reached from Wickenburg.

Yuma County.

(Special Correspondence).—The number of employes on the California-Arizona and Hecla properties has been increased and several freight teams have been purchased preparatory to starting ore shipments between the mines and Tacna, the shipping point on the Southern Pacific Railway. Arrangements have been made for building a line from Welton, the postoffice station on the Southern Pacific Railway, to the mines. On the Temper claim one tunnel is in 160 feet; a winze has been sunk from this tunnel 96 feet; another tunnel is being driven 100 feet below.

Welton, Oct. 30.

CALIFORNIA.

Calaveras County.

The Lightner hoisting works and 40-stamp mill were destroyed by fire Oct. 30. The loss will reach $150,000, with an insurance of $50,000. The fire started in the candle room, where the men change their clothing on going to work. It is supposed that the flame from a candle was communicated to a miner's coat. One thousand cords of wood was also destroyed. The sixteen men in the mine escaped through a 600-foot shaft into the Angels mine. The Lightner mine is owned principally in Stockton. —— W. T. Mitchell and F. Sciaroni were convicted at San Andreas recently of having attempted to wreck the Angels mine at Angels Camp during last May. Sciaroni was the foreman, and, learning that he was to be discharged, with Mitchell and Charles Holmes put in blasts at different levels of the mine to cave the shaft in. Holmes turned State's evidence, thus avoiding prosecution.

Nevada County.

The South Yuba M. & S. Co. has bought the Virginia & Gold Hill and the Martha quartz mines, near French Corral. Al Ellinger of Grass Valley is president of the company. O. Woehler is the general manager. Development work will be started.

Placer County.

It is reported that rich wash gravel has been struck at the Dardanelles mine at Forest Hill, being operated by A. G. Read. F. Randall is foreman.

Sierra County.

(Special Correspondence).—The Forest City M. Co. report pay gravel.——Wm. Brady, superintendent of the Irwin gravel mine, is putting in power drills, to be run by gasoline.——Spaulding & Peckwith will start the West Point mine when the rains come on.——The Golden Scepter have rich gravel opened up in their channel at Bunker Hill.——There is a report of a copper strike near Basset's station.——The Keystone will soon be ready to start its 10-stamp mill near Sierra City, as the work of repairing the damage caused by the recent flood is nearly completed.——The electric plant being put in at the Telegraph mine, near Downieville, is nearly completed. This will furnish power with which to sink on the vein. J. W. Finney is the superintendent.—— Sinking still continues to show up a strong vein of fair values at the Oaklick, in Jim Crow canyon, near Sierra City.——It is stated that 2530 pounds of ore taken from the Lightner mine at Alleghany last month gave a bullion return of $35,325.42 and 263 pounds of concentrates which assay $110,000 per ton. The 263 pounds of concentrates will give returns of about $15,000. This property is owned by H. L. Johnson of Alleghany.——Lumber is being taken to the Sovereign mine, near Downieville, to repair the buildings for winter.

Downieville, Oct. 31.

Henry Goering of Sierraville has sold the Last Chance gravel mine above Mohawk Valley in Sierra and Plumas counties, not far from Clyde. He has been placed in charge of the mine for the present. A new tunnel 800 feet long will be run to cross the channel and arrangements will be made for working all winter.

Trinity County.

A rich strike is reported in the Bonanza King mine, 4 miles east of Carrville. The mine was bonded to Treadwell of San Francisco by Vollmer, Eldridge & Filmer.

The dredger at Trinity Center, owned by Payne Bros. & Keenan, has closed work for the season. This is the only dredger operating in this county and this was the third season it had been in use. G. W. Payne of Santa Rosa, the superintendent, says this season's run has been satisfactory. The boat has a capacity of 500 yards a day.

A rich strike has been made at the Mountain Bloomer mine at Denny by J. A. Byers.

Tuolumne County.

Shaft sinking has been started at the Reed mine, near Big Oak Flat.—— It is reported that a 5-stamp mill is to be put up at the Mary mine, near Arrastraville.——Lack of water has caused suspension of work at the Jumper mine at Stent. —— At the Black Oak at Soulsbyville advantage is being taken of the idle season to make needed repairs and to retimber wherever necessary. —— At the Sunnyside mine, near Tuolumne, a crosscut tunnel will be started. A compressor is to be put in and machine drills will be used in the tunnel.

COLORADO.

(Special Correspondence).—The question of making the Bureau of Mines a repository for maps and other information of different mining sections is being considered among mining men of this State. It is proposed to ask the next Legislature to appropriate money to this department for maintaining men in the field in gathering information and making maps that will be of value to the mining industry. A question arises similar to the drainage question now being agitated in the Cripple Creek district. The Bureau of Mines sends a representative to the section involved and makes a map of the district, and estimates the cost of driving a tunnel necessary to drain the section. By a certain number of property owners petitioning the parties in charge to drive the tunnel the work is commenced and finished, and each property holder benefited by the tunnel will be assessed according to the benefits received from the tunnel. In this manner it is believed by the parties who have the matter in hand that much quibbling and delays will be avoided in getting the necessary relief. In Leadville the Yak tunnel is draining a large area of valuable mineral land without recompense from the owners of the land benefited. The same applies to the Cowenhoven tunnel at Aspen, Newhouse tunnel at Idaho Springs, the Nelson tunnel at Creede and the El Paso at Cripple Creek. If the State had charge of this work the expense would be divided among the parties benefited instead of allowing individuals of one company to do all the work and stand all of the expense involved in the enterprise. In this manner each mining district would be benefited to the extent that a map would be made of their locality and additions and corrections made from time to time. These maps would be kept on file and copies could be obtained from the Bureau of Mines office.——Governor McDonald has declined to call an extra session of the Legislature to provide bonds for the handling of the war debt incurred during the big strike in Cripple Creek and Telluride; also to pass a law regulating banking institutions of the State.——Most of the placer mines of the State have closed down for the winter. The recent snows made it impossible, as well as the shortage of water and freezing nights, caused the shut down for the year. —— The machinery at the new United States Mint in this city has been tested and is now ready for coining. Regular work will not be commenced before the first of the year.

Denver, Oct. 30.

Clear Creek County.

(Special Correspondence).—The St. Paul M. & M. Co., Mont. Tong manager, is driving a tunnel under Green Lake mountain to tap the Colorado Central vein. The tunnel will cut the vein 1000 feet deeper than the old workings of the Colorado Central Co. The tunnel is in 150 feet, being driven with an electric air drill. It is being debated whether they will do all the work through this one tunnel or divide the work with the old workings of the St. Paul Co. Nearly 2000 feet of work has already been done in different places on the property, and this tunnel will be 2000 feet in length when completed.—— The East Argentine T., M., M., P. & T. Co. is driving the Sidney tunnel. This tunnel is now about 900 feet in Pendleton mountain and still driving. The same company are also driving the H tunnel, which is in 300 feet. Power drills are used in both tunnels. The power plant of the company consists of a 9½-foot Pelton wheel and 8-drill compressor. They have 200 feet water fall, giving them about 100 pounds pressure. At the upper end of the flume they have a boiler and intend to turn steam into the pipes, to keep from freezing during the winter months, and they believe in this manner they will be enabled to operate throughout the year. This is an experiment. H. J. Crist is president and M. Sidney manager.——The Domino M. Co., owning a property across the gulch from the Sidney tunnel, has given an option for two years to E. Quigley of Idaho Springs, who intends to start a new tunnel. Power will be obtained from the East Argentine Co. to operate their drills.——The Waldorf M. Co. has completed a 50-ton mill at the Wilcox tunnel and will soon be in a position to turn out concentrates. The power for operating the mill is obtained from the Georgetown Electric Light Co. This company also furnishes the different properties of the Waldorf Co. with power for operating and light purposes. The wires are strung through Silver Plume to the Stevens mill and then brought over the hill to the Kittie Ousley and Tobin mines, and thence to the Wilcox. The Wilcox is running seven drills in the mine and two more will be added. At present they are not driving the tunnel, but drifting on the Commonwealth and Paymaster veins, in which they are opening up some good ore. The tunnel will be continued on to connect with the Stevens mine, on the opposite side of the mountain. Peter Hector is mine foreman.——The Tobin, on the eastern slope of McClelland mountain and one of the Waldorf Co.'s properties, is doing development work preparing for spring shipments. One tunnel is in 2000 feet and one 1600 feet. They are not aiming to take out large amounts of ore at present, as they do not expect to be able to ship before spring, when the railroad will be operating from the mine. Machine drills are used. Eighteen men are employed in the mine. John Nash is foreman.——The Kitty Ousley, belonging to the same company, is taking out some good ore. Foreman J. E. Wing states that he has opened up a vein 18 inches to 2 feet wide of sulphide ore and is looking better with each shot. A concentrating mill will be built in the spring to handle the ore from the mine. These properties, as well as the Wilcox tunnel, are above timber line. Chas. Tingle is superintendent and E. J. Wilcox of Denver manager.——In this same district the Santiago mine is keeping three wagons busy hauling ore to the mill at Georgetown, where it is being milled for shipment to the smelters. Wm. Rogers is manager.——D. Kennedy has started his mine, which has been idle for several months past. The mine is being cleaned out ready to take out ore.——S. Anderson, manager of the Independence M. Co., is operating on the Griffith mine, near town. The company intends building a mill for handling the ore at the mine, as well as treating the old dump, which carries considerable lead and zinc.——Another year should see heavy shipments of ore from the East Argentine district. The amount of work done in that district the past year has been satisfactory to all.—— The Vidler tunnel, which is intended to pierce the range and come out in Summit county, is operating a few men at present. R. C. Vidler, manager of the property, is still in London, but is expected home within the next sixty days. It is reported he has raised the necessary capital to finish the project. This tunnel when finished will be used as a railroad tunnel, and it is the intention of the management to build a railroad from the portal of the tunnel in Summit county to connect with the Colorado & Southern at Keystone, a few miles from Dillon. This will make a much shorter route from Denver to Leadville than by the present route which goes through South Park via Como and Breckenridge. On the eastern slope of the range it will connect with the new road now being built by the Waldorf Co., and the grade of which is now within a few hundred feet of the eastern portal.

Georgetown, Oct. 28.

(Special Correspondence).—The Dives-Pelican mill, which has been closed for some time on account of some repairs being made to the chutes in the mine, will be started about Nov. 1.——The railroad being built from Silver Plume to the East Argentine district has been graded and the laying of steel has commenced. The management of the railroad hope to have trains running

to the mines of East Argentine in the next thirty days. The road connects with the Colorado & Southern at Silver Plume. In order to get to the top of the mountain a switchback had to be built, and the grade is extremely hard. Some difficulty will undoubtedly be encountered with the snow during the winter months.

Silver Plume, Oct. 30.

The Commodore tunnel driving into Red Elephant mountain, near Empire, has reached the big veins and the company is upraising and drifting to prospect and develop them.

The Flexible tunnel has been driven over 200 feet into Saxon mountain, near Georgetown, under the direction of D. B. Roberts.——The Magnet mine, on Saxon mountain, is being developed under the management of W. B. Jacoby.——Drifting from the 265-foot level of the American Sisters mine, on Columbia mountain, near Georgetown, is opening up good ore.——The upraise from the Bonanza tunnel of the Democrat Mountain M. Co., for the purpose of securing air, has been completed after five months' work.——The shaft on the Edgar property can be sunk without difficulty.

Eagle County.

J. H. Lemmon has struck rich ore while sinking a shaft on the North Star on New York mountain, near Fulford.——The lessees on the Lucy, near Fulford, are breaking high-grade ore and sacking it for shipment. J. Bowman has let a contract for development on the Cattlet & May, near Fulford, to W. E. Frost.

Gilpin County.

The Pewabic Co. of Russell gulch is putting machinery on the Iron mine which will enable it to sink to a depth of 1500 feet.——The Ute mine at Nevada, near the California, has been started up by Central City men under the direction of Manager Pearce.——The force at the Freedom mine has been increased.——The Imperial Gold M. & M. Co., operating the Mackey mine at Apex, has commenced work on a new lode, the Amazon, which was recently purchased by the company.——S. T. Elliott will sink the Grand Central shaft, near Central City, from the 400 to the 600-foot level, and drifting will be commenced in the 350-foot level west. Retimbering of the shaft is to be done from the 200 to the 300 level.

Copper-iron ore has been found at a depth of 100 feet in the Rochester shaft of the Apex G. M. & M. Co., at Apex, by Manager C. E. Barrick.

The Carr claims, on Bob Tail hill, the aerial tramway and the Randolph 50-stamp mill, owned by King Leopold of Belgium and a number of wealthy Englishmen, have been sold to an Eastern syndicate for $50,000 cash. The deal was put through by G. P. Goodyear of Denver. The Randolph mill is in North Clear creek, below Black Hawk. The group has one shaft 800 feet deep.

Gunnison County.

The Maple Leaf Con. G. M. Co. is developing the Maple Leaf group, near Gunnison. The main shaft is down 250 feet and has opened milling and shipping ore. A mill is to be put on the property at once. —— The Cortland mine, above Ohio City, in McIntyre gulch, has been leased out in blocks and the leasers are taking out ore.

It is reported that the Gold Link T. & M. Co. has resumed operations on its big tunnel above the Raymond, near Gunnison.

Hinsdale County.

It is reported that high-grade ore has been opened in the Monte Queen mine, on Crooke mountain, near Lake City.

Lake County.

The Ruby mine, near Twin Lakes, recently shipped a carload of first-class ore to the Leadville smelter that netted $300 per ton. All of the low grade ore from the property is being stacked on the dump waiting the completion of the mill. The property will work all winter. From the different properties on Carbonate hill, Leadville, the tonnage during the month has been increased and they are sending out 400 tons daily. The upper and lower shafts of the Waterloo are shipping seventy-five tons daily and the Porter, Ladder and Crescent No. 2 are outputting 150 tons daily. The company working one shaft on the Evening Star is shipping fifty tons and a number of small lessees are shipping from ten to twenty tons daily. Prospecting with the diamond drill on the Ollie Reed No. 2 shaft, South Evans, Leadville, has ceased, as the results were not satisfactory. The company is working in No. 1 shaft. New prospect drifts will be started from the different levels in this shaft and the ground developed.

J. A. Storm has resumed work on the Bedford group on Mt. Ewing, near Twin Lakes. —— Work will commence very soon on the Ten Broeck, near Twin Lakes. —— The Mt. Storm tunnel at Red mountain is near the vein from which the rich ore was obtained on the surface.

Pitkin County.

Aspen ore is a low-grade silver-lead, but it is cheaply mined and gets the benefit of very low smelting charge because of its lime and the small per cent of silica. Some of the properties contain zinc, but it, too, is low grade. This product is marketed in Pueblo and at Iola, Kan. Most of the district's output is from leased ground. The recent fire in the Percy–La Salle, one of the most extensively developed properties, threw many miners out of employment temporarily; but it is stated that the damage will be fully repaired before the close of December, when the former activity will be resumed. The Smuggler and Percy–La Salle have been the largest shippers, but the Aspen, Compromise, Spar, A. J. Refent, Homestead and some others of lesser note have been steady producers. The ruling wage scale is $2.50 per diem.

San Juan County.

The Rattling Jack and Elk claims, on Breece hill, Silverton, have been leased to G. F. Barry, who will sink both shafts deeper. The present depth is 300 feet. The Rattling Jack shaft will be sunk to a depth of 750 feet.

The Silver Ledge mine and mill and the Esmeralda mine, near Silverton, have been closed down for the winter.

San Miguel County.

Manager W. C. Beam of the Japan-Flora M. Co. has closed down the property near Telluride.——The Pandora Gold M. & D. Co. has been formed with W. E. Westland of Denver, president; Charles Rittmaster, vice president; J. A. Manifold, secretary; S. L. Fulkerson, manager and treasurer, all of Telluride, except the first named. This company recently secured from the Smuggler-Union M. Co. a long-term lease on 2300 contiguous feet within Smuggler-Union territory, on the Pandora vein, between the point where this vein is intersected by the Pennsylvania tunnel and the lines of the Valley View group of mines. Just below the Valley View, which is much higher than the Pennsylvania tunnel, Messrs. Hallet & Webb held a lease on a considerable stretch of the Pandora vein, whose interests the new company purchased, giving it a clear passage. The purchase lease is known as the upper lease, and between it and the Pennsylvania tunnel the ground is known as the lower lease. The lease from the Smuggler-Union Co. carries with it the privilege of operating the Pandora vein through the Pennsylvania tunnel. The Pandora crossing the Pennsylvania at an angle of 45°, it is the intention of the management of the new company to crosscut from the Pennsylvania tunnel to the Pandora, drift on the latter until vertically under the upper lease and then raise to the surface. The upper lease is now being operated as extensively as the ground opened up will permit, the output being packed by mule trains to the Smuggler-Union mills at Pandora for treatment, and the values realized are more than sufficient to pay operating expenses. The Smuggler–Union M. Co. has a tramway in operation from the mouth of the Pennsylvania tunnel to its two large mills at Pandora; therefore, after the level has been projected on the Pandora vein and connection made by a raise with the workings of the upper lease, the ore can be dropped down, delivered at the surface of the upper terminal of the tramway and transported to the mills, effecting a saving of $2.50 per ton over the present method of packing the product on mules to the reduction plants.

Summit County.

It is reported that rich gold ore has been found in the Excelsior mine, near Frisco.——The new power plant of the Southwestern Brokerage Co. has been started up. It will furnish power for the air drills to be used in the driving of the main tunnels of the North American Mines Co. and the Mary Verna M. Co.——The concentration mill of the Old Union M. & M. Co., near Breckenridge, is running full time. The property is being worked through the main 1600-foot tunnel. A crosscut driven 97 feet north from the 1000-foot point in the tunnel recently cut a 2-foot streak of good concentration ore. A. E. Keables is manager and G. C. Smith superintendent.

Teller County.

The Hummer mine, of Cripple Creek, has been leased for two years to the Hummer Leasing Co., and active mining operations are to be under the direction of Chas. Ridpath. A 10x12 hoist is to be put in over the shaft, which is 230 feet deep.——Hoisting has been started from the 13th level of the Ruby mine, of Cripple Creek.

Work has begun in the Hoosier mine on Tenderfoot hill, Cripple Creek, under the direction of B. Shell, lessee. He will prospect to the bottom levels. On the 500-foot level a vein of good appearance has been followed by drift and winze for a short distance. Like conditions have been exposed on the bottom level to a depth of 635 feet.——The Trilby and Ben Harrison claims of the Moose Co., on Bull hill, Cripple Creek, have been sold to C. J. Billerbeck and T. Murray. ——P. McDonald has started work on a lease on a section of the Mabel M. mine on Beacon hill, Cripple Creek.

IDAHO.

Custer County.

The White Knob copper properties at Mackey have been leased and work will be continued under the management of F. M. Leland. The White Knob smelter is being dismantled, preparatory to shipping to the Balaklala mines in Shasta county, Cal.

Elmore County.

F. C. Innes, general manager of the Benton mine, at Atlanta, says in the experimental mill the saving on the plates runs from 55% to 58% of free gold, with from 22% to 24% of the values obtained in the concentrates, and from the slimes and sands remaining they are securing 80% by cyanide, giving a total extraction approximating 95% of the crude value of the ore. Mr. Innes will spend the winter in San Francisco, Cal., and while there will have a full equipment of machinery made for the property. This will consist of a hoisting plant, air compressor and machine drills and an electric plant.

Idaho County.

F. S. Myers of Richmond, Va., one of the principal owners of the Silver King mine at Warren, has shut down the mill because of lack of water. Steam is to be substituted for water power and the ore treatment changed.

At Florence four companies have been working this year in preparation for next year's run. The Gold Lake Co. has been active on Gold creek and has ditches in readiness for the spring run. The Mammoth, consisting of 600 acres, has been operated by a Cleveland, Ohio, company. The Last Chance has put in one giant. Development work has also been done on Miller creek.

Shoshone County.

The Success mill is shipping about 1000 tons of ore and concentrates a month. The zinc ore and concentrates average over 50% zinc, with low silver values, while the lead ore and concentrates will average 60% lead and about 45 ounces silver to the ton. The mill as rearranged has a capacity of 100 tons a day. Its equipment consists of a Blake rock crusher, 1 set of Blake and 2 sets of Humphrey rolls, 6 impact screens, 4 sets of jigs and 5 Wilfley tables. So far it is the only producer of 50% zinc ore or concentrates in the Cœur d'Alenes. The lead concentrates are marketed without any trouble, but the zinc concentrates and hand sorted ore are being shipped to the smelter at Iola, Kans., the freight rate being $10 per ton. The smelter agrees to purchase them, provided they average 50% zinc or more, for $33 per ton. After the freight rate is deducted this leaves the Success Co. $23 per ton for its zinc concentrates and ore. All the other lead mines of the district, most of which contain a percentage of zinc in their ore, get rid of as much of the zinc as they can in milling, with the result that the creeks are full of rich zinc tailings.

The annual report of the Federal Mining & Smelting Co., operating in the Cœur d'Alenes, covering the year ended August 31, shows a gross tonnage of ore mined amounting to 664,830 tons. The concentrates and shipping ore amounted to 85,205 tons. The total mineral production shows an output of 2,689,867 ounces of silver and 88,274,055 pounds of lead. The financial statement is as follows: Value of silver shipments $1,502,652; value of lead shipments, $3,066,779; net profit for the year, $1,242,697; dividends paid in the same time, $1,098,895; cash in banks August 31, 1905, $558,607. The general manager reports that the various mines belonging to the company are in excellent condition, and that the ore reserves were increased by 600,000 tons during the year. The control of the Federal Co. recently passed into the hands of the American Smelters' Securities Co.

MONTANA.

Fergus County.

The Barnes-King Co., at Kendall, will soon be operating its new electric diamond drill on ground adjoining its main property, and through its operations the company expects to add a considerable area to its producing ground. Much new machinery is now being put in at the mine.

Granite County.

C. Bergstrand, of Gold creek, has purchased the Wahlgren & Swanson properties, near Royal. The group comprises the Tussle, Hope, Hope Extension and Durvey quartz mining claims and the Little Creek placer mining claim. The principal development work on the group consists of a shaft which has been sunk 110 feet.——The Butte and Anaconda smelters are bidding for siliceous ores in Granite county. The minimum percentage of silica they require is 70, which they will work for $3 per ton. For every unit higher than 70 and up to 90, they allow 15 cents, giving the shipper all the metallic values in the ores. This premium will give a stimulus to mining in Granite county.——The Royal Gold mill at Royal has started to crush ore. The low grade or milling stuff is being put through the mill, while the high grade ore is being shipped to the smelter at Helena.

Madison County.

The Toledo mines and mill, near Sheridan, which were formerly owned and operated by the Bismark-Nugget Gulch Co., are to be worked by the Toledo M. & P. Co. The incorporators are L. D. McCall, W. A. Stanton and C. W. Foster of Chicago; H. M. Blossom of St. Louis, H. M. Langdon of Cincinnati, G. J. Renner of Youngstown, Ohio, and J. J. Shubert of Kankakee, Ill.

Silver Bow County.

(Special Correspondence.)—By the amalgamation of a number of independent mines, which have been shipping about 100 tons of ore daily, the East Butte Co. will increase the output to at least 500 tons a day. Work has been started on the Mary MacLane, and sinking is in progress on the Yankee Boy. The Wheeler, Oneida, Hancock, Simons and Lassen are also working. A new engine and hoisting plant has been put on the Dutton capable of working to a depth of 800 feet.——The Pittsburg & Montana Co. has purchased the Carlisle mine, located ½ mile east of its smelter. The Carlisle is supposed to be on an extension of the Pittsburg and East Butte veins.——The destruction of the coking plant of the Utah Fuel Co. by fire for a time threatened to inconvenience the Washoe smelter of the Amalgamated Co., as it has been getting one-third of its supply of coke from the Utah Co. However, it also has three or four other sources of supply, and these have promised to increase the shipments to Anaconda, so that the loss from the Utah source will be offset by increases from other sources, and the Washoe smelter will continue to run as heavily as usual.——Judge Hunt of the United States Court has refused to vacate an injunction in a suit of E. Rollins Morse against the Montana Ore Purchasing Co., one of the first suits brought in the noted litigation between the Amalgamated and Heinze interests. The injunction prevents the Heinze people from working in the Michael Devitt ground, owned by the Butte & Boston Co. Heinze has for years claimed that the vein from the Rarus mine dips into the Michael Devitt and that he has a right to follow it. He has twice convinced jurors of his contention, but the courts themselves have not been satisfied and the case is awaiting its third trial. In the meanwhile the injunction stands.——North Butte keeps up its record of ore shipments. The new shaft and equipment will soon be completed.

Butte, Oct. 30.

Siliceous copper-silver ore is being reduced to blister copper without concentration, heap roasting or any other process except that of running it through the blast furnace and converter, at the property of the Pittsburg & Montana Copper Co. at Butte. There are only two furnaces in operation in the plant, one of which is a blast and the other a converter, capacity of the latter being 15 or 16 tons of ore. The ore in its raw, moist state goes into the blast furnace and comes out matte, and then a mixture of matte and raw ore goes into the converter and comes out blister copper. At a public test given the plant recently the pour from the converter was begun shortly before 12 o'clock and lasted nearly an hour, during which time between 5 and 6 tons of blister copper in slabs, weighing 200 pounds each, were added to the stock.

NEVADA.

Humboldt County.

A test furnace, put in at Lovelocks by C. A. Gage recently, produced a 60-pound bar of antimony. The

claim from which the ore was taken has been developed by a tunnel 1200 feet and a shaft 250 feet. J. M. Jones of New York and C. A. Gage are the owners.

The inability of the Salt Lake smelters to handle the ore output from Nevada will compel several of the larger mines at Tonopah and Goldfield to build mills in order to treat their own ore. The announcement has been made that the Western Ore Purchasing Co. of Reno, representing the American Smelting & Refining Co., can hereafter ship but 150 tons a day from the southern district until an additional smelter can be built in Utah. This allotment is apportioned to the various mining companies, and the first to announce, in consequence, that it will build a mill of its own is the Montana-Tonopah. President Knox says that at the start a 50-stamp mill will be put up, and that it will be built in units, so that it may be enlarged.

Esmeralda County.

The Mohawk-Alpine Co. at Silver Peak is operating its two stamp mills. Most of the ore being worked is obtained from the Mohawk-Alpine mine, but the ore from the Mary mine yields equally as good returns on the plates. Development work is under way at the Mary mine, which was recently purchased by the company from John Chiatovich. The company is operating a cyanide plant in connection with each mill.

Lincoln County.

The mill of the Newport-Nevada Co. at Deer Lodge is said to be handling thirty tons daily of ore that runs $15 in gold per ton. —— E. D. Trenam, manager of the Deer Lodge G. M. Co., adjoining the Newport-Nevada properties, reports good progress on the tunnel, which will tap the ore bodies at a depth of 325 feet. Deer Lodge is 24 miles by stage from Uvada, Utah.

A 10-stamp mill has been bought for the Cyrus Noble mine at Searchlight. Good ore is said to have been struck in a winze from the 200-foot level.——The Ascot M. & M. Co. will resume sinking on the Ascot shaft, near Searchlight, from the 365-foot level.——A 300-foot vertical shaft is to be sunk on the Big Six group at Searchlight by James Wilson.

Nye County.

A new gasoline hoist has been put in at the Humboldt Tonopah mine by Superintendent Frank Haley.—— Water has been struck at the 200-foot level of the Tonopah Home shaft being sunk by J. W. Skelton.

Owing to the scarcity of water and the high rates charged for it by the water companies, the Tonopah Railroad offers to transport crude California oil free to both Tonopah and Goldfield for use in oiling the streets of both towns.

NEW MEXICO.

Grant County.

Henry Woods and H. H. Whitehill, owners of the St. Helena mine, Central City, are preparing to put in a boiler and pump to unwater the shaft preparatory to again starting work on the property. The ore will be shipped to the Silver City smelter.——The Phelps Dodge Co. is working 26 men in the Hanover copper mine at Hanover under the direction of Robert Musgrave. ——The Hermosa Copper Co. at Hanover is developing the Tourmaline and the Humboldt mines. A 90 H. P. boiler and a new hoist have been put on the latter. The old shaft is down about 140 feet and has been enlarged to two compartments to a depth of 90 feet.——At Santa Rita the Santa Rita Copper Co. has completed a new shaft, known as No. 8, to a depth of 214 feet. It is a 2-compartment shaft, 4x4½ and 4½x5 feet.

Taos County.

The New Mexico Chemical Amalgamating Co. intends putting up a mill near Red River. M. L. Harney is president, with principal place of business at Springer.

OREGON.

Baker County.

M. A. DeHuff of Spokane, a stockholder in the Daines M. & M. Co., which owns the Belcher mine, near Greenhorn, says that the company proposes to operate the mine all winter. A 1200-foot tunnel will be run from the Belcher property under the Golden Gate ledge.

Douglas County.

Manager W. B. Stewart, of the Continental mine at Myrtle Creek, has started the new 50-ton concentrating mill.

The Magnolia 10-stamp mill, near Granite, is to be started on ore from the Snow Bird mine under the direction of L. Durkee. —— Work at the Black Jack mine at Alamo is under the direction of T. J. Sheedy.

Grant County.

Superintendent N. F. Heath of the Standard mine, near Comer, has driven 300 feet in No. 1 tunnel during the last two months. A 171-foot raise has been completed and another raise has been made to a height of 90 feet. The first raise connects with No. 3 level. The intermediate level between Nos. 1 and 3 has been driven 170 feet on the vein, and will be carried ahead until it is above the face of No. 1. This level is 86 feet above No. 1. On November 30 bids are to close for the new concentrating plant. The excavation and timbers have been finished. The new mill will be put at the portal of the intermediate level, 86 feet above No. 1, as the latter does not give sufficient dump. The lower level will be continued as a drain at that depth, and ore mined there will be hoisted to the mill level when operations commence. A crew of forty-two men is employed at the Standard.

Jackson County.

The New York & Western Mines Co., which recently bought the Opp mine, near Jacksonville, has begun work under the direction of Foster & Gunnell of Grants Pass. Next summer a plant capable of treating 200 tons of ore daily is expected to be placed on the Opp. A carload of ore has been shipped from the Opp to Denver for treatment and analysis, that the best method of reduction might be ascertained. A building is being put up at the mine for a 10-drill compressor which will be driven electrically. A double-track tunnel is being driven on the mill level to tap the Opp veins at depth, and all ore for the mill will come through this.

The Layton hydraulic placer mines, near Applegate, have been sold by J. Layton to G. P. Mimms. Six giants are to be added to the battery, and the capacity increased.

Josephine County.

The affairs of the Lucky Queen M. Co. of Grants Pass are being readjusted. Work will be resumed under the management of C. D. Crane. A 10-stamp mill was put in last year.

SOUTH DAKOTA.

Lawrence County.

Although it was announced that the Golden Reward Co. had decided to put up a large cyanide plant at Bald mountain to handle its ores more economically, it has since been decided to abandon this plan and to increase the capacity of the mill at Deadwood.——The 200-ton cyanide plant of the Eleventh Hour Co. is nearly completed.

Pennington County.

(Special Correspondence).—James Cochran has uncovered a new shoot of ore lying east and north of the main open cut. The full extent of the new find has not yet been determined, but preparations are being made to get into this new ground by means of a drift from the floor of the cut, running in a northeasterly direction. Stoping of this ore body will be commenced as soon as preliminary arrangements for economically handling the ore have been completed.——At the Golden West mine as depth is attained the character of the ore is gradually changing, and the installation of a cyanide plant is being considered, as a portion of the gold is said to be difficult to amalgamate. Amalgamation is practiced in a Chile mill.

Rochford, Oct. 28.

TEXAS.

James T. Callbreath, secretary of the American Mining Congress, has completed the preliminary programme for the international meeting to be held at El Paso, November 14 to 18. It follows: Invocation; addresses of welcome; response by President Richards; responses by States; J. H. Richards, annual address; R. S. Morrison, author of "Morrison's Mining Rights," "Mining Laws;" V. C. Alderson, Golden, Colo., "Co-operation Between State Mining Schools and State Mining Bureaus;" C. M. Shartel, member of Congress, Neosho, Mo., "The Zinc Industry of the Kansas-Missouri Fields;" W. J. Thomas, chemist of Bingham (Utah) smelter, "Damages Arising From Smelter Fumes;" C. J. Norwood, director of Kentucky State Geological Survey, Lexington, Ky. (subject not assigned); W. M. Porter, Chicago, "Eastern Exhibition of Minerals and Mining Machinery by American Mining Congress;" F. E. Wire, Libertyville, Ill., "Attitude of Eastern Capital to Western Enterprises During Development Stage, and How to Attract It;" W. B. Phillips, president Texas State Mining Association, Terlingua, Tex., "Quicksilver Deposits of Brewster County, Texas;" F. A. Jones, Albuquerque, N. M., "Mineral Resources of New Mexico;" L. E. White, State Commissioner of Mines, Denver, Colo., "Mine Drainage Districts;" M. A. Smith, Tucson, Ariz., "A Department of Mines and Mining;" R. E. Benedict, Thatcher, Ariz., of United States Forestry Department, "Forestry as It Affects the Mining Industry;" C. D. Wolcott, director of United States Geological Survey, "The Advantages of Greater Co-operation Between the United States Geological Survey and State Mining Bureaus;" L. E. Aubury, State Mineralogist of California, and author of "California Law to Prevent Mining Frauds," "The Prevention of Mining Frauds by State Legislation;" J. W. Malcolmson, M. E., El Paso, Tex., "The Relation of Mining and Smelting Between Mexico and the United States;" W. P. Blake, Tucson, Ariz., "Ores, Worthless Twenty-five Years Ago, Which Have Been Made Valuable by Improved Mining Methods;" R. Gilman Brown, San Francisco, "The Examination of Mines Preliminary to Purchase of To-day as Compared With Twenty-five Years Ago;" unassigned, "Mine Management Now as Compared With That of Twenty-five Years Ago;" "The Proper Education of a Mining Engineer."

UTAH.

Beaver County.

Steam shovels are to be used at the Cactus mine of the Newhouse M. & S. corporation at Newhouse. At the same time a large force of men will be put to work cutting into the mountain and increasing the flow of the Wah Wah springs, from which the mill and the town of Newhouse derive their water. There has recently been uncovered a surface deposit of ore 300 feet long by 180 feet wide, which it is estimated will yield 4000 tons of ore for every foot of depth attained in it. Mr. Newhouse calculates that the steam shovels can be profitably employed to a depth of 100 feet in this deposit.

Carbon County.

In a fire at Sunnyside on October 26, two crushers, ½ mile of trestle work running up to the mouth of both mines, the main hoist of No. 1 mine, three coal crushing plants, the tipples, railroad and mine cars and several small buildings of the Utah Fuel Co. were destroyed. This has caused some inconvenience to Utah and other smelters dependent on this plant for coke. The plant is to be rebuilt at once by General Manager H. G. Williams.

Salt Lake County.

Manager D. C. Jackling of the Utah Copper Co. reports that grading for the company's big concentrating plant is being pushed at a site 4 miles from the American S. & R. Co.'s smelter. The grading will be finished by the middle of November. The main concentrator plant will cover five acres of ground and will have a capacity of 5000 tons of ore a day. The first unit of this plant will be put into commission as soon as completed and will handle 3000 tons of ore per day. The construction of the second unit of the plant will commence as soon as the first is in commission.

Announcement is made by the Bingham Con. C. & G. M. Co. that its new additional equipment for its smelter will be ready to be placed in commission early in November. The new reverberatory is finished and the roasting plant is under way. With these additions to the present plant completed and placed in operation the company will be capable of handling 1000 tons of ore daily. The capacity of the plant is now taxed to the utmost.

The Bingham Group M. Co. intend repairing the 3000-foot Last Chance tunnel preparatory to working the Greeley-Sacred claims in the West Mountain mining district, near Bingham. R. L. Booth of Bingham is interested.

Summit County.

The Ontario drain tunnel at Park City is open for 13,000 feet and workmen are driving a drift around what is thought to be the last cave. The first drift started was sent in for 30 feet and then the pressure from the tunnel side—the ground being bad—was so great that the timbers were broken as fast as they could be put in. Consequently this drift was abandoned, a bulkhead put in, and work on a new drift running off at a greater angle from the tunnel was commenced. This drift is in 50 feet and, though the ground is at present soft and treacherous, it is thought that it will soon change and that solid ground will be reached. A diamond drill is at the tunnel in readiness to be set up as soon as the ground will permit of its being done in safety. A bore will then be sent through to the tunnel, and unless all expectations are wrong the pent-up water will be tapped. If this is the case, water will be drained off and the trouble which has caused the Ontario Co. so much expense will be over.

Tooele County.

The new slimes plant at the Ophir Hill mine at Ophir is reported to be satisfactory by Manager E. W. Clark. ——The Overland shaft at Sunshine is down 280 feet.

Uinta County.

The Uinta Reservation was thrown open to mineral location on October 27 and many claims were located near Vernal, including gilsonite, asphaltum, coal, lead, copper and silver properties. The deposits of gilsonite and asphaltum are rich.

WASHINGTON.

Ferry County.

The First Thought M. Co. is making regular shipments of gold ore from their mine near Orient. P. Walsh is superintendent.——H. K. Jessup of Spokane is shipping zinc ore from the Young America mine at Bossburg.

FOREIGN.

AUSTRALIA.

Queensland.

The report of the general manager of the Mt. Morgan mines states that during the year ended May 31, 1905, the ore treated from the open cut amounted to 134,435 tons, which is 13% more than for the previous year, and the gold recovered from it amounted to 56,604 ounces, being 20% more than was obtained during the previous year. The amount of sulphide ore treated from underground was 109,296 tons, 8% less than for the previous year, and this yielded 62,034 ounces of gold, an increase of 5% as compared with last year. The quantity of copper precipitate won from this ore amounted to 237 tons 15 cwt., carrying 75.5% of copper. The total of both kinds of ore treated was 243,731 tons, which is greater than for any previous year by 6000 tons. In addition to the above, 3182 tons of auriferous copper ore were treated in the early part of the year, from which 263 tons of copper matte, carrying approximately 1409 ounces of gold and 115 tons of copper, were produced. The open cut is now in a satisfactory condition for extracting ore, the large mass of barren rock which overlaid and endangered the workings having been removed. It will be necessary to make provision for carrying the open cut down to the 450-foot level, 200 feet below the bench now being worked on. For this purpose it is necessary to excavate the waste for a considerable distance from the ore body to prevent it endangering the workings when the ore is being mined at the level mentioned. It is much less costly to do this in the immediate future while the steam shovels and trains are in position and have ample room to work. Prospecting at the lower levels by means of diamond drills was discontinued in April, the establishment of reserves of ore being amply in advance of the undertakings for extracting and treating it. The main working shaft is now down to the 650-foot main level, and the remaining 300 feet to be sunk will be finished in time to supply ore to the copper reduction works. Two of the main oreways are finished, and the other two are sufficiently advanced to enable their completion in ample time. The consumption of explosives now aggregate nine tons per month, and will shortly reach about eleven tons. The superintendent of the reduction works states that the total quantity of ore and tailings operated on during the year was 278,123 tons. Of this quantity, 109,296 tons was sulphide ore, and was dealt with at the mundic works. On the west works 134,435 tons of oxidized ore was treated. These two quantities represent 39.3% and 48.3% respectively of the total amount of material handled. At the lower works 34,392 tons of old tailings were retreated with payable results. The aggregate amount of ore and tailings put through for the year shows an increase of 11,724 tons compared with the previous year, which is equal to 4.4%. Notwithstanding the increasing sulphur contents of the ore, particularly on the west works, the average cost of treatment per ton is practically the same as last year — viz., 11.3s per ton. The installation of a battery of gas producers on the west works is now complete, and it is materially due to this factor, taking into consideration the nature of the ore at present being treated on this plan, that the cost of treatment is being kept at a normal figure. The sluicing scheme has been completed on the mundic works, and the results from same have fully come up to expectations, the cost of emptying these vats having been reduced from 8d to 1d per ton. The same system is now finished on the west works, and will effect a proportionate saving there. Machinery for filling the

mundic vats has been installed on the first section of these works and is working satisfactorily, reducing the cost of filling from 5d to 2d per ton. Similar machinery has been put on No. 2 section. The canals for the precipitation of copper have been added to, and from time to time are being augmented in order to cope with the gradually increasing supply of liquors. During the year 237 tons 15 cwt. of copper precipitate was recovered, carrying 75.5% of copper, this being an increase compared with the previous year of 18.5% in quantity and 1% in quality. The total quantity of ore treated for the twelve months was 243,731 tons, and the fine gold obtained 122,281.22 ounces. In addition to the ore treated, 34,400 tons of tailings were retreated at the lower reduction works, and 1305.49 ounces of fine gold obtained, the average value being 2.10 dwt. The average grade of all ores treated during the year was 9.71 dwt., or 41.24s per ton, which is an advance in value of 3.31s per ton on the ore treated during the previous year. The ore treated at the mundic works shows an increase in value of 1.4 dwt. per ton, and that treated at the west works an increase of 0.5 dwt. per ton. The total amount of fine gold produced during the year was 122,281.22 ounces. The amount of bullion in which the above yield was contained was 137,694.90 ounces, of an average value of £3 15s 9.33d per ounce.

Victoria.

There are now fourteen State batteries at work in Victoria, and it is proposed to invite tenders for five more, with the option of taking two or more. Five-head batteries are to be substituted for the three-head machines. Several applications have been received for batteries, and the residents of the localities have agreed to comply with the conditions of the Mines Department to form trusts for their management. A nominal rental of 1s a year is charged to create the legal position between landlord and tenant.

Western Australia.

The regulations under the Western Australia Mining Act, 1904, came into operation throughout the State on Sept. 1. Prospecting areas of forty-eight acres for gold and minerals other than coal or oil are granted to holders of miners' rights outside the limits of a gold field, and eighteen acres within the limits of such field. Bona fide work in prospecting must be carried out after ten clear days from the date of registration. The area for coal or oil is 3000 acres and must be worked after the expiration of thirty clear days by not less than three men for every 1000 acres. Exemption from labor conditions is only granted in special cases. Records and plans are to be furnished in certain eventualities and the discovery of gold or mineral is to be reported to the Warden. The extent of the reward claims is to be determined according to the distance of discovery from the nearest mine. The labor conditions need not be complied with on any reward claim granted in conjunction with any ordinary claim which adjoins, if the labor conditions in respect to the latter are complied with; but a reward claim held alone is to be worked by at least one man. Reward leases are also granted, the labor conditions of an ordinary mining lease to be applied thereto; but the rent may be remitted for a certain period, according to the distance from the reward lease to the nearest mine. Regulations are made respecting alluvial and lode claims, water rights and mining on reserved and exempted lands. The maximum area which may be marked off and applied for as a mining lease is as follows: For coal, sec. 52, 320 acres; coal, sec. 56, 640 acres; gold, sec. 52 and sec. 56, 48 acres; gold in all other cases, 24 acres; metallic minerals, sec. 52 and sec. 56, 48 acres; metallic minerals in all other cases, 24 acres; non-metallic minerals in all cases, 48 acres; precious stones, 24 acres. Coal or oil leases are to be worked by not less than one man for every sixty acres for the first twelve months, not less than two men for the second twelve months, and three men for every succeeding year. Gold leases, under section 52 or subsection (1) of section 43, are to be worked by not less than one man for every twelve acres; every other gold lease by one man for every six acres; but in no case shall any lease be worked by less than two men. Provision is made for the amalgamation of leases, mining on private land, the purchase and sale of gold, marking off of mining tenements, boundary marks and forfeiture and all exemptions from the labor covenants of a lease are to be registered and an annual return presented. A mining tenement on which labor conditions are prescribed shall be considered "efficiently worked" when the requisite number of men are engaged bona fide in working thereon for eight hours on every working day except Saturday, when four hours shall be sufficient. The men so employed must be either the holder or holders, men working on wages or men working under a duly registered tribute, which authorizes their employment as fulfilling or partly fulfilling the labor conditions. Regulations are also set out in regard to transfers, liens, mortgages, and caveats, partnerships, tribute agreements, surveys and proceedings in the Warden's Court.

BRITISH COLUMBIA.

Boundary District.

The Daly Reduction Co. at Hedley has applied for 5000 inches of water from the Similkameen river, the water to be returned to the river at Twenty Mile, after having been used for power. The company's 40-stamp mill is running continuously on ore from the Nickel Plate mill.

Treasurer G. W. Wooster of the Granby Con. gives the following summary of the year's business of the company, ending June 30, 1905: Produced 14,237,622 pounds fine copper, sold at an average price of 14.36 cents; 212,180 ounces fine silver, sold at an average price of 58.30 cents; 42,884 ounces fine gold, sold at $20. These prices are net after all expenses have been deducted. The total realized equals $2,749,145.02. Working expenses at mines and smelter, freight, refining, selling, general expenses, $1,797,964.35; foreign ores purchased, $238,531.41; net profit for year ending June 30, 1905, $712,649.20; surplus from previous year (corrected), $842,226.01; net surplus June 30, 1905, $1,554,875.27; expended in new construction, equipment at mines, smelter and converter plants, etc., $343,974.28; for additional mining properties, $142,603.33. All development, renewals and repairs have been charged to working expenses. Mine development, 5200 lineal feet; diamond drill development, 3148 lineal feet; Granby ore smelted, 550,738 dry tons; foreign ore smelted, 39,382 dry tons.

Boundary mines for the week ending October 28 sent ore out as follows: Granby mines to Granby smelter, 17,655 tons; Mother Lode to B. C. Copper smelter, 4032 tons; Oro Denoro to Granby smelter, 50 tons; to B. C. Copper smelter, 50 tons. Total output for week, 21,787 tons; total for year to date, 731,277 tons. Following is the treatment record of the Boundary smelters for the week: Granby smelter, 16,944 tons; B. C. Copper smelter, 4047 tons. Total for the week, 20,991 tons; total for the year to date, 750,093 tons.

East Kootenay District.

James Cronin, manager, states that the mine at Moyie will be working a full crew by November 15th, and that the concentrator will be running by December 1st. The smelters at Nelson and Trail are in need of ore, as before the recent fire and shutdown half their supply came from the St. Eugene. The blacksmith shop is completed, and the temporary hoist is in place. Work in the shaft has been resumed. It is to be sunk an additional 160 feet.

Rossland District.

The Le Roi mine for the year to date has shipped 97,576 tons of raw ore to the smelter and milled 3240 tons of second-class ore. The shoot on the 900-foot level of the Le Roi, a portion of the Black Bear ore shoot, which was 108 feet wide on the 800-foot level, is being stoped. On the 900-foot level it is nearly as wide as on the level above. The tonnage shipped for the week ended October 28 was: Le Roi, 1650; Le Roi, milled, 21; Center Star, 1630; War Eagle, 1050; Le Roi No. 2, 60; Jumbo, 100. Total for the week, 5630 tons, and for the year, 270,964 tons.

Slocan District.

In Ainsworth camp it is reported that P. Burns and associates have bonded the Highlander property.—— The reduction works at Pilot Bay have been leased to the Fernau syndicate, which has been making repairs for some time. The concentrating section is ready for operation, and will be employed in reducing zinc ores from the Blue Bell mine.——At Kaslo the Sapper mine is in operation and has about 1500 tons of zinc ore accumulated. This produce carries an unusually high percentage of zinc, and is expected to run 50%. George Alexander is expected to ship ore this winter from the Ruth mine, near Slocan.——At Sandon the Payne and Star properties are being operated.——The Fernau zinc enrichment plant at Rosebery has been blown in.——The Monitor mine at Three Forks is shipping to Rosebery.

West Kootenay District.

Near Camborne the Eva mine is working forty men in gold ore.——The Beatrice, at the head of Mohawk creek, near Camborne, is reported to be making a good showing in development work. —— The Silver Dollar, on Mohawk creek, is putting in machinery. —— The Mammoth, on Goat mountain, near Camborne, has had supplies packed in and will work all winter. Its principal ore is silver.——Near Ymir, the Molly Gibson mine has completed its concentrator and is prepared to ship at least a car of ore daily. The company will wait until snow falls to afford sleighing from the mine to the lake front.

JAPAN.

The law passed by the Japanese Parliament recently, which empowered and invited the Land Bank to make advances to the proprietors of mines at moderate rates of interest, not exceeding 8% per annum, is proving effective. According to the Belgian Moniteur des Interets Materials, advantage has already been taken of the new legislation. When fully applied, it is estimated that this will increase the annual output of gold and silver by about 5,000,000 yen. It was really the outbreak of the war with Russia which moved the Government to turn its serious attention to the matter, and during 1904 the annual output was increased 50%. The advances of the Land Bank are made upon the advice of a committee, which inquires into the organization of each mine, the quality of its output, etc. The capital advanced is to be returned in yearly payments within a period of ten years, the Bank of Japan, acting upon the advice of the Imperial Mint, buying up the gold and silver produced. The mines of Formosa are also increasing their production every year, while in Corea the Osaka Mint is already actively buying up Corean gold dust. When modern methods shall have been introduced for the exploitation of the gold fields, this country also may take an important position as a gold producer. For the twelve months ending February, 1905, the output of the gold mines in Japan amounted to 9,000,000 yen. The gold fields in Formosa yielded 3,000,000 yen, making the total yield from Japanese territory 12,000,000 yen—about $6,000,000.

MEXICO.

Chihuahua.

The San Patricio mines in Parral district are again to start work. Sinking will be resumed on two of the shafts and continued to the 650-foot level, when crosscutting and drifting will be commenced. J. N. A. Conner has completed an experimental test plant at Parral to determine the proper cyanide treatment of the ores of the Veta Colorado M. Co. preliminary to the building a 500-ton reduction plant.

Durango.

Superintendent F. C. Morehouse, of the Mexico Consolidated M. Co., reports from Guanacevi that at the 300-foot level of the Otero shaft on the Soto property an ore body has been disclosed on the north carrying high values. Previously the ground there had been barren. The management plans to have the mill in operation during the first part of November.

Guanajuato.

The Guanajuato Amalgamated Gold M. Co. is working the Jesus Maria and Villarino mines, purchased from the Castenada estate. A. Adams of New York is at the head of the company.——The Mineral Development Co. is preparing to sink a deep shaft on the Nueva Luz properties at Guanajuato.——The Guanajuato R. & M. Co. will have its mill completed by the first of the year. Milling ores are being found in the Cata mine.——The Guanajuato Consolidated M. & M. Co. is successful in cyaniding its ores. It will put up a mill at the Carmen mine.

Jalisco.

An air compressor and drills, hoist, pumps and an electric light equipment are being put in at the Carrizo copper mine, west of Autlan. K. E. Keller is manager and E. E. Nicholson superintendent. —— C. Romero, owner of the Tamara y Anexas mines, has leased the San Antonio reduction works on the bank of the Santiago river, near Hostotipaquillo. He will improve and enlarge the reduction works, and will treat the milling ores of the Tamara y Anexas mines there. The San Antonio plant has been operated in the past by the San Antonio M. & M. Co. The San Antonio plant consists of a 20-stamp mill, a concentrating table and a patio for amalgamation. Only five stamps are now in shape for operation. The mill will be repaired so as to secure the service of the entire twenty stamps, two concentrating tables will be added and cyanide tanks will be put in.

Sonora.

(Special Correspondence).—The Sonora Bonanza M. Co. is working its mines, 4 miles west of Imuris. The ores contain copper, gold, silver and wulfenite. Concentrating machines and a cyanide plant are to be put in. W. M. Barker is general manager.

Cananea, Oct. 28.

The Yeso mines, near San Jose de Gracia, 25 miles east from Hermosillo, are being worked by the Angus M. & M. Co.——It is reported that owing to the impossibility to get wood cut and hauled into camp, on account of the depredations of Yaquis in the vicinity, the Copete M. Co. has had to suspend operations. An effort to substitute coal was made, but the beating to death with clubs by Yaquis of four teamsters, on the road between Carbo station and Copete, has made it impossible to get coal transported from the Sonora railway to the camp.——The Verde Grande M. Co., 40 miles northwest of Hermosillo, have contracted for a new smelting furnace, burning charcoal. J. D. Fresh is general manager.

Zacatecas.

The San Rafael gold mine, near Zacatecas, is being pumped out. This mine is now owned by A. E. Stilwell of Kansas City, Mo.

Personal.

C. B. KINGSTON is now in the Transvaal, S. A.

J. R. CRUM of New York is in Guerrero, Mexico.

J. A. SHINN of Leadville, Colo., is in Pittsburg, Pa.

M. TONG is manager St. Paul mine, Georgetown, Colo.

E. C. JOHNSON is manager Gertie M. Co. at Hill City, S. D.

H. L. JONES is now manager Antler mine, Hill City, S. D.

WM. M. BREWER of Vancouver, B. C., is visiting California.

W. F. GRACE has returned to England from northern Australia.

BERTRAM HUNT has returned to California from Central America.

S. F. GODDARD is in charge of mines in the Val d'Aosta, Italy.

PHILIP L. FOSTER sailed from New York for London on the 25th ult.

JAMES H. ROBERTSON has left El Oro, Mexico, to proceed to Peru.

HENNEN JENNINGS has returned from London to Washington, D. C.

F. T. KELLEY, manager I X L mine, near Sumpter, Or., is East on business.

W. S. MORSE is to resign charge of the Mexican business of the Guggenheims.

J. W. ASTLEY has retired as superintendent of the Le Roi mine at Rossland, B. C.

W. C. POTTER changes his residence from Mexico City to Aguascalientes, Mexico.

THE address of H. W. Turner will be hereafter care of Ladd Metals Co., Portland, Or.

J. H. MULLIGAN has resigned as mine superintendent Cataract Copper Co., Basin, Mont.

FRANK GRAHAM is superintendent Dives-Pelican-Seven Thirty mill, Silver Plume, Colo.

M. P. MCCARTNEY has resigned as assayer Bamberger-DeLamar Co. at DeLamar, Nev.

E. C. KING has resigned as assistant superintendent Arizona Smelting Co. at Humboldt, Ariz.

J. H. VANDERCOOK has charge Sinaloa-Durango M. & M. Co., near San Ignacio, Sinaloa, Mexico.

H. G. A. BRUNNIER, manager Conlon mine, Grass Valley, Cal., has returned from a visit to Idaho.

C. F. MAUNDER has been appointed superintendent Chicago-Goldfield M. Co., at Diamondfield, Nev.

F. W. BRADLEY has succeeded J. S. Wyatt as general manager Eureka & Excelsior mine at Bourne, Or.

G. W. SCHNIDER, Inspector State Bureau of Mines, Denver, Colo., has returned there from Portland, Or.

WALTER FITCH has resigned as general superintendent of United States M. Co. of Salt Lake City, Utah.

G. A. GUESS has taken the position of chief chemist Cananea Con. Copper Co. at Cananea, Sonora, Mexico.

P. H. MAHONEY, manager Potosi mine, Good Springs, Utah, has returned there from San Francisco, Cal.

JAS. GEARON, superintendent Hunter mine at Wallace, Idaho, has returned to the mine from a visit to Chicago.

JOHN M. SHERRERD, general sales agent Taylor Iron & Steel Co., High Bridge, N. J., is on a business visit to California.

E. L. ADKINS of Bellingham, Wash., has been appointed manager Marvel M. Co., operating mines at Yale, B. C.

GRANT SNYDER, superintendent Balaklala mine at Kennet, Shasta county, Cal., has returned from Salt City, Utah.

HENRY PRALL of the Empire Zinc Co. of Denver, Colo., has been examining zinc properties around Vancouver, B. C.

A. V. OLIVER has resigned as manager Tucabe M. Co., near Magdalena, Sonora, Mex., and has been succeeded by A. W. Morris.

W. A. DESBOROUGH, formerly with the Risdon Iron Works, will hereafter represent the Fulton Iron Works of San Francisco in the Southwest.

E E. NICHOLSON, formerly foreman Granby mine, British Columbia, has been appointed superintendent Carizzo copper mine, near Autlan, Jalisco, Mex.

R. B. LAMB has been elected superintendent and general manager Daly Reduction Co., operating the tramway and mill treating ore from the Nickel Plate mine at Hedley, B. C.

W. M. BARKER has resigned as superintendent Green Con. C. Co., Cananea, Mexico, to devote his time to the Sonora Bonanza M. Co., Imuris, Sonora, Mexico, of which he is president and general manager.

W. C. MILLER, general manager Federal M. & S. Co., which has taken over the Morning mine at Mullan, Idaho, announces that H. W. Morse will be retained as manager and J. Corson as mine superintendent.

J. E. MCALISTER has been appointed manager Mother Lode mine at Deadwood, Boundary district, B. C., to take the place of Frederick Keffer, who has been made engineer of the mining department of the B. C. Copper Co., with headquarters in New York.

Books Received.

Water Supply and Irrigation Paper No. 141 is entitled "Observations on the Ground Waters of Rio Grande Valley," by C. S. Slichter. This report contains results of recent investigations in connection with the underground-water problems of Rio Grande valley.

The United States Geological Survey has published Water Supply and Irrigation Paper No. 145, entitled "Contributions to the Hydrology of Eastern United States, 1905," M. L. Fuller, geologist in charge. This paper is the third of a series of progress reports on the hydrology of the eastern part of the country. It contains papers on the following subjects: Hydrologic Work in Eastern United States; Drainage of Ponds into Drilled Wells; Two Unusual Types of Artesian Flow; Construction of So-called Fountain and Geyser Springs; A Convenient Gauge for Determining Low Artesian Heads; A Ground Water Problem in Southeastern Michigan; Water Supplies at Waterloo, Iowa; Water Supplies From Glacial Gravels near Augusta, Me.; Water Supply from the Delta Type of Sand Plain; Waters of a Gravel-filled Valley near Tully, N. Y.; Notes on Certain Hot Springs of the Southern United States; Notes on Certain Large Springs of the Ozark Region; Water resources of the following areas: Catatonk area, N. Y.; Pawpaw and Hancock quadrangles, W. Va. – Md. – Pa.; Nicholas quadrangle, W. Va.; Mineral Point quadrangle, Wis.; Joplin district, Mo.–Kan.; Winslow quadrangle, Ark.; Contact region between the Paleozoic and Mississippi embayment deposits in northern Arkansas; Portsmouth–York region, Me.–N. H.

"Technical Methods of Ore Analysis," by Albert H. Low, will prove valuable to every conscientious assayer. The book describes analytical methods that are likely to be needed in giving a complete report on the total composition of any ore that may be submitted. The author presents practical methods for the determination of twenty-nine of the more common metallic elements in all of their usual combinations, alphabetically arranged. Some of the methods given have been devised by the author, some are compilations of the work of others and some are modifications of existing methods. The directions for manipulation are complete but not verbose. Each has been subjected to the crucible of actual trial and repeatedly refined by laboratory experience. In contrast to many existing manuals the methods are applicable to the common ores of this continent and omit details necessary for some foreign compounds. The book is essentially a manual of practical methods that have proven good in the varied experience of a man well known for accurate and original work. The author states: "It has been my aim to make the descriptions so minute and complete that if the operator will follow them exactly he can scarcely fail to obtain satisfactory results. But herein lies the difficulty. There seems to be a tendency among technical chemists not to follow directions exactly. In carrying out a method the alert operator sees a short cut and takes it, or a "better way" occurs to him and he introduces it in the place of the one given him. There would be no ultimate harm in this (since all methods fall short of perfection) if the operator would only take the time to investigate and determine the real value of his ideas. In some cases he might discover that his supposed improvement was spoiling a good method, and he would come to agree with the author of the method, who had himself probably gone over the same ground. I have seen methods of my own thus modified, and ideas hastily adopted whose incorrectness I had previously demonstrated by careful investigations." The chapter on combining determinations contains several time-saving hints. Approved methods are also given for testing boiler waters, coal and coke and crude petroleum, apparently with the intention of determining their commercial value, rather than presenting a complete analysis. The chapter on apparatus gives some novel devices for the laboratory, but that on electrolysis is deficient, as it describes several antiquated methods and omits reference to recent electro-chemical progress. The book could be shortened by omitting an elementary explanation of the use of logarithms. These indispensable adjuncts to rapid work are among the fundamentals of the chemist's education, and could be omitted in a manual of this character. Heretofore the working chemist has often depended upon manuals prepared for students' use. These are necessarily limited in their application, and usually several volumes are required to furnish a working library. This book will find a welcome place on the working shelf of the assayer, who is compelled to leave many of his books in his trunk. It is published by John Wiley & Sons, and will be sent postpaid by the MINING & SCIENTIFIC PRESS for $3.

Commercial Paragraphs.

THE Main Belting Co. have appointed Messrs. Frost & Hall of 312 Cooper Bldg., Denver, Colo., as special selling agents for the "Leviathan" belting in that territory.

THE Chicago Pneumatic Tool Co.'s statement shows profits for the quarter ending Sept. 30, 1905, of $241,791.45. After deducting quarterly dividend No. 11 of $61,137.83, there is a surplus carried forward of $483,813.50.

THE gold dredgers owned by the Clear Creek Dredging Co. and the National Dredging Co., now operating about 12 miles from Denver, Colo., are Bucyrus dredgers. All the machinery was built in South Milwaukee, Wis.

THE Yampa Smelting Co. have contracted with the Allis-Chalmers Co. for six McDougall furnaces for the Salt Lake City plant. Each furnace will have six superimposed hearths, each with its sets of rabble arms and rakes. Furnaces measure 18 feet, outside diameter. The Nevada Con. Copper Co. of Nevada has contracted with the Allis-Chalmers Co. for similar furnaces.

L. S. PIERCE, 1653 Welton St., Denver, Colo., patentee and manufacturer of the Pierce amalgamator, was awarded a gold medal by the Portland, Or., Exposition by the jury of awards. He reports recent shipment of a 25-ton machine for South Africa, through the Leyner Engineering Works of Denver, Colo., and one to the Syssert Iron & Mining Works, Station Mramorskja, Government of Perm, Russia.

THE North Carolina granite corporation of Mt. Airy, N. C., is installing a Sullivan Corliss two-stage air compressor for driving the Sullivan drills and other compressed air appliances used at its quarries. This compressor has a capacity of 2000 cubic feet of free air per minute at seventy-eight revolutions. The air cylinders are connected to a Sullivan Corliss cross-compound, condensing steam end, especially designed and proportioned for this purpose. The air inlet valves are of the Corliss type, operated by independent eccentrics, and the discharge valves on both cylinders are of the automatic poppet type, moving in a direction parallel with the piston rod, with removable seats located in the cylinder heads. A similar machine is installed at the works of the Southern States Portland Cement Co. at Rockmart, Ga., and is stated to have given efficient service during the two years it has been in operation.

W. H. WHITESIDE, president Allis-Chalmers Co., says that there is no truth in the rumors of contemplated absorption of the company by the General Electric Co. "In the electrical business the Allis-Chalmers Co. has about $3,000,000 invested. This is in the Bullock plant at Cincinnati. It represents $3,000,000 out of a total capital of $36,000,000 of the Allis-Chalmers Co. Our business as a whole differs from that of the General Electric. We are engaged largely in the manufacture of steam engines, mining machinery, flour milling machinery, saw milling machinery, crushing machinery, sugar machinery, etc. To acquire the electrical business of the company, in which alone the General Electric would be interested, would involve the purchase of the controlling interest in the entire Allis-Chalmers Co." The Allis-Chalmers Co. is stated to have purchased outright the Bullock property, which it formerly leased. There will also be expended at Milwaukee over $3,000,000 in improving the plants there.

Trade Treatises.

Cranes—ladle, overhead traveling, gantry and locomotive—are superbly illustrated and explained in a handsome booklet from The Wellman-Seaver-Morgan Co. of Cleveland, Ohio. As one of a series descriptive of iron and steel works equipment, this will prove interesting to metallurgical engineers.

Catalog A of assay, analytical and pulp balances and weights of precision, manufactured by Wm. Ainsworth & Sons, Denver, Colo., is a good example of modern high-class catalogue work. Good pictures, terse text and neat arrangement give a favorable representation of the instruments catalogued. Details of balance construction are well illustrated.

The large catalogue of the Morse Bros.' Machinery & Supply Co., Eighteenth and Lawrence streets, Denver, Colo., contains 226 pages descriptive of mining, milling and smelting machinery supplies. It is conveniently indexed for ready reference, gives freight rates to all principal points, and is embellished with hundreds of illustrations portraying the machinery described and offered for sale. A copy will be sent anywhere on application.

A useful catalogue of books on steam and the steam engine is received from Henry Carey Baird & Co., industrial publishers, booksellers and importers, 810 Walnut street, Philadelphia, Pa. The catalogue is conveniently arranged, alphabetically by authors' names, its augmented usefulness by such arrangement being manifest. There is also a brief description of each book on the subject which this old established house publishes. Besides, there is a similarly complete catalogue of their books on mechanics, machinery, machinists' work, dynamical engineering, mechanical drawing, transmission of power, gas, gasoline and heat engines, refrigerating machinery, fuel, boiler making and management, pattern making, heat and thermo-dynamics, the heating of buildings by steam and hot air, mechanism, tool making and designing, screw cutting and boiler incrustation, which will be sent free to any address anywhere upon request.

Latest Market Reports.

SAN FRANCISCO, November 3, 1905.

METALS

SILVER. — Per oz., Troy: London, 28 1/16d (standard ounce, 925 fine); New York, bar silver, 62¾c, refined (1000 fine); San Francisco, 62¾c; Mexican dollars, 51c, San Francisco; 48c, New York.

COPPER.—New York: Standard, $16.35½; Lake, $16.35½@16.67½; Electrolytic, $16.62½; Casting, $16.00@16.37½. San Francisco: $16.75. Mill copper plates, $17.50; bars, 18@24c. London: £71 10s spot per ton.

Copper is at practically the same price as last week, but is in somewhat less demand, large consumers having apparently stocked up for the present. A slightly lower price may now be anticipated. The monthly statement of James Lewis & Son of Liverpool shows the total visible supply of copper in October, 1905, to be distributed as follows: Total stock on hand, 8304 tons; afloat from Chile 4000 tons; from Australia, 4000 tons; total visible supply 16,304 tons, which is over 1000 tons less than the amount reported on the first of August and first of September respectively, but is nearly 2400 tons more than was on hand October 3, 1904. This circular contains the following information concerning copper: The scarcity of refined copper which has been experienced for some time past has now extended to Standard copper, the available quantity of which has been reduced to the extent of 1847 tons during the past month, considerable shipments of Chile bars having been made to the United States and also to the Continent, in addition to good deliveries for conversion into electrolytic copper by English depositors. As large quantities will shortly be required for the manufacture of sulphate, a further serious curtailment of the public stock may be looked for. The effect of this materially reduced supply is apparent in the premium of £1 to £1 5s per ton paid for Standard for prompt and early delivery, as compared with the price obtainable for delivery in three months time, and it is further enhanced by the policy of many consumers in buying only for their immediate requirements —a policy that will probably lead to a further increase in the premium they will have to pay for immediate delivery, and be an element of strength to the market for some time to come.

LEAD.—New York, $5.40; St. Louis, $4.50; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £14 18s 9d ℔ long ton.

SPELTER.—New York, $6.25: St. Louis, $6.00; London, £28 5s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $32.80@33.25; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔ lb., 40c. London, £149.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $16.85; gray forge, $16.35; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔

bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12½c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency the following are worthy of special mention:

MACHINE FOR SPLITTING CLOTH.—No. 802,545. Oct. 24, 1905. John F. Ames, Portland, Or. This invention relates to means for splitting cloth of standard width into strips of any desired width, and pertains especially to the splitting of the cloth while rolled in contradistinction to splitting lengths of cloths and then rolling or reeling the severed strips The main object is to save time, labor and expense and to provide a simply constructed and operated machine which will handle rolls of cloth or other fabric, paper or the like, of any texture or size and which is capable of adjustment to adapt it to cut a roll into any desired number of narrower rolls.

FIREPROOF PARTITIONS.—No. 802,556. Oct. 24, 1905. C. M Depew and H. E. McCoy, San Francisco, Cal. This invention relates to an improved fireproof building construction, and particularly pertains to a partition structure. Its object is to provide a simple, cheap, light and stable rigid fireproof structure of this character. It consists in the combination with a jamb-timber having an angular tongue on one edge, of partition panels having grooves on the edges adjacent to said timber, angle-iron uprights fitting the tongue of the timber and the grooves of the panels, means for anchoring the opposite ends of the panels, top and bottom supports for the series of panels, and finishing strips secured to the timber, and other details of construction.

SURFACING AND POLISHING MACHINE.—No. 802,604. Oct. 24, 1905. A. T. Spence, J. H. Prugh and S. B. Zimmer, Oakland, Cal. This invention relates to an apparatus which is designed for producing even surfaces and cleaning or polishing any surface to which such an apparatus may be applicable. It consists in a surfacing and polishing machine of a frame supported with relation to the surface to be acted on, independently movable abrading rollers, springs by which the rollers are normally maintained in contact with the surface, and a lever with intermediate connections and a stop with which the lever is engaged to raise the rollers from the surface, and other details of construction combined and adapted to produce the desired result.

SURFACING AND POLISHING MACHINE.—No. 802,605. Oct. 24, 1905. A. T. Spence, J. H. Prugh and S. B. Zimmer, Oakland, Cal. This invention relates to an apparatus which is especially designed for producing even surfaces and cleaning or polishing any surface to which such an apparatus may be applicable. It comprises in a surfacing machine, a longitudinally slotted drum and a flexible covering material, the contiguous edges of which enter the slot, jaws between which said edges are held, an eccentric mounted upon the drum shaft, said jaws pivoted together in pairs and one jaw of each pair being extended beyond its pivotal center to form a lever arm which clasps the eccentric, and a radially movable rod upon which the jaws are fulcrumed, and other details of construction.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING OCTOBER 17, 1905.

802,252.—FIRE ESCAPE—C. W. Anderson, Seattle, Wash.
801,849.—METER AND MOTOR—A. H. Carpenter, Stockton, Cal.
801,968.—GOLD SAVING APPARATUS—J. A. Clark, Yankee Hill, Cal.
802,272.—LETTER FORMER—G. W. Dettner, San Francisco.
802,183.—DAM—G. W. Durbrow, Indio, Cal.
802,274.—STIRRUP—J. Engleheart, Waconda, Wash.
801,859.—PRESERVING WOOD—W. E. Everette, Tacoma, Wash.
802,033.—ALARM—C. Freeman, Los Angeles, Cal.
802,036.—CULTIVATOR—F. W. French, Oakland, Cal.
802,282.—SPEED CONTROLLER—F. A. Gerting, Portland, Or.
802,207.—DOUGHNUT MACHINE—Gray & Van Fleet, Riverside, Cal.
802,362.—BEARING—Green, Lyons & Garey, Los Angeles, Cal.
802,144.—WINDMILL—B. R. Harrington, Phœnix, Ariz.
802,213.—PIPE BAND FASTENING—A. W Hight, Ballard, Wash.
802,289.—PURSE HOLDER—R. K. Hohmana, San Diego, Cal.
802,215.—TUBE CUTTER—E. Johnson, Seattle, Wash.
801,990.—WATER GATE—Kellar & Thomason, Covina, Cal.
802,332.—VEHICLE WHEEL—J. M. Lenford, Hood River, Or.
802,106.—TOILET SEAT—J. V. Matteson, Fruitvale, Cal.
802,306.—SWIMMING APPLIANCE—E. J. McKittrick, Walla Walla, Wash.
801,893.—DOOR—A. C. Mortenson, Santa Barbara, Cal.
802,228.—CURRENT MOTOR—A. A. Morton, Walla Walla, Wash
802,304.—SASH FASTENER—S. F. and D E. Myers, Los Angeles, Cal.
802,108.—LINOTYPE MACHINE—C. J O'Brien, Redding, Cal.
801,902.—INCANDESCENT LAMP—S. Olafson, Seattle, Wash.
802,111.—ANNUNCIATOR—A. L. Peterson, Clipper Mills, Cal.
802,235.—CHANGE MACHINE—T. I. Pottier, San Francisco.
801,921.—ROCK CRUSHER—A. Scott, Carters, Cal.
802,123.—GUN MOUNT—M. C. Taylor, San Francisco.
801,944.—SHOW CASE—F. Weber, Los Angeles, Cal.
802,063.—TRANSOM OPENER—G. C. Weil, San Francisco.
802,343.—LOCK HOOK—E. Wiet, Sacramento, Cal.
801,953.—MUSIC LEAF TURNER—H. L. Wilson, Port Townsend, Wash

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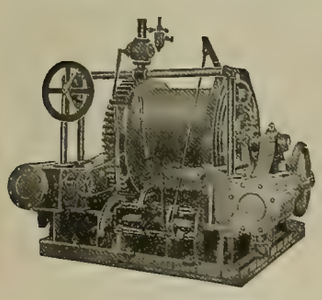

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Utah Agents: Salt Lake Hdw. Co., Salt Lake City, Utah.

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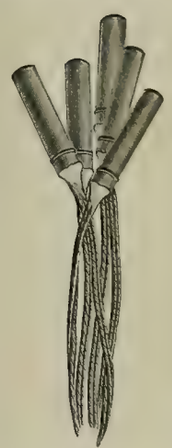

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Whole No. 2364.— VOLUME XCI. Number 20. SAN FRANCISCO, CAL., SATURDAY, NOVEMBER 11, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Um Garaiart Mines, Egypt.

View of Assouan on the Nile, Egypt.

Hieroglyphics on Rocks at Khorseghi.

The Temple of Phillae, Showing Marks of Inundation.

A Desert Resting Place on the Road to Absciel, Egypt.

An Ancient Miner Drilling.

Three Sheiks of Egypt.

Ancient Grinding Quartz Mills.

SCENES IN THE GOLD REGION OF EGYPT. — (See page 324.)

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SAN FRANCISCO, NOVEMBER 11, 1905.

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CALIFORNIA and Pacific coast manufacturers, who were long handicapped by prohibitive prices of fuel, are given much encouragement by the present ability to secure fuel oil at a comparatively low figure. Several establishments in San Francisco are now contracting for oil delivered at their respective plants for from 42 cents to 48 cents per barrel. Electric power and cheap fuel are greatly aiding in developing Pacific coast resources.

THE burning of the coke-making plant recently at the Sunnyside coal mines in Utah threatens to embarrass the smelters of that State somewhat in their metallurgical operations, as unless a supply of coke can be obtained elsewhere some of the furnaces must soon blow out, and wait until such time as they can secure a continuous and sufficient supply. This incident shows how closely different branches of the mining and metallurgical industry are interdependent upon each other. Should the coke shortage last long, it will materially affect the copper output of Utah.

THE staff of highly paid engineers, managers, and the large clerical force essential to the operation of an extensive mining proposition, would completely swamp a small enterprise. In the conduct of the affairs of the large concern this official paraphernalia are essential — though not infrequently overdone, but the small mine can usually dispense with them. In the history of some large mines which have been successfully run with elaborate official staff, the time usually arrives when the proposition can no longer be operated profitably under such conditions, but if the mine, or various portions of it, is given over to leasers, large profits are again forthcoming, simply because it is stripped of the greater part of the expensive engineering and office staff. All work is done in a practical manner by experienced men, and no extraordinary expenses are permitted.

Be Up to Date.

The methods employed by some mill and mine managers and superintendents in certain districts in Colorado are rather crude. From their conversation one would think they were living in some other age than the twentieth century. In one mill, particularly, an arrastra was observed in operation which was used in "pan amalgamation," as the operator explained. This machine was of the ordinary type and was between 4 and 5 feet across the top and somewhat smaller at the bottom—pan-shaped and probably 2½ or 3 feet deep, with an opening on one side at the bottom. This contained a stone weighing 250 to 300 pounds, which was being dragged around in the pan, which also contained quicksilver. Through the arrastra pulp from the stamps and plates was passing. This process completed the "amalgamation," and the operator explained that he was able to make a better saving with this method than by any other.

The efficiency of the arrastra as a gold-saving device has long since been recognized by those who have had experience in its use. In Mexico, Arizona and California the arrastra is well known and was a favorite device of the Mexicans and early miners in the Southwest; but in Colorado this simple, primitive machine is seldom seen. The thought naturally occurred that there are modern methods and appliances available in good milling which make the arrastra an unnecessary attachment in the stamp mill. This machine was operated by steam power—somewhat of a luxury for an arrastra, which is usually operated by the aid of a mule or horse.

As a rule, the operators of Colorado are progressive and up to date and always willing to adopt new and improved methods for handling ore, and especially in the treatment of the ore, and knowing exactly what each ton is worth as it goes to the mill or smelter. The superintendent of a property in that State said that he had been connected with the mine for the past eight years and that he had not spent over $25 in that time on assays. When asked how he could tell the value of his ore, or how much he should receive for it when shipped to the mill or smelter, he said: "Oh, that's easy enough; you see, when a man has been on a mine for a few months or a year he can tell close enough as to what the ore is running without having it assayed." This mine has been paying dividends under such management for some time past. What would the mine be worth to stockholders if they employed an up-to-date manager and improved methods? Inquiry usually develops the fact that such managers are not keeping posted on the methods of the day by reading progressive mining journals. They usually say: "Well, I am getting a daily paper and one or two others, and then, you see, I am kept pretty busy here most of the time—I don't really have much time for reading." An operator in Colorado discharged one of his men who had been with him for a year on the grounds that he had never seen the young man reading a mining paper of any kind, and that a man in his employ must keep abreast of the times or suffer the consequences of being sent down the hill. This summary method of dealing may have its advantages, but it would seem to be the better plan for the management to provide a reading room and suitable literature for the men and encourage them in the habit of reading up-to-date journals and books on those subjects closely identified with their work.

An Unappreciated Resource.

In Eastern States there are numerous instances where natural gas is employed in heating and lighting cities, and in some cases it is employed as fuel in metallurgical operations. In view of these facts it seems strange that the natural gas available in several of the Western States is not employed in the same manner. In portions of Utah, Montana, Colorado, Oregon, California, Washington, Nevada and elsewhere natural gas has been proven to exist in large amount, but it is utilized to a very small extent. In a few places it is employed for heating purposes, but it is not employed nearly as much as its importance and value suggest it should be. It is surely due to lack of knowledge of the value of this resource in the Western States that it is not more commonly used. In the East natural gas is employed extensively in heating and lighting, in the manufacture of glass, in the generation of steam, for puddling iron, in roasting ores, heating furnaces, in the manufacture of steel and also as a source of power in the gas engine, in drilling and pumping oil and gas wells, and in other utilities. In the oil regions of the West it is not an uncommon thing for a bore to strike a flow of gas instead of oil. In such event the well is generally either capped or fired and allowed to burn for months, wasting thousands of dollars' worth of a natural product that might be utilized at a profit as great as if it were oil and not gas that had been struck in the well. In some of the Eastern States more than 5,000,000 people derive the benefit of the use of natural gas as fuel. Large compressors are run by natural gas, which is exploded directly within the cylinders, the compressors pumping the gas from wells having weak pressures, and forcing the gas through pipe lines to the points of use.

The Diamond Drill in Prospecting.

At various periods in the past has been pointed out herein the advantage of a diamond drill prospecting company, which, under contract, would undertake to bore holes for the purpose of prospecting undeveloped ground. Such companies have since been organized and are in successful operation. One company formed for this purpose is operating under contract in the War Eagle and Center Star mines, at Rossland, B. C., in the Sullivan mines at Marysville, Mont., in the Nickel Plate mines, for the Daly Reduction Co., at Hedley, B. C., in the British Columbia copper mines at Princeton, B. C., in the J. R. Cook mines, in the North Moccasin mine, and in the Bullard mine at Kendall, Mont., and until recently in the Pittsburg & Montana, at Helena, Mont. Many mining companies and the individual owners of mines would like to have prospecting done as cheaply as possible, but do not look with favor upon the expense incidental to the purchase of a diamond drill outfit, partly because of lack of knowledge of the machine, of its utility, and of the manner of running it. The idea of a company organized to do prospecting by this means in a district is one at once appealing to those who appreciate its advantages. The work above referred to was mostly for the purpose of locating veins believed to exist, but the whereabouts of which was not definitely known. The holes bored were generally about 300 or 400 feet in length, boring proceeding at the rate of 15 to 40 feet daily, according to the ground. The cost of the black diamonds used in diamond drilling operations is at the present time from $60 to $65 per carat, depending on quality, some being superior to others. The work of setting these in the boring bit can only safely be intrusted to an experienced man, for a novice would, in all probability, lose the diamonds in the hole. Diamond drilling is a science in itself, but in experienced hands is a comparatively inexpensive and satisfactory method of prospecting ground. Holes may be bored to any depth up to 5000 feet, though deep holes require powerful and expensive machinery of this type, and are more expensive per foot drilled. The diamond drill is yearly coming into more extended use in the mines of the West, as the advantages of this means of prospecting becomes more familiar to mine owners and managers. Some excellent results have been obtained by the use of the diamond drill in Leadville district, Colo., in Utah in various places, and also in California.

MANY mines possess the elements of success, but are handicapped by a lack of sufficient means to equip and operate the property on a scale commensurate with its magnitude, or by the parsimony or ignorance of the owners or management. The mines which run on a margin of profit so small as to render the outcome always a matter of doubt usually produce the best superintendents, for their energies are constantly directed toward a legitimate reduction of expense while increasing the output. Although this is a fact commonly recognized among mining men, the popular saying is that "Good mines make good miners." This is an admission that the rich mine will pay under extravagant or inexperienced management, but where the profits are large there is usually little disposition to complain at the character of the management.

Annual Assessment.

The inception of a miner's title to his mining location is his discovery. This is a fact well established by the laws and the courts. To preserve and perpetuate this title the law requires the performance of certain acts on the part of the locator—the annual assessment work. The performance of this work, or the making of improvements on his claim to the extent of one hundred dollars annually, permits the miner to hold possession of his claim to the exclusion of all others. These are the two factors of perpetual ownership—discovery and the performance of the amount of work (or improvements made) to the extent of one hundred dollars annually. As the end of the year is approaching, many holders of unpatented mining claims naturally are making preparations to comply with the laws, and thus hold their claims for another period. In view of this fact a few pointers on annual assessment generally will be welcomed by many.

The miners of the West early called this performance of a stipulated amount of development work, or improvements, "assessment work," and the performance of it the "representation" of the claim.

The early Federal mining laws—those of 1866—made no provision for annual labor on mines, leaving its regulation to the several States or mining districts, but as the requirements of these were so widely different the Federal Statutes of May 10, 1872, made the necessary provision for this, to apply to all claims previously located or which might be thereafter located.

This law provided that the year within which the work should be accomplished should begin with the date of location of the claim; but this law appearing somewhat confusing where there were groups of locations owned by the same parties, the several claims of which were located on different dates, the law was amended January 22, 1880, and provided that the period within which the work to be done annually on all unpatented claims located since May 10, 1872, should commence on the first day of January next succeeding the date of location of such claim. This made the date of expiration of annual assessment on unpatented claims uniform throughout the United States. The law also provided that no assessment work need be performed within the year in which the claim was located.

As, under the provisions of this liberal law, a claim could be located on the first day of January, and no assessment work required within the year of location, nor during the following year up to the last month of the year, or just sufficient time within which the $100 worth of work or improvement might be made, several of the mining States of the West passed laws (as well as some counties and districts) which require the performance of a stated amount of work within a short period of the date of location, as a part of the act of location. This is undoubtedly wise legislation, as it has a tendency to lessen the likelihood of wholesale location of mining ground by the few first-comers in a new district, and aids materially in the development of the mineral resources of the country. Some of the States have also adopted laws relative to annual assessment work—not as a part of the act of location. Arizona, Nevada, North and South Dakota and Washington have statutes which formally adopt the Federal laws, and which, while not emphasizing the Federal statutes or adding to their requirements in any manner, practically shut out any district laws or rules which would have a tendency to increase the amount of labor required by the United States laws. In New Mexico the Legislature has fixed the value of a day's work at $4 for eight hours. The Wyoming statute provides that the assessment work on placer claims shall consist of $100 worth of manual labor, permanent improvements on the claim in the way of buildings, or roads or ditches made for the benefit or working of such claim, to show that the work or improvements are in good faith.

Colorado has a State law requiring that on placer claims of 160 acres, or more, there must be at least one hundred dollars worth of work, done annually before the first of August of each year. On smaller claims the amount shall be in proportion, but not less than twelve dollars worth of work shall be done on any claim. Where two claims adjoin, the work may all be done on one claim for the benefit of both. This law was held by the courts to be contrary to the Federal statutes and void. Colorado, therefore, has no valid legislation on the subject. In regard to lode claims, the Colorado law is silent, consequently the Federal laws alone control.

California and Utah have no legislation requiring the performance of any work as a part of the act of location, the Federal laws only being operative in this respect in those States.

In Colorado, the State laws require the filing of a location certificate within three months from the date of discovery. Before the expiration of this time, and within sixty days from the date of discovery, the discoverer must sink a discovery shaft on the lode to a depth of at least ten feet, from the lowest part of the rim of the shaft, or deeper if necessary, to show a "well defined crevice." Any open cut, crosscut, or tunnel which shall cut a vein at a depth of at least 10 feet below the surface, or a tunnel run along the vein for a distance of 10 feet, is considered equivalent to a 10-foot shaft.

In Arizona, within ninety days from the date of discovery, and posting the notice thereon, a discovery shaft shall be sunk on the vein to a depth of at least 10 feet, from the lowest portion of the rim of said shaft, or deeper if necessary, until there shall be exposed therein "mineral in place." An open cut, adit or tunnel may be substituted for the shaft, as a part of the act of location, which shall be equal to a shaft 10 feet deep, 4 feet wide and 6 feet long, and which shall cut a mineral bearing lode at a depth of 10 feet from the surface.

In Idaho the locator must complete his location by marking his boundaries within ten days from the date of discovery. Within sixty days from the date of location the locator must sink a shaft upon the lode to a depth of at least 10 feet from the lowest part of the rim of such shaft (which means that where the shaft is located upon a hillside the lower and not the upper side shall be the place of measurement), and not less than 16 square feet in area. As in the States above mentioned, a cut or tunnel of proper size, on the vein, may be substituted for a shaft.

In Montana the first requisite after discovery is the posting of a notice, and within sixty days of the date of discovery the locator must sink a 10-foot shaft, or run a cut or drift, exposing a "well-defined crevice" or "valuable deposit." The Montana law resembles that of Colorado in its general features.

In Nevada, also, the posting of a notice is required, and the locator must within ninety days from the date of location sink a shaft to the depth of at least 10 feet (or its equivalent), showing a "lode deposit" of mineral in place. This legislation has been held to be valid.

In New Mexico, from the time of taking possession, and prior to recording the notice of location (three months after posting), the locator must sink a discovery shaft upon the claim to the depth of at least 10 feet from the lowest part of the rim of said shaft at surface, or must drive a tunnel, open cut or adit upon such claim, exposing mineral in place at least 10 feet below the surface.

In North Dakota the locator must within sixty days from the date of discovery file a location certificate with the county recorder, but before filing such certificate must sink a shaft sufficient to show a well-defined mineral vein or lode.

The law of Oregon requires that the locator post a notice of discovery, and before the expiration of sixty days from the date of posting same, and before recording the notice of location, must sink a shaft to the depth of at least 10 feet. Here also an open cut, crosscut or adit, exposing the vein at a depth of 10 feet from the surface, may be substituted for a shaft. The law of that State distinctly provides that the work required by this State statute shall not be considered as part of the work required by the United States statutes. An affidavit showing compliance with the foregoing provisions is required to be made and attached to the notice of location and recorded therewith.

South Dakota requires a 10-foot shaft or cut with 10-foot face exposing mineral in place. As in North Dakota, the locator must record a location certificate within sixty days from the date of discovery, but before filing such notice must sink a discovery shaft on the claim 10 feet deep.

In Washington the locator is given ninety days within which to record a notice of location, but before filing the same he must have sunk a discovery shaft to a depth of at least 10 feet. Other superficial work equivalent in extent to a shaft which shall expose mineral in place at least 10 feet from the surface may be substituted for the shaft. These provisions do not apply to locations west of the summit of the Cascade mountains.

In Wyoming the locator has sixty days within which to sink a 10-foot shaft or make a corresponding open cut.

These State laws were passed with the object of compelling the would-be locator to actually demonstrate that he has discovered a mineral vein in place, and to further compel him to demonstrate his good faith by performing a stated amount of development within the period fixed by the respective States.

The language of the State statutes having a bearing on this subject is in many instances unfortunate, in that they anticipate a geological condition which may not exist. All miners know that a valuable mineral deposit may exist which has no distinct well-defined walls. Yet some of the laws demand a "well-defined crevice," "well-defined mineral vein or lode," etc. It is evident, of course, that the intent of the law is that "mineral in place"—that is, not loose detached pieces of ore commonly known as float, shall be discovered.

There is no question as to the wisdom of this State and district legislation, which has a tendency to promote the development of the mineral resources of the country. In all cases after the first two years succeeding the date of location, except in the few States which have laws on annual assessment, the claim holder usually defers his assessment work until he is compelled to resume it to save his location from being taken by another.

The class of work or improvements permissible as assessment work is that work or development which will have a tendency to improve the property, or that class of improvements, in the way of buildings, machinery, ditches or roads, or other substantial investment which may have a direct benefit on the development and operation of the mine or mines.

In case of a group of claims the work (or improvements) may all be placed on one of the claims if for the manifest benefit of all, or the expenditure may be made entirely without the limits of the group for the benefit of all of them. If a portion of the group is patented, the expenditure may be made on a patented claim for the benefit of all the claims in the group which are unpatented, it being only necessary that the equivalent of $100 be expended for each unpatented claim of the group.

THE time usually arrives in the history of most rich mines when the fact can no longer be disguised or disregarded, however unpalatable it may be, that the rich ores are giving place to those of lower grade and of more complex composition, with a correspondingly increased expense in treatment and a lessened return per ton of ore treated. There are scores of examples of this condition, and the unwelcome change in ore composition and value must be offset by corresponding changes in mining methods, ore handling below ground and on the surface, and the adoption of metallurgical processes which will secure a higher extraction at reduced cost. In other words, the change from rich to low-grade—or from free milling to base—ore must be met by the wise application of methods and processes which will result in a corresponding reduction in costs. This, modern science usually makes possible, but to take advantage of the new order of things the management of mines must sweep aside prejudice, time-honored precedent, tradition and practice, for that which is superior.

ONE of the features of modern copper mining in the Lake Superior region is the vigorous exploration of copper-bearing beds which have been known for years, but which were recognized in former times as containing too small an amount of metal to afford a profit under the conditions existing and the methods of operating at that time. The cheapening of production by the introduction of improved methods and machinery now bring some of these low-grade deposits within the range of possible profit.

CONCENTRATES.

THE presence of lead or iron in gold renders the alloy brittle and unfit for use where strength or ductility are essential.

COLD rolled steel makes excellent "U" bolts for machine drill use. They will outlast other metal generally used for this purpose.

IN Kings county, California a mine telephone is in successful operation a distance of 50 miles, the conductor being the wires of a barb-wire fence.

A VEIN may occur at contact of a dike with older rock, or it may occur wholly within the dike itself, due to fissuring of the dike subsequent to its injection.

ANY mineral at all soluble in water will leave a clearly perceptible residue on a platinum dish when the solution is evaporated. Gypsum is slightly soluble in water.

IT never pays to handle rock or ore in a wheelbarrow where a track and car can be utilized. The difference in cost will in a short time pay for the installation of track and car.

MADAGASCAR has gold mines, but the development of the mining industry in that island is as yet in its infancy. The gold output of Madagascar in 1904 was about $1,500,000.

GOLD which has been collected in metallic iron in metallurgical operations may be recovered by roasting the iron with pyrite and a small amount of rich copper ore on the hearth of a reverberatory furnace.

COMPRESSED air was used for agitating the silver-bearing solution in the hypo-sulphite of soda lixiviation of silver ores, when sodium sulphide was added to the solution for the purpose of precipitation of the silver.

A SUBSTANTIAL tramway trestle may be made of 2x8-inch lumber if the pieces be properly disposed. There is a tendency to employ timber of unnecessarily large dimensions in structures of this character.

IF the bolt holes in the base of a mortar are not of the same size as he anchor bolts, the mortar is very likely to shift about on its foundation and in time get a rocking motion as the stamps fall and finally require resetting.

BERYLS are usually various shades of green, shading to light blue and whitish blue, but are also occasionally found of rose red color. Crystals of the latter sort are found in the gem mines at Mesa Grande, San Diego county, Cal.

THE grade of ditch lines, roads and tramways may be established with sufficient accuracy by the use of the triangle and plumb-bob. The accuracy of the work depends entirely upon the care employed in the use of this simple instrument.

IT is stated that the Britannia copper mine on Howe Sound, B. C., is equipped with 400 rock drills of various types, and there are said to be more rock drills operated in the lead-zinc region of southwest Missouri than in the entire State of Colorado.

IT is ordinarily unsatisfactory to build heavy structures of any kind on a mine dump unless it has been made many years and has firmly settled. A new dump shrinks in volume by the slow settling of the mass, which continues for years in some cases.

HONEY-COMBED and heavily mineralized veins undoubtedly offer a better inducement to exploration than veins of pure white quartz. Very few large veins of white quartz outcropping on the surface contain payable values. There are exceptions, but they are rare.

A GOOD suspension bridge may be made from disused mine hoisting cables. Such a bridge may be built over almost any stream where sufficient tension can be brought upon the ropes, to give them a proper catenary curve. Such bridges have been constructed and used for the passage of mine cars, and also to carry air and water pipes.

THE expense of treating ores in a stamp mill is determined by the capacity of the plant per crushing unit, the number of men employed and the wages paid, and, to some extent, the arrangement of machinery and distribution and cost of power. Mills having the same crushing capacity are not always operated at the same expense per ton of ore treated.

IT is difficult to suggest a name for a new location that will not conflict with others already in existence. Miners seem to have exhausted their ingenuity in that direction, and duplication of names of mines is of very common occurrence, particularly among the more noted mines, such as Anaconda, Silver King, Homestake, Independence, Tonopah, etc. A prospector in Riverside county named his claim Hexahedron, a name which has probably not as yet been duplicated, but should the claim of this strange name come into prominence there would doubtless soon be numerous Hexahedrons.

QUICKSILVER occurs usually as the sulphide (cinnabar), also as metacinnabarite, another sulphide, and as native mercury. A few other mineralogical occurrences are of merely scientific interest. The large deposits of the world occur under almost identical geological conditions—at or near the contact of sandstone and serpentine.

A VALUABLE paper on tellurium ores can be found in Vol. XXVI, p. 485, Trans. A. I. M. E., written by Frank Clems Smith. It is entitled the "Occurrence and Behavior of Tellurium in Gold Ores," more particularly with reference to the Potsdam Ores of the Black Hills, South Dakota. A discussion of this paper will be found in the same volume beginning at p. 1103.

IT is not likely that the X-ray will prove of material or practical value in the determination of the values in ore. It is no doubt true that the metal may be seen in a small piece of rock by use of X-ray apparatus, but ordinarily gold and other minerals of value occur disseminated in extremely small particles, and where they do not may be seen without the aid of this extraordinary paraphernalia.

THE composition of the ore charge at Mount Lyell, Tasmania, is stated to be about as follows: Fe, 40.30%; SiO_2, 4.42%; $BaSO_4$, 1.48%; Cu, 2.36%; Al_2O_3, 2.04%; S, 46.01%; Ag, 2 ounces per ton; Au, 0.0725 ounce per ton. This general average is maintained as nearly as possible by mining the necessary amounts from various portions of the ore body, which differs in composition from place to place. The height of the ore column in the furnace is kept at 9 feet 6 inches.

A FARRED LETTER in a chemical formula indicates that two atoms of that element are represented by the symbol, while each of the dots over the symbol represents one atom of oxygen. The small numerals to the right of any symbol multiply not only the number of atoms of the element represented by the symbol, but also the atoms of oxygen indicated by the dots above it. This is a survival of the old dual system, by which the cathions were represented as oxides and the anions as hydroxides. It is now obsolete.

PYRITE containing 40% iron and 43% sulphur is worth at the present time at tide water in Spain about $2.50 per ton. A large amount of pyrite is shipped annually from the Spanish mines. A similar grade of pyrite at San Francisco, Cal., is worth about $4 to $4.50 per ton. On the Pacific coast a higher grade of pyrite —50% sulphur—is desired by the manufacturing chemical companies. At the port of New York pyrite sells for about 10 cents per unit of sulphur contained. At this rate a 50% ore would be worth $5 per ton of ore.

DIFFERENTIAL results in the re-assay of pulp samples, which have been submitted for check assays, probably represent the different quantities of gold and silver in the several lots taken from the pulverized general sample, and not to defective assays. Gold ores in which the gold is evenly disseminated in very fine particles give more uniform results than where the values are in coarse gold. The screening out of metallics, and the addition of these values to those obtained in the assay of that portion passing the screen, must necessarily lead to differing results.

CHUTES constructed of pipes or of wood, if of greater than 6 or 8 feet length, should have a slope angle of at least 35°, or only dry rock will run in them. A long chute provided with a gate at the lower end, and which is filled with a mixture of fine and coarse ore, if at all damp will not run readily at even 35° when the gate is opened, it being frequently necessary to enter the chute and move the ore along. Such chutes should have a slope of about 45°, but should be kept full, or the impact of the falling ore when dumped from a car will soon wear the structure out, even if lined with iron.

THE hydro-metallurgy of copper is not a simple proposition, for its success depends to a great extent upon definite chemical knowledge and experience. Some ores are naturally suited to leaching, but others have to be prepared by roasting and by other preliminary treatment. The roasting must be done with greatest care by experienced men, or it may easily be overdone. It is the process often adopted for ores too low grade in copper to be treated at a profit by any other method. Twenty or more years are required for sulphide ores to oxidize sufficiently by natural processes, so that the copper may be recovered by leaching.

IN the use of machine drills it is very essential that sufficient lubricating oil be used inside the machine, but the tendency is to use too much. Any excess of oil will be blown out within a few minutes after drilling begins. The machine should be examined by the machinist frequently to see that the machine is kept properly packed, and the management should not permit the miners to take a machine apart underground in the working place, for even if the drill runner be competent to make the necessary adjustments or changes, which generally he is not, the drift or stope is not a machine shop, and not the proper place to perform such work. Usually more harm than good is done in this way. If the machine fails to work well it should be sent to the shop, whether it be on the surface or underground.

THE mineral contained in rock—pyrite, galena, blende, chalcopyrite—usually will break free from the gangue if the ore be crushed sufficiently fine, for the reason that the surface between the ore particle and the gangue mineral is a natural surface or plane of fracture. If ores are not crushed sufficiently fine, the mineral will not separate readily from the gangue, and a portion of the values must thus pass into the tailings as this grain of ore; part sulphide and part gangue will not, in all probability, be saved on the concentrator. It at once becomes a choice of crushing finer and making a higher saving while lowering the crushing capacity of the mill.

NATURAL lubricating oil—petroleum—is a composition of gases and liquids. When the oil reaches the surface of the earth the gases pass off into the air leaving behind the liquids, the composition of which is variable proportions of carbon and hydrogen. It is usually a dark green by reflected light, and red by transmitted light. The various grades of petroleum are known under the general term "hydro-carbons." The principal combinations in the crude state are methane, CH_4; ethane C_2H_6; prophane, C_3H_8; butane C_4H_{10}; pentane, C_5H_{12}; hexane, C_6H_{14}; heptane, C_7H_{16}; octane, C_8H_{18}. These compounds appear to bear a simple relation to each other throughout the series.

WHEN a dike of intrusive rock accompanies a vein, the geological conditions must show whether the vein or dike is the older. In case the vein is cut by the dike, it may be that the dike has little if any influence on the ore deposition, as in its intrusion it has simply followed a line of pre-existing weakness, the plane of the vein. If, on the other hand, the dike is found to be a portion of the vein, having been altered by the infiltration of waters from below, then there is the liability for the dike to occupy the entire fissure, and the values to practically disappear, as, in all probability, only those portions of the dike which have been subjected to pressure and crushing will be found infiltrated with mineral to a payable extent.

IT usually pays to spread concentrates out on a drying floor, frequently raking them in order that the moisture may disappear by evaporation before shipment to smelters. This is particularly advisable where the transportation charges are high. Many mines ship concentrates carrying from 10% to 20% moisture, which is little less than this amount when received at the smelters, as the opportunity for drying when sacked is greatly reduced. Some shippers claim it is economy to ship damp concentrates, but this is a policy rarely justified. A ton of damp sulphides containing 12% moisture will cause a greater loss than those shipped dry and which lose something by dusting. This latter factor can be reduced by the use of canvas sacks.

A UNITED STATES deputy mineral surveyor is appointed by the Surveyor-General of the respective districts. A deputy may hold a commission in more than one State, but can make no surveys in a district in which he holds no commission. He must give a bond in the sum of $10,000. They are officers of the Land Department and as such are under obligations to perform their duties in accordance with official instructions. At one time the Land Department held that they were not prohibited from making mineral entries within the district for which they are appointed, but by subsequent rulings it was determined that they came within the inhibition of Section 452 of the Revised Statutes and were prohibited from entering or becoming interested in any of the public lands of the United States. There has been some controversy and uncertainty about the legality of this departmental ruling, but a recent Supreme Court decision has determined that a deputy mineral surveyor can locate no public land of any description, nor hold an interest in the same.

GOLD POCKETS are usually discovered by systematic search and not by coming upon them by chance. The pocket hunter pans the alluvial on the hillside where he thinks a pocket may be found, and finding gold pursues his investigation systematically, usually digging shallow pits at stated intervals. If the gold found comes from a single point on the hillside above, the occurrence of gold as indicated in the test pits, will indicate a fan-shaped distribution of the gold from the vicinity of the pocket down the hillside, the gold gradually spreading out as the distance from the pocket increases. The pocket may be shallow or lie deep beneath several feet of soil and rock. When the latter occurs it makes the labor of the pocket hunter more difficult and its results less certain. Those who follow pocket hunting as a business usually become very expert at it and can "read the signs" as they are uncovered in digging with almost unerring certainty. When the pocket hunter becomes thus expert he is able to save himself much labor and can more quickly reach a safe conclusion as to probabilities after on y a few holes have been dug.

Gold Mining in Egypt.*

The gold district of Egypt, as far as known at present, is situated between the river Nile and the Red sea for 100 miles or more on either side of the 24th parallel north latitude. Assouan is one of the chief cities in this part of Egypt and in recent years has come into prominence through the construction of a dam across the Nile near the city for the purposes of irrigation. The quarries of red granite of Assouan are noted, the stone having been used extensively locally and also by the Romans.

In this region are many evidences of former occupation of the country by miners. Numerous ancient workings have been found and in some of them rich ore still remains.

The writings of the ancient Greeks, and also the inscriptions on the rock faces and the walls of temples and other buildings, indicate that the mines were not worked steadily, many interruptions occurring on account of wars.

The gulches and valleys of the region contain alluvial gold, and some of these have been extensively worked by the ancient miners. One of the most important of these is the Wadi Allaghi, which runs in a northwesterly direction from the vicinity of Mount Elba, near the Red sea, to the Nile, as indicated on the accompanying sketch map of the region. Other gold districts are those of Um Rus, Oneib and Ciega. There are also ancient copper mines in this mineral region.

The ancient Greek geographer thus describes the methods of mining in those days:

"They put fire to the reefs, and the thus loosened stones were taken away and crushed. The chief quartz powder by water, on specially constructed tables. The lighter parts are washed away, while the heavy gold dust remains in the rills. By taking up the gold with soft sponges it gets a final cleaning, and is then molten in small clay retorts, with a mixture of lead, salt, a little tin and bran. After glowing for five days and nights, the material is one compact gold mass, in quantity only a little less than the quartz powder has been."

One of the accompanying illustrations shows a number of these ancient mills of stone. Mining was evidently carried on successfully in this primitive fashion for many centuries, and apparently mostly before the Christian era. There have been numerous concessions granted to mining corporations to reopen and operate these ancient mines, among them being the Egypt & Sudan Mining Syndicate, the Egyptian Gold & Gem Syndicate, for emeralds are reported in the ancient workings found on this company's concession between Hamesh and the Red sea. Others are the Egyptian Sudan Minerals Co., Deraheib & African Syndicate, and the Nile Valley Co., Ltd. The latter is one of the most important and has the most extensive ancient workings on its concessions. This property is under the management of John M. Beckwith, E. M., who several years ago was general manager for the Silver King Mining Co., Ltd., at Calico., San Bernardino county, Cal. The deserts of Egypt present few novel features or conditions to Mr. Beckwith, who became thoroughly familiar with similar conditions in southern California. In a private letter recently written he says some of the veins are rich, and that in a few days he took out about $50,000 in specimen rock. These mines are at Um Garaiart, about 60 miles from the river Nile and 100 miles from Assouan. At Ceiga No. 1 are the deepest mines. The vein is 4 feet wide and was evidently rich also.

There is much that is speculative in the history of these mines of Egypt, though of great interest. The accompanying illustrations, and also those on the front page, give a good idea of the topography and sterile aspect of the Egyptian desert. The inscriptions on the rocks are still well preserved, as they

View in Ancient Workings at El Hudi, Egypt.

Team of Camels Drawing Wagon in the Desert, Egypt.

Looking North from Absciel—Ancient Copper Mines.

Prospect Shaft at El Hudi, Egypt.

Ancient Workings at El Hudi.

work had an expert miner to perform, who brought the laborer to places where he had traced the gold, and divided the work among them according to the capacity of the single man. The strongest, and still in the prime of manhood, were used to break the stones and to work in the shafts. Without anything else but their own strength, they were breaking the stones with heavy iron hammers and following the gold-carrying vein. A light was fastened to their foreheads, and, under the eyes of their gruesome foreman, they had to work from morning to night. The stone material was carried by children out of the shafts, and only the oldest men, useless for any other work, had to bring it to places where others were kept busy crushing. This was done by strong young men of about 30 years of age, using heavy iron pestles and stone mortars, the latter being hewn in the solid rock. In mills, placed in long rows, one close to the other, the crushed quartz is ground by women. Only expert laborers were treating the must continue to be for many centuries more—if not defaced—in that dry atmosphere. The accompanying map and the following description of the mines of the region are from the London Mining Journal:

In the works of Um Eleacha two working periods are distinguishable. As sure, we only know that already before the times of the oldest Egyptian kings, or at their times, a mining population has been working in the districts between the Nile and the Red sea, but most probably unknown to anyone in Egypt.

The old Phœnicians already were trading in these districts, and later the Egyptians got enormous amounts of gold from here. To make an exact calculation of the gold produced is impossible; one can only imagine it when reading the accounts of the treasures of the Egyptian kings, and from the highly advanced skill with which the jewelries found in ancient tombs are worked.

It seems that with the diminishing power of the Egyptians the mines have been more and more neglected, and later we can only find that in the begin-

*See Illustrations on Front Page.

ning of the ninth century after Christ they again were exploited by El Omari, a descendant of the Khalefa. The first mine, most likely, was at Um Garaiart, about 60 miles from the Nile, at a place where water was plentiful. These mines were worked with varying success, and in them we have the Nile valley mines of to-day.

Owing to quarrels with the different tribes, El Omari had to retreat to a mine farther south and farther off the Nile, near the Gebel Aswad. Here water was very scarce. After he had slain the Nubians and secured a way for water from the Nile, El Omari worked here for several years. A third mine was at Ceiga, three days from the Nile. Here the gold-bearing reef has been taken out to a great depth—how deep it is impossible to say, as in some places the hanging wall has fallen in, and the workings are silted up to about 100 feet from the surface. In other parts the workings are about 300 feet deep. The reef here is about 4 feet wide, and the ancients have removed all the gold-bearing stone, leaving the white buck reef standing.

With much blood is marked the history of these mines, for which 60,000 camels were carrying provisions from Assouan. The gain from these works must have been enormous, but nowhere has been found anything definite about the value of it.

About the northern mining districts of Hamamat and Sighdit (Sikait?) reports have been published by Mitchell, but for exactness they cannot be compared to those of Floyer. Mitchell only describes the discovered ruins of ancient settlements and the traces of mining works around the Hamamat district.

Brugsch Pasha is proving from ancient documents that the first working period has been about 2500 B. C. The Pharaohs of the second dynasty were already working them, and to judge from hieroglyphic inscriptions found by Mitchell in the ruins at Hamamat, the second period was begun under the Ptoleman King Euergetes, about 200 B. C.

Farther south, in the western and southern wadies of the Gebel Elba, several large and small mines have been discovered. Linant de Bellesfond was probably the first to examine them. He reports of them as follows: "In the upper part of Wadi Murat, about 21° 10′ latitude north, are traces of old mines and quartz reefs, which have been worked from the open. The reef runs from southeast to northwest, and the quartz seems not at all rich in gold. These mines are of a much later date than those at Gebel Raft." Here we have the Om Nabardi mine of the present day.

In the Wadi Habsah (20° 20′ N.) are numerous traces of old settlements—broken quartz and ruins of huts where the latter seems to have been crushed. It seems as if these mines have been worked without any rule, and the reefs are mostly worked only at the surface.

Of a much later time are the mines of Ceiga, before mentioned. Here a big quartz reef in mica and talc-slate is divided into numerous small reefs and veins, leading in every direction. The most of these veins have been exploited at a small hill. To judge by the ruins of old dwellings, a large number of workmen must have been employed here. From 400 to 500 single huts are scattered about in the valleys, and in many of them are still found small handmills for grinding the quartz. It seems that the work here has been suspended after exhaustion of the quartz, as far as they could reach it.

Deraheib is situated at the south of the Wadi Allaghi, which latter is leading northwest to the Nile, as far as Dakkah, between the first and second cataracts. Here are the ruins of quite a large town. Big parts of two castles on the opposite hills are still standing in very good order. Two periods can be distinguished here by the construction of the buildings, as well as by the methods employed in mining.

Map of Southeastern Egypt, Showing Locality of Gold Mines.

The old mines distinguish themselves from the others by their vastness and the carefulness with which they have been worked. The quartz reef has split into many branches and veins, and every one of them has been followed by the miners. These mines were worked by the Copts in 1300 A. D.; the name Deraheib is from Der (a convent) and aheib (beautiful). At some places two main shafts have been sunk, and farther down both have been connected by long drives. There are vast places entirely hollowed out, and the ways in many of the big workings are barred with hills of broken down walls and debris. One of the shafts is closed up at the end by a solid stone wall. These mines were first worked in the times when Egypt was governed by the Pharaohs. In almost every shaft the walls have been tried much later with chisels, probably to examine the quality of the quartz.

The later works of the Arabs are all in the open, as the Arabs detested to work underground. To judge by the numerous ruins of huts and great buildings, a large number of workmen must have lived here. Most probably there was formerly plenty of water through rainfalls, as wells have not been found.

Though neither documents nor inscriptions have been found here, doubtless these are the mines of which Diodorus, the ancient Greek writer, speaks, and which were said to be Allaki, probably the Allagi of to-day. Diodorus describes the gold production of the ancient Egyptians in the year 50 B. C. as follows: "On the borders of Egypt and the neighboring countries, some districts are full of mines, which produce plenty of gold. The soil is black, but has many veins white as marble and glittering from the precious metal. A large population is working here, as the kings of Egypt are sending to the mines not only all the criminals of the country, but also their whole families, and even their descendants and relations, to multiply the revenue of the mines. With chains forged to their feet, these people are working day and night. They are watched by soldiers, who do not understand their language. Nobody cares for them, and whether they are well, or sick, or weak, they are driven to work until death releases them."

An inscription in the palace of Thebes, Karnak, states the revenues from the gold mines of the Egyptian Kings to have been 22,000,000 minas. This sum has been calculated as equal to £6,000,000.

After Diodorus nothing is mentioned about these mines by any other author until the Arab Macrusi, who lived about 1385 A. D., or 1430 years after Diodoc. He tells that under the reign of King Achmed of Egypt, an Arab went to Nubia, and was working there, under an everlasting war, in the old mines.

It seems strange that in the long space of time between the two periods of Diodorus and Macrusi no mines have been worked, and that the mines should have been desolated for so long. The places known as gold carrying, and which have been worked in olden times, are:

Um Gariat Ceiga Gebel Abdulla Machemunaye Um Gabril Tamille Gebel Essewed Gebel Tellatabd Um Taiur	Between 22° and 23° latitude north.
Oneib Wadi Hegatte Wadi Affave Wadi Daguena Wadi Nasarrie Deraheib	In the district of the Melekal Arab.

At all these mines, which were exploited in the old times on a considerable scale, but later on a smaller scale, the sometimes very variable gold production had to be got through a most wearisome kind of mining, and the revenues of the different works could only be considered as a profit in representing the labor of prisoners and slaves.

Two days south of Deraheib is Oneib. Here are the largest workings in Egypt or the Sudan. The reef here occurs in a range of four slate hills, and the gold-bearing stone has been all removed down to the Wadi level. These hills are literally cut in two. There are three reefs here, but only the first one appears to have been worked for any length of time. A half a day's journey northwest from Oneib are the old workings of El Harr. Here there are ruins of many old buildings and the remains of crushing mills. The works here are not to be compared to those at Oneib, but it is probable that all the stone was brought from Oneib to here to be treated with water. There is a large quantity of tailings here. El Harr is situated at the junction of two wadies, or dry water courses, and it is probable that there was a good supply of water here, both from rainfalls and wells. Wells may have been sunk by the ancient miners, but are now silted up to the surface.

Taking into consideration the machinery of to-day, and the fact that the ancients had no pumps or appliances for dealing with water, and must therefore have been stopped on reaching water, Egypt appears to have a bright future as a gold producing country.

Venezuelan Gold Fields.

TO THE EDITOR:—Gold in abundance occurs in all parts of the Venezuelan Guiana. Through liberal laws a stampede to the region could be easily induced. The placers are especially rich, the climate fair and the inhabitants favorably disposed toward English speaking people.

Most of the auriferous Guiana region is embraced in the Territory of Yuruary, recently created. Yuruary is as large as France. It has a population of 15,000.

In such a great extent of land, subject to many atmospheric changes, there is no uniform class of temperature. Both topography and geological conditions cause divergences of climate. On Muria hill, for instance, the thermometer always shows a temperature between 15° and 20° lower than that of the plains below. A similar variation of temperature is observed in all localities where there are groups of hills placed in the midst of savannahs. In August, September and October the thermometer often registers 110° F., but at all other times the Territory enjoys a fresh and agreeable climate, which contributes to good health.

The principal orographic feature is the Paracaima range, and the most notable landmark is Mount

Roraima. There is a zone about 2000 square miles in extent in which there are many natural prairies, interspersed with lomas and traversed by some elevated table lands, resembling small sierras, where the gold is found. The upheavals most noted for auriferous deposits are Muria hill, Botanama, Miripia, Tomasote, Carapa, Platanal, and Caroni. The region is at present given up almost exclusively to the raising of cattle. There are numerous springs.

The rest of Yuruary is entirely unknown. It is a forested country, unexplored—an immense wilderness, whose area has never been calculated because of a lack of data and detail. Only the edge of this region is known, since it surrounds the partially settled pastoral district on all sides. It offers itself only to the imagination as a defiant sea of vegetation.

There are few inhabitants in the Venezuelan Guiana except the aborigines. In the entire Territory there are but two Americans. South of the Cuyuni river live Caribs; to the south of these Arecunas and Guaicas, who people a picturesque plain called Camarata; still farther southward, on the road to Mount Roraima, where the jungle becomes so thick that a man can hardly "cuss a cat" through it, live the Marabitanos, who occupy a beautiful prairie known as La Gran Sabana. The Marabitanos are white Indians, who cultivate beards. They are now at war with the Arecunas and Guaicas, who are beardless, olive-complexioned aborigines. The Caribs are of a light mulatto color. They fight very little, but eat all strangers who stray singly among them.

All these tribes are composed of robust, well-built Indians, inclined to agricultural and pastoral pursuits. They gather rubber in the forests and transport it by the Cuyuni river to Georgetown, in British Guiana, for sale. They recognize the Government of Venezuela, but have no dealings with Venezuelans. Most of them are Christians and have Spanish names, though few of them speak Spanish. They all speak English—in a way.

There are forty-five different kinds of useful woods found in the forests of the Yuruary region.

In 1889 the population of Yuruary was 13,000. In 1891, after the inception of exploration work under President Crespo, it was 18,000, or an increase of 40% in two years. In 1898, just before General Castro came into power, it was 28,000. The fall to 15,000 has occurred almost wholly during the last two years. Within two years more, under the unscientific Government now existing, it will fall below 10,000. In three years sixty towns have disappeared.

Decadence of the gold mining industry is due to the nationalization of mining property by Castro. Titles to mines cannot be secured and gold cannot be extracted without a penalty.

As showing the great importance of the Venezuelan Guiana field, it may be stated that during three years of the progressive Government of Crespo the production of gold increased 70%.

Americans will do well to watch for a change in the Venezuelan Government, to pour into the Guiana region at the earliest opportunity. The gold is ready for appropriation. JOHN DWYER.

Caracas, Oct. 15.

THE PROSPECTOR.

The samples from Silverbell, Ariz., have been examined with the following results: No. 1 is practically all silica and has the appearance of being a silicified intrusive (dike) rock; there is also a small amount of carbonate of lime in it; this rock bears a remarkable resemblance to the gold ores of the Gold Roads district of Mohave county, Ariz., and this department suggests that the rock be tested for gold and silver—on general principles. No. 2 is a slightly porphyritic feldspathic rock. No. 3 is diorite-porphyrite, containing considerable iron sulphide. No. 4 is also porphyrite, though of lighter color; both rocks are intrusive. No. 5 is quartz porphyry—numerous blebs of quartz, with crystals of feldspar in a fine-grained groundmass. Nos. 6 and 7 come under what is known as keratophyre, a fine-grained rock composed chiefly of feldspar; both rocks contain a considerable amount of magnetite in small grains. No. 8 is syenite in which the hornblende is very much decayed; it contains a little biotite mica and very little quartz; sulphides of iron and copper also occur. No. 9 is a feldspathic rock, somewhat altered and colored greenish by finely disseminated microscopic particles of chlorite; it also contains pyrite in disseminated grains.

The light greenish-gray rock from Bearmouth, Mont., is felsite, a feldspathic rock; it contains pyrite and may occur in or with gold ores; rocks of this description should be assayed to determine the values, if any, in gold and silver; the appearance of pyrite in this rock, together with the fact that it contains more silica (quartz) than it normally should, suggests the advisability of doing some prospecting on or near it; the green mineral is silicate of iron and magnesia.

The metallic mineral from Prescott, Ariz., is antimony sulphide; as it only occurs as an incrustation on the rock, it is of little value for the antimony it may contain.

The Salts of Potassium.

One of the pamphlets recently issued by the United States Geological Survey is entitled "Potassium Salts," and is the advance sheets of the Mineral Resources for 1904. Although the production of potassium salts would be of great value to the United States, there has been comparatively little effort made to find them. W. M. Courtis, writer of the bulletin in question, says in this regard:

No systematic work has been done in this country for the purpose of developing beds of potassium salts, with the exception of the work done by a small Michigan company organized in 1899 for that purpose. Within recent years both individuals and small companies have attempted to exploit certain districts or properties for potassium salts, but so far as is known they have accomplished nothing of practical value. The actual work of the Michigan company referred to was limited to one hole 500 feet deep put down at Cody, Wyo. A contract was made for drilling 2500 feet, but after boring 500 feet the men threw up the contract.

Very little money has been expended in the attempt to discover potassium salts in the United States in comparison with the value of the discovery to the country and in comparison with the sums of money expended on the German mines by way of exploration. The United States Potash Co. did not expend over $30,000 in its four years of surface exploration and preparatory work, and private individuals have reported a total outlay for exploration of about $40,000. In the German field, where the extent of the deposit is pretty well defined, immense sums of money have been expended in exploration. The Hohenzollern Co. at Alfeld-on-the-Leine spent some £300,000 in fruitless exploration work. At Bentheberg, near Hanover, a shaft was sunk 3250 feet and potassium salts of fine quality were found; but the shaft failed, owing to the influx of water into the mines. The Deutsche Solvay Werke at Micheln, in the Kalbe district, has a capital of $2,380,000 to be used for the development of potassium salts.

There are seven districts in the United States, including a Mexican locality extending into the United States, which seem to offer the most favorable conditions for boring, and in which a hole put down 1000 to 2000 feet would decide for that district whether it contained a bed of potassium salts or not. These seven fields are in the neighborhood of:

1. Cody, Bighorn basin, Wyo.
2. Magnesian lakes, near Laramie, Wyo.
3. Byron springs, Contra Costa county, Cal.
4. Death Valley, Cal.
5. Sierra de los Cucapas basin, Lower California, extending into San Diego county, Cal.
6. Boundbrook, N. J.
7. Mount Tom, Mass.

Although no deposits of potassium salts similar to those found in the Stassfurt district of Germany have been discovered in the United States, various indications of possible potassium deposits have been found in saline springs, in oil wells and bore holes, and in desert deposits.

Along the line of a fault on the rim of the Big Horn basin, Wyo., the waters are rich in potassium salts, running from 5% to 11% of the total residue. The latter amount is claimed for the Great Spring of Thermopolis, at the eastern end of the Big Horn basin.

POTASSIUM SALTS IN OIL WELLS AND BORE HOLES.—Many of the saline waters struck in wells and bore holes in the Western oil fields have been tested for their potassium contents. In many cases the quantity was so slight that no record of the analysis was kept. A few examples of the richer analyses are given in the following table:

POTASSIUM SALTS IN SALINE WATERS FROM CALIFORNIA OIL FIELDS.

Sample.	County.	Percentage of Potassium Salts in Residue.
1. Oil City bore hole	Fresno	6 51
2. From sulphur bank	Lake	Slightly over 2.
3. Williams Bros.' oil well	Napa	Slightly over 1
4. From Miners' oil well	Colusa	Slightly under 1.
5. Coalinga	Fresno	0.62
6 Berryessa oil well	Napa	0 7

No analyses of oil-well water have shown a higher percentage of potassium salts than those here given.

POTASSIUM SALTS IN DESERT DEPOSITS.—From time to time large deposits of potassium salts are reported as found in the arid regions of the West, but on examination these deposits usually prove to be mixtures of sulphate of lime, sulphate of soda and carbonates, with but a small percentage of potassium salts. Prospectors have analyses made, and the chemist reports perhaps 20% of sodium and potassium salts. The prospectors immediately imagine this percentage to be largely potassium salts, while as a matter of fact it is chiefly soda and contains probably 1% or less of potassium salts. A good example of such deposit is that of Cariso creek, San Diego desert, Cal. Another is a deposit in Uinta county, Utah (south of Rock Springs, Wyo.)

The composition of the deposits of salts about the sinks of the desert country may be seen from the following analysis, which may be taken as a general type of all such deposits:

ANALYSIS OF SALTS FROM CARSON SINK, CHURCHILL COUNTY, NEV.

	Percentage.
Insoluble in acid, gypsum and clay	77.264% } 88 554
Water and organic matter	11.290% }
Sodium sulphate	1 396
Sodium chloride	.677
Potassium sulphate	.214
Ferrous sulphate	.690
Magnesium sulphate	.097
Calcium sulphate	.367
Soda, as silicate or other combinations	4.290
Traces and undetermined (total salts 11 446)	3.715
Total	100 000

A full description of the various soda lakes throughout the country is to be found in Bulletin No. 60 of the United States Geological Survey.

An analysis from a deposit in the district in the neighborhood of the volcanoes of Lower California, lying west of the Sierra de los Cucapas, and probably extending into the San Diego desert of California, gives the following results:

ANALYSIS OF SALTS FROM SIERRA DE LOS CUCAPAS BASIN, LOWER CALIFORNIA.

	Percentage.
Water	43.65
Ammonium sulphate	39 03
Potassium sulphate	15.20
Undetermined	2.12
Total	100.00

Forestry on Mining Lands.

One of the forest tracts which are now being managed under working plans prepared by the United States Forest Service is situated in southwestern West Virginia. About 24,000 acres in the heart of the soft-coal region, and consisting of mixed hardwoods, form the basis of the plan. The owners, who are chiefly interested in mining, asked the assistance of the Forest Service, which was given in accordance with its co-operative plan. They saw that the introduction of forestry would enable them to convert the idle forest land into profit, and so increase the income from their holdings. Since the local logging methods are so careless, and since grazing and fire have wrought so much damage in the region, it is rarely that second crops can be secured after once the virgin timber has been removed.

In applying for the help of the Forest Service the owners had two main objects in view. They wished to handle their lands so as to obtain continued supplies of timber sufficient for the present and future needs of the town and the mines, and, in addition to this, to have a surplus of valuable timber such as yellow poplar or white oak, to be cut and marketed from time to time.

The study of the tract on which the plan is based revealed conditions common in the region, and the recommendations which were made by the Forest Service, and which are being carried out by the owners, apply in a general way to a number of similar forest problems.

Fires, everywhere the chief menace to forests, have been especially destructive in this locality. Spring and fall are the dangerous seasons, April, May, October and November being the months when most fires break out.

Repeated fires, even when they are individually unimportant, do much more havoc than is realized by the uninitiated. Burning leaves which should protect the ground leave the soil exposed, to be eroded by the rains and dried and hardened by the sun and winds. Impoverishment of the soil necessarily follows, and, with it, deterioration in the character and growth of the timber. On spots which are repeatedly burned over it is impossible to obtain reproduction from seeds, since the seeds are burned before they can germinate, or if the seeds escape, the seedlings are killed by the next fire. The roots of seedlings and saplings, persisting after fires, reproduce themselves by sprouts, so that little by little the entire stand is changed to sprout growth.

Grazing has been carried on ever since the early settlement of the region. Cattle, horses, mules, sheep and hogs were all found on the tract, cattle in the greatest number. Cattle and sheep have been the most injurious. The bad effects of overgrazing are chiefly injury to the soil, to the seedlings, and to young trees small enough to be reached by the cattle. According to its composition, the soil is either packed hard or pulverized by the feet of the grazing animals. The seedlings and young saplings can never develop healthful growth so long as their leaves and tender shoots are again and again browsed. Occasionally, where logging has just been done, grazing helps to expose the soil, and so many encourage the germination of seed, but as soon as seedlings appear grazing on lumbered areas becomes exceedingly harmful.

Perpetuation of the forest depends first and foremost upon its ability to reproduce itself. In order that it may do so, the trees which die and those which are cut must be replaced by young ones. And since young trees are exposed to many dangers, many more young trees must start to grow than are needed in the mature forest which is to replace the older one.

Apart from the ridges and slopes of this tract, which has been so repeatedly burned over that seedling reproduction has become impossible, it was found

that if fire could be stopped reproduction would be abundant in the forest.

The recommendations based upon the study of the tract deal with the solution of the following problems:

1. Protection of the forest from fires.
2. Restriction of grazing to clearings and land not recently lumbered.
3. Obtaining satisfactory seedling reproduction of the more valuable timber trees.
4. Removal from the forest of inferior species at a profit, or, in other words, the utilization of low-grade timber.
5. Modification of present logging practices, for the purpose of reducing waste in felled trees and of leaving the forest in improved condition.

Concrete Mixtures.

A writer in the Cement Age gives the following advice on the mixing of cement mortars and concrete:

One part Portland cement, 2 parts sand, 4 parts broken stone give the strongest concrete made.

One part Portland cement, 2½ parts sand, 5 parts broken stone give an exceedingly strong concrete, suitable for foundations for sidewalks, engine foundations, etc.

One part Portland cement, 3 parts sand, 6 parts broken stone offer an exceedingly strong concrete, suitable for carrying a "skyscraper."

One part Portland cement, 4 parts sand, 8 parts broken stone furnish a sufficiently strong concrete for ordinary purposes.

One part Portland cement, 5 parts sand, 10 parts broken stone make a cheap concrete—stronger than concretes from common cements.

THE measurement of a horse's power of work, first ascertained by Watt, the inventor of the steam engine, says Popular Mechanics, was founded upon the basis that the average brewery horse was capable of doing work equal to that required to raise 330 pounds of weight 100 feet in one minute, or 33,000 pounds 1 foot in one minute. This estimate, however, was for one minute; it would not be possible for a horse to perform this amount of work continuously for eight consecutive hours. One horse could exhaust twelve men in a single day; for where a strong man could perhaps pull half of 330 pounds to a height of 100 feet in two minutes, he probably could not repeat the operation more than a few times. A man's power is about one-tenth of a horse's power—that is, where a horse could pull 330 pounds to a height of 100 feet, one minute, and then slack up and repeat the operation, for eight hours, thus pulling four hours, and slacking up four hours, it would require ten strong men to perform the same amount in that length of time. When man put horses to work the gain in labor for the world was thus tenfold. Multiply this by steam power, water power, air power, and, above all, electric power, and one has a problem in mechanical progression.

In Nova Scotia.—IV.

CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by T. A. RICKARD.

The finding of fragments of quartz containing gold ("float," as we call it in the West) in the glacial drift has given the clue to the discovery of several lodes. As a rule, such pieces have not traveled far; moreover, the direction of their source is indicated by the glacial striæ. A good example of the application of geological knowledge to prospecting is afforded by the finding of the Rose vein at Montague, as told by Mr. George W. Stuart.* Angular pieces of rose-colored quartz, rich in gold, had been found in drift, down to a depth of 15 feet. Most of them were at grass-roots, although some were encountered near bedrock. Search was made for the vein that had shed them, but such work was confined to the vicinity of the largest mass of drift. Mr. Stuart had noticed a large boulder of quartzite, twenty tons in weight, traversed by a narrow serpentine seam of slate. This peculiarity gave the clue, for eventually 2500 feet north of the boulder he actually found the spot whence it had come, this being determined by the shape of the recess made by its removal and by the identity of the peculiarly corrugated seam of slate. Up to that time, from 1862 to 1877, the search for the Rose vein had been restricted to a distance, northward, of 200 or 300 feet from the "float," but now it became evident that search must be made further afield. The boulder just described had traveled 2500 feet along a line, as determined by glacial striæ, 2° east of south. Shortly afterward a large rose-colored boulder of quartz, weighing 500 pounds, with a wedge of quartzite attached to it, was discovered and it was carefully examined before being broken up for the gold it contained. A year later, on December 7, 1878, the "Rose lead," as the miners had already christened the vein, was found. Forty feet east of the point of discovery, Mr. Stuart detected the very place from which the last mentioned boulder had been detached; the remainder of the wedge of quartzite and the shape of the recess in the quartz coincided exactly. The quartz had been borne 1200 feet along the line of glacial movement. Whether some of these conclusions were not reached after the data were known, I must leave to the reader; the main facts and the sound reasoning based upon them present an excellent example of skillful prospecting.

Of course, the striæ are not always uniformly in one direction; they vary with the topography and they diverge in different localities. Moreover, the distance which the drift has traveled ranges from a few feet to several miles. The Rose vein was not found for so long because the prospectors had a decided notion that they should not look for it far. In the sequel, it was proved that pieces of the quartz had been carried a mile away; just as in the case of the Dufferin lode, the "float" was found near the shore, a distance of 2½ miles. In prospecting under such conditions the first thing is to find quartz drift that has not been water-worn. At Seal Harbor, within the last year, a promising gold lode has been found by the aid of glacial evidence. Angular boulders of quartz, weighing up to half a ton, had been uncovered at grass-roots; these carried gold in small stringers traversing quartzite. One boulder yielded $300. At intervals, in a line northward, trenching was started; this followed a course north 3° west, as marked by the striæ on bedrock. No lode was found. The drift continued to be of equal thickness northward; this indicated that no approach was being made to the source of it. Another set of trenches was started farther to the west, until the work had extended 600 feet west of the drift outcrop; at this distance the drift lay on bedrock, proving the direction of search, north 18° west, to be correct. A little more trenching led to the uncovering of the lode itself, a large width of quartzite interlaced with small stringers of quartz, as shown in the accompanying photograph.

It is also to glacial erosion that Nova Scotia owes those stretches of flat upland, half moor and half swamp, that are called "barrens;" they are dreary tracts that elsewhere, in the interior of Canada, extend northward until they merge into the frozen moss of the Arctic tundra. The "barrens" are clothed with heaths, such as sheep laurel (kalmia angusfoliata) and rhodora (a rhododendron). There is also the bay-berry and, in early summer, the trailing arbutus, the flower covered by its own leaves. But more plentiful than any of these is the blue-berry and, where fires have raged, the raspberry Near

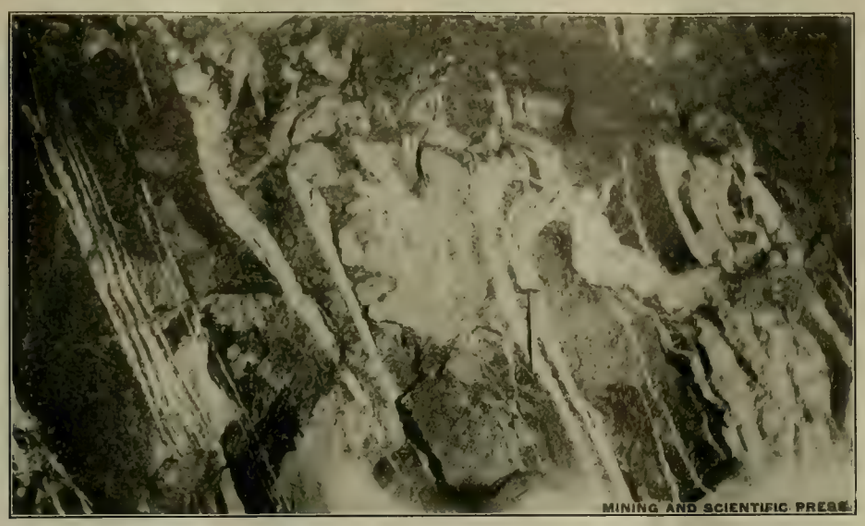
*Trans. Mining Society of Nova Scotia. Vol. V. pp. 23-26.

E. R. FARIBAULT. T. A. RICKARD. D'ARCY WEATHERBE

Ready to Take a Tribute Pitch.

The Caribou Lode, at the 950-Foot Level, Nova Scotia.

the settlements the primeval forest has all been cut down and a generous second growth has come up. The "bush" is thick and is often rendered impassable by wind-falls. Many a time have I wondered how these were brought about within the heart of a forest, where the wind would seem to have full play only over the tops of the trees. Wind-falls are the work of cyclonic storms, especially at the time of the autumn equinox. Mr. D'Arcy Weatherbe, deputy inspector of mines, told me how he had been present when trees of 3 feet diameter were twisted around and thrown down by the wind. He and his companion, engaged in hunting moose, found the forest full of driven spray and subsequently discovered that this came a distance of over 200 yards from a shallow lake, the surface of which was uptorn by the wind and whirled among the trees. The lake was covered



Beaver Hat Lode, at Seal Harbor, Nova Scotia.

with small waterspouts, spread all over its angry surface by reason of the cyclonic action of the storm.

By reason of glacial denudation and the intense disintegration of the rock surface which must have preceded it, the gold-mining country of Nova Scotia is not picturesque, although it has a quiet beauty, due largely to the contrast of water and forest. In crossing high ground the view is one wilderness of dark woodland; the somber tints of spruce and fir are lightened by patches of maple, birch and beach; here and there, like jewels in an Ethiop's ear, are lakes mirroring a perfect sky. But life is absent; it is a lovely desolation. An occasional grouse crosses

A Fishing Settlement in Nova Scotia.

the road; a shy rabbit, even a porcupine; but human habitations are wide apart, and the track of a moose will suggest that this is a primeval wilderness untamed by man. In the valleys there are clusters of whitewashed houses with shingled roofs, devoid of color; the village churches, for there are several, have white steeples; the cultivated land is meager; there is no exuberance of life or color, save in autumn. The road comes often within sight of the sea or edges the shore of an estuary; the headlands thrust their dark woods far out into the gray waters; rocky islands mark dangerous navigation, and cold fogs, obliterating earth and sky, suggest the further risks encountered by the hardy fisher-folk, whose cottages line the wayside. The lobster pots lie scattered on the beach, and the iron kettle in which they are boiled is seen near the fish sheds. The long wooden stands or "flakes" on which the cod is dried and salted is in evidence, through both the sense of sight and smell. The "dories," the almost unsinkable little boats in which the fishermen ply their trade, lie close to the beach; the dark shallows reflect the forest-clad shore and the white cottages; farther out in the harbor the wind and sun make rippled silver, and on the horizon a wreath of smoke marks a coasting steamer. There is a hint of quiet thrift and simplicity of life. Nature also is restrained—severe as a Puritan, a restful reticence, without exuberance of color or reckless sculpturing of line. It is a strong contrast to the scenes of that golden country over which Bret Harte has thrown the halo of a romance that will not die.

A Rapid Method for the Determination of Copper in Chilled Slag.

Written for the MINING AND SCIENTIFIC PRESS by H. A. TOBELMANN.

Take two grams of the finely ground sample, brush into a No. 1 Griffin beaker, add 15 c.c. boiling distilled water, then, giving the beaker a rotary motion with one hand, add 15 c.c. hot concentrated HCl with the other. Continue rotary motion until dissolved to prevent caking.

When slag is all dissolved, or nearly all dissolved, immediately fill beaker with boiling water and pass a current of hydrogen sulphide (H_2S) gas into the solution. Continue this until all the copper has been precipitated as copper sulphide (CuS), which will be in two or three minutes (as in nearly all blast furnace or converter slags the metals are in a reduced form), then remove beaker from source of heat and allow the precipitate to settle. When settled, filter with suction on an asbestos film, on a platinum cone. Wash precipitate three times with boiling water, then invert funnel over the original beaker, allowing the platinum cone with its asbestos film to drop into it. Rinse funnel with 5 c.c. concentrated nitric acid (HNO_3). Cover beaker with watch glass and set on hot plate. In a few minutes the CuS will be dissolved and the asbestos turned white. Now rinse off the watch glass and sides of beaker with water. Carefully add 15 c.c. concentrated ammonia (HN_4OH), filter into flask, wash, cool, then titrate with a known solution of potassium cyanide (KCN).

NOTES.—By careful work the copper in the slag can be determined in less than ten minutes. In case the slag is not chilled, I generally add a little hydrofluoric acid (HF), which materially helps the solution, the action on the glass being much less severe than one would expect.

Should small particles remain undissolved it will not matter, as all the copper would be removed by the HNO_3 acid treatment to which the CuS, plus residue (insoluble), is subjected.

The asbestos film is made by pouring over a platinum cone in a funnel an emulsion of short fiber asbestos in water, and then turning on the suction. This will form a thin film of asbestos on the cone which is capable of holding the finest precipitates. Those objecting to KCN titration can use the iodide method. If the iodide method is used the platinum must be removed from the solution and washed. When the asbestos has turned white add a crystal of chlorate of potash ($KClO_3$). The solution is now boiled until fumes cease coming off, then diluted to 20 c.c., 15 c.c. NH_4OH added, and the solution again boiled for one minute, then removed from source of heat, then 8 c.c. of acetic acid ($C_2H_4O_2$) added, and then cooled. Add a few grains of potassium iodide (KI), and, when dissolved, the solution is titrated in usual manner with a solution of sodium hyposulphide ($Na_2S_2O_3$).

Both methods are accurate and give uniform results. The KCN method is the simpler and quicker. While chemist and assayer for the Old Dominion C. M. & S. Co. at Globe, Ariz., I often found it necessary to turn out exceedingly quick results, and found this method satisfactory, giving accurate results.

Ore Valuation of a Rand Mine.*

Written by E. J. WAY.

In a paper on "The Determination of the Present Value of a Mine on the Rand," read before the Institution of Mining and Metallurgy by F. Hellmann, it was pointed out that "the accuracy with which the problem can be solved depends upon the reliability of the various factors entering into the calculation." The most important factor in the calculation would appear to be the recovery value of the ore itself. This can only be ascertained with any degree of accuracy after a mine has to a large extent been opened up, so that average values can be arrived at. The writer has been at great pains to ascertain why the most carefully prepared assay plans have not properly accounted for the gold recovered. The recovery, generally speaking, should have been higher than the actual returns. In these days, when mines are opened from end to end, and to depths on the reef of from 1000 to 1500 feet, exposing 500,000 to 1,000,000 tons of ore, greater accuracy should be the rule in gauging the value thereof in the mine, and the consequent recovery value.

An assay plan is made, and it is assumed that it is as accurate as possible, and that the calculations to arrive at the values of stoping widths have been made out without error.

Stoping width has now to be considered in relation to ore mined. By stoping width is understood the width necessary to take out a given thickness of banket. If the values are calculated on a lode of 6 inches of banket, it is usual to allow a stope width of 3 feet for the purpose of getting out that 6 inches, and the value of the 6 inches is diluted accordingly. In a lode or reef 4 feet wide no allowance in calculation would be made, as that width is considered sufficient for all purposes. Therefore a 6-inch lode assaying four ounces is reckoned to have a value in the mine of 13.3 dwt. over 3 feet, the hanging and foot wall being considered valueless. In the same way a 4-foot lode assaying 12 dwt. is reckoned to have a value in the mine of 12 dwt. over 4 feet. Taking the latter case and presuming that the lode is interstratified with thin bands of sandstone which have been taken into account and included when the value was arrived at, there will be a margin of sorting of say 15% provided that the 4 feet are taken, and no more.

The usual calculation is made:

100 tons assaying 12 dwt. contain	1200 dwt.
15 tons waste rock assaying 1 dwt. contain	15 dwt.
85 tons sorted ore contain	1185 dwt.

One ton has a value after sorting of 13.9 dwt., and, on a basis of 90% extraction, a recovery value of 52.5s.

Waste rock after mining, when sorted after being in contact with banket, generally has an average value of about 1 dwt. fine gold per ton.

As a matter of fact, instead of a recovery of 52.5s, only about 42s on a basis of 15% sorting and 90% recovery would be saved in actual practice. This is one example of the many hundreds that have come under the notice of the writer, and the object of this paper is to account for the difference. It will be seen at once how important the question becomes when recovery values have to be considered in connection with propositions which on mine assays show a very small margin of profit. In the above case 15% is taken as the basis of sorting, because if the reef is taken out clean between its walls (as the basis of calculation presumes and lays down it must be), it is difficult to find even 15% of pickable waste rock.

Taking the above case with the 4-foot lode assaying only 7 dwt.

Again:

100 tons assaying 7 dwt. contain	700 dwt.
15 tons waste assaying 1 dwt. contain	15 dwt.
85 tons sorted rock contain	685 dwt.

Therefore one ton has a value of 8.06 dwt., and on a 90% recovery basis a value of 30s 6d, which is payable. It would, however, be found that this ore, if sent to the mill after 15% sorting, would only yield about 24s 3d, and it could hardly be worked at a

*Trans. Inst. Min. and Met.

profit. There is a discrepancy, if the latter figure be right (and actual work shows that it is), of 6s 3d, a sum quite large enough to seal the fate of, perhaps, a big corporation, but it might not be discovered until the mill itself found it out.

The reason for this discrepancy is that no allowance has been made for the waste of actual mining. In measuring the width of a stope it is usual to measure the actual face, the measurement being taken at right angles to the dip of the reef. The actual face between foot wall and hanging wall may in this way be 3 feet.

Now if a measurement be made 3 or 4 feet back from the face between foot wall and hanging, also at right angles to the dip of the reef, it will be found in the majority, if not in all cases, if the bed has remained continuous, and has not been cut out by a fault, and has not pinched, that such a measurement will be greater by about 12 inches than the measurement at the face. The dilution caused by these 12 inches which have not been allowed for will account for the difference in nearly all cases. In other words, actual blasting on a 3-foot lode or in attempting to carry a 3-foot stope, will generally carry away 6 inches more in the hanging wall and 6 inches more in the foot wall than the actual calculated width. It is found, therefore, that the assay plan stoping width in feet, which may be called X, becomes in practice X + 1. Going back to Example 1, the theoretical recovery without making this allowance was 52.5s, and in actual work was found to be only 42s. The assay plan gave 12 dwt. over 4 feet and 15% was sorted. Making the foot allowance the actual stope becomes 9.6 dwt.:

100 tons assaying 9.6 dwt. contain	960 dwt.
15 tons waste rock assaying 1.0 dwt. contain	15 dwt.
85 tons sorted ore contain	945 dwt.

One ton after sorting contains $\frac{945}{85} = 11.11$ dwt. per ton. A 90% recovery on 11.11 dwt. = 41.99s, or very close to the 42s obtained.

This may be taken as a typical example. The writer has worked many hundreds of such, and has ascertained from many mine managers, who have given him great help in the matter, that this method of making allowance brings their calculated values and actual results very close.

The Practical Operation of Machine Drills.*

NUMBER II.—CONCLUDED.

Written by E. M. WESTON.

In a small stope, however, with a face height of about 40 inches, the following arrangement shown in elevation (Fig. III) is advantageous. The width of

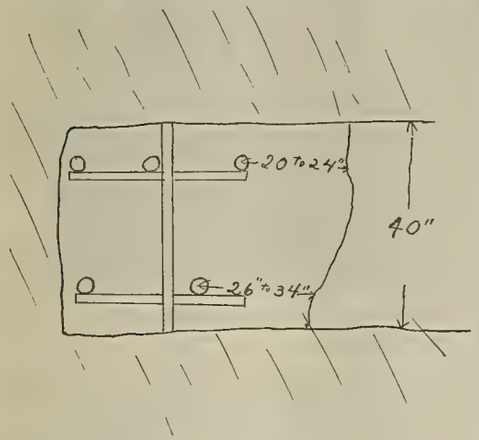


Fig. 3.—Machine Drills.

face of the bench is 5 feet and depth of holes 6 feet to 7 feet. These are bored in the order shown, and should be all parallel to each other and to the face of stope, except hole 4, which having little burden can be made to look in somewhat. In average ground this round should bring out a bench from 4½ feet to 5 feet by 6 feet to 7 feet, with a charge equivalent to an average of 3½ to 4 large cartridges per hole. In some mines where stoping with machines is done on wages, it is the custom to limit the number of cartridges issued per shift. This I think is a mistake, as any miner taking an interest in his work tries to get the best results, and if he is not given the explosive he thinks necessary, and in any mine the conditions vary enough to make a fixed rule bad, he is apt to be discouraged and lose interest. On the other hand, of course, careless miners would waste explosives. For these and other reasons contract work is always to be preferred. In one mine the allowance per hole for big machines was 2½ big cartridges, and in another with small machines six small cartridges. I have often used five or six large cartridges to advantage with small machines. It would be interesting if members would supply information as to the allowances made in mines they know of and the conditions there. The judging of what is a proper and just sufficient charge is perhaps the most difficult part of the art of rock drilling, as the holes vary so much and so many factors have to be taken into account. The question as to what is the maximum burden to be placed on a hole is one hard to determine, even when the rock is homogeneous. It is evidently some factor of the height of the face, and I should be glad if some mathematically endowed members would attack the question. My experience is that there is a given maximum burden one can put on a hole beyond which no charge however great will dislodge the rock. If there is no plane of weakness it is about two-thirds height of face; but may equal or exceed face height if there is a defined plane of weakness. There would be an advantage gained, I think, if rock drill miners when working in stopes were supplied with a rather weak gelignite, containing, say, 50% nitro-glycerine in addition to the usual blasting gelatine. As I have before shown, in all holes it is not advisable to concentrate the explosives near the bottom of the holes, and in cases where it was necessary or unavoidable, to bore weak holes, a lower strength of explosive could be economically employed. Unfortunately, it is not always possible to bore the hole of ideal strength. For hand stoping in some mines I believe the management suddenly served out gelignite to their stopers in the same quantity as the more expensive gelatine, and it was stated that no falling off in the quantity of rock broken was noticed. I think, however, that in hand stoping also a judicious use of different strengths of explosives for different holes would prove more advantageous. Or, does this experiment prove that blasting gelatine is too powerful for work in hand stopes? There is the interesting question, as to whether or not tamping is of any use in assisting the force of explosion. A little is always necessary where several holes are fired in series to prevent the shock jerking the primer and fuse out of hole. The theory of tamping appears to be that it interposes between the explosive and the cushion of the atmosphere, a body, that by its inertia, and the friction of its parts against the side of the hole, offers a resistance to the escape of the gases. This resistance in the case of high explosives can proportionately amount to very little, while their detonation is so sudden as to expend all its force on the sides of hole before seeking any escape along it. This is shown in "bull ringed" holes. Water is always considered an efficient tamping, but its inertia and friction amount to nothing in such a case. I am led to infer then that its only beneficial action is in excluding air that might otherwise act as a buffer between explosive and the side of hole. One, however, finds great differences of opinion on this question. The Government mining regulations lay down the rule that only sand or clay loosely filled in, or water, may be employed for tamping. Yet certain manufacturers of explosives, in printed instructions sold with their explosives, advise the use of sand very firmly rammed. As a matter of fact every one does break the law by using sand or grit firmly made into paper cartridges and rammed home with a good will. I think from experience that an inch or two of tamping is as effective as 18 inches. I must refer to the regulations forbidding under any circumstances boring in the stumps or sockets of old holes. Every one who has done any rock drilling knows that it is impossible to observe this, as very often the only possible place to start a hole is in the socket of an old one. The Government should recognize this and allow boring where, say, the stump hole is 3 inches in diameter, 9 inches or less deep, and where the bottom can be clearly seen, and all loose rock liable to contain hidden explosive carefully removed. The accidents occurring owing to cartridges being forced into a hole slightly too small for them leads me to mention an expedient so simple that I would apologize for bringing it forward were it not for the fact that few appear acquainted with it. It is true the Government regulations forbid forcing a cartridge into a hole; but a contractor will not see his day's work spoiled for lack of a little force, and an accident last year on the French Rand mine showed the results. If, when a cartridge sticks even in a damp hole, a little water is poured in and allowed to stand a few minutes, it will be found in nine cases out of ten that it has so soaked and softened the paper round the explosive that it will now move easily. If it has become doubled up and cannot be dislodged, the water by filling the hole below it acts as tamping and renders the explosive effective.

In considering what is the best size of machine to use in wide stopes it must be remembered that miners can generally be got to look after three 2½-inch or 2¾-inch machines; while they refuse to supervise more than two large machines. As far as my experience enables me to judge, three 2¾-inch machines provided with proper steel will break more than two 3⅜-inch machines; while the air consumption will be nearly the same in each case, and, provided reliable labor is to be obtainable, I believe them to be superior. In small stopes 2¾-inch machines do excellent work. Personally I should prefer a machine a shade smaller (about 2⅝ inches diameter), and I think one might be designed as powerful as the present 2¾-inch machines. With these the arm, bar and clamp are of the same size and diameter as with large machines, and this is rather awkward in practical work in small stopes. For effective stoping a good range of movement of the arm up and down the bar is necessary in order that the top and bottom holes may be parallel, or nearly so, in a vertical plane, and be bored, say, 30 inches apart. In this way the stope is kept at a proper and regular size, for if, owing to being bored at nearly the same elevation of machine, the holes diverge, they are always liable to break into the foot and hanging wall (see Fig. IV).

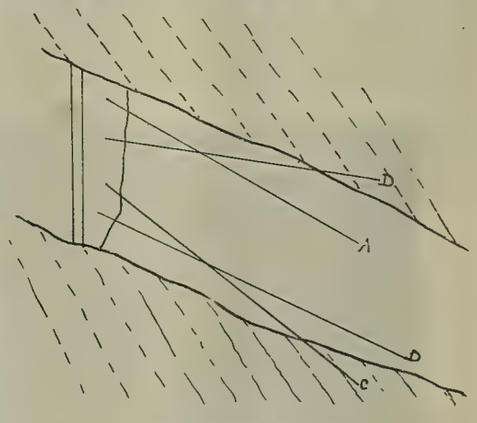


Fig. 4.—Machine Drills.

For the same reason several different sizes of bars should always be supplied to miners. With a bar for big machines only 24 inches or 30 inches long, the part of arm that embraces the bar is about a foot long, and this will allow little range of movement between the piece of bar and screw at the top. In fact only 5 inches or 6 inches in range is obtained. When large arms must be used a great advantage is gained by cutting off 3 inches top and bottom of the portion embracing the bar. With a good 3-inch or 3½-inch arm, bar and clamp a much greater vertical range is obtainable for the machine, and better work made possible, especially in awkward places. I know of one mine on the Rand where it is stated that machine stoping on a 38-inch width was for a period cheaper than hand labor. A feature I would introduce in small machines, and in big ones also, would be to place two "necks" and "seats" on the "cradle" of machine, one forward and the other about 6 inches back from it. This would add little to the weight and would often mean the saving of much time when the only drill available was just a little too long to "follow." This often occurs below. It would save time lost in hunting for a suitable drill or moving arm or clamp. Instead the machine would be lifted into its other seat and boring resumed. This device would also prove useful when owing to the shape of roof or foot wall it is necessary to "rig" bar either too close or too far from the face to be bored. I cannot lay too much stress on the importance of supplying machines with an adequate or rather excessive supply of drills. Of course where sharpening is done underground these remarks do not apply so much; but in many cases it is a struggle to obtain sufficient drills. The record book of the foreman blacksmith may indeed show that what is apparently an ample number has been issued; but a time always arrives when, owing to breakages, borrowing without permission by one's neighbor, one's jumper boy throwing drills down a winze to save trouble in carrying them to the shaft, a difficult hole, the starting of which has blunted numerous drills, or a hundred other causes, one is unable to do a proper shift's work. There should be a reserve of fifteen to twenty drills always available on the spot and the miner be given all or more drills than he asks for; while at the same time a sharp lookout be kept behind old pillars and in abandoned workings for neglected ones. When one hears battery managers complaining of amalgamating troubles one wonders if they are aware how much oil is used and spilt by machine men and their natives below. Half to three-quarters of a pint of oil seems the amount used per machine per shift, and where many are employed it means quite a quantity of oil coming in the rock to the battery. A miner working three small machines should always be allowed to have one spare one in the stope to save time in case of breakdowns, and a few big machines should be kept at or near the shaft at every level as spares. This simple matter is not attended to in all mines. Every miner working machines should have a locked box given him solely for keeping his tools and spare parts in (such as U bolts, side rods, clamp and arm bolts, etc.), of which a liberal supply should be given him.

When developing I always endeavored to make the distance between the "collars" of the cut holes about 18 inches apart, the idea being to get the explosive as much behind the center core of rock as possible. I have seen miners obtain good results in average ground by placing the holes within 12 inches of each other. Their theory seemed to be that in this manner the shattering force of the explosive was

*Abstract Jour. Chem. Met. & Min. Soc., S. A.

better applied in pulverizing the core, rather than in ejecting it. A contribution from some experienced miner on "cuts" and "cut holes" generally would be interesting.

The Highest Mines.

It is not a great many years since there was a theory among a large number of miners that, to have a profitable mine, it was necessary to seek high altitudes; that if a mine was found at or near sea level it would be of little value. Recent years have proven that there is absolutely nothing in such prejudice against the occurrence of mines of gold, copper or any other mineral at low altitude. The noted mines of the Treadwell group of Alaska are only a few feet above sea level. Many of the copper and gold mines on the chain of islands reaching from Vancouver to Seward Peninsula run down to the water's edge of either the Pacific ocean or some one of the numerous interior channels. In South America gold mines are known on the west coast which are at the level of the sea. Some of the noted mines of Australasia are but little above the sea.

In the United States, however, particularly in the Western portion, the mines are mostly above 1000 feet altitude, and from that upward to 13,000 feet, and even more, in the State of Colorado. In California, in the Sierra Nevada, there are many mines and ore deposits at altitudes varying from 8000 to over 11,000 feet. In Idaho some of the mines are over 7000 feet above the sea, and in Utah the most noted mines are from 8000 to 10,000 feet or more above this universal datum.

Mines operating at low levels in many instances have advantages over those situated in the mountains. This advantage is generally the more easy means of communication with the outside world.

Low altitude, however, does not always signify superior economic conditions. In San Diego county, Cal., some of the largest gold mines in that State are less than 500 feet above sea level; but they are surrounded by miles of desert sand and abrupt, precipitous mountains and are more unfortunately situated than some of those at high altitude.

The accompanying illustrations show the types of mountain scenery in the mining region of the West. One shows the rounded slopes, partly covered by snow. Although not a rugged country, transportation here is difficult, by reason of the numerous small gulches and ravines. A few stunted pines and tamaracks are the only trees seen in the landscape, though in the gulches a few aspens quiver with every passing breath of wind. Though not easy of access and distant from the railroad, still the prospector has penetrated here during the summer months and has found sufficient encouragement to establish a camp and open a mine, which will prove to be of greater or less value, as determined by development.

A Glacial Valley Amid High Ranges, Where Both Mining and Agriculture Thrive.

Near Timber Line in the Colorado Rockies.

The other engraving is that of a glacial valley surrounded by hills which rise 2000 feet or more above the valley. Here not only mining but also stock raising, and, to a limited extent, agriculture, are possible during summer. Here, too, the pines and the aspens grow side by side, and the miner has built his habitation of logs near his prospect.

Each of these illustrations is typical of the conditions as they exist in different portions of the high mountains of the Western United States. Neither represents the worst features—the extreme types of mountain scenery. These latter are merely a few precipitous rocks projected above the eternal snows of some high range—where a narrow trail, mostly cut in the ice, is the only means of communication with the world below, where the buildings are erected against the side of an overhanging precipice as a protection against snowslides and where the moisture in the rock is frozen solid to a depth of several hundred feet. These are some of the inconveniences of the highest mines, and yet some of these mines furnish a grade of ore which makes their operation largely profitable, and the prospector does not hesitate on account of the situation, if he can only find pay rock there.

Testing Ores and Tailings Preliminary to Cyaniding.

As there is a frequent demand for literature on the testing of ores and tailings with a view to ascertaining the amenability of the material to such treatment, the following partial bibliography on the subject has been prepared, being a number of original papers in which the methods are described in detail:

FELDMANN, W.—Notes on Gold Extraction, Johannesburg, 1904.

FURMAN, H. VAN F.—Laboratory Tests in Connection with the Cyanide Process, Trans. A. I. M. E., vol. XXVI, p. 721; "Manual of Practical Assaying," p. 401, ed. 1905; MINING AND SCIENTIFIC PRESS, Nov. 7 to 28, 1896, pp 379, 402, 421 and 441.

CLENNELL, J. C.—Notes on Experimental Metallurgy, Jour. Chem. & Met. Soc. S. A., Dec., 1898, vol. 1, p. 177; vol. 2, p. 492; MINING AND SCIENTIFIC PRESS, Feb. 18-25, 1899, vol. 78, p. 181 and 209.

JANIN, L., JR.—Practical Points for the Assay Laboratory, Pacific Coast Miner, Jan. 10, 1903, p. 30.

BROWNE, R. S.—Testing Ores for Cyanide Treatment, MINING AND SCIENTIFIC PRESS, Jan. 2 and 9, 1904, vol. 88, pp. 6 and 22.

JAMES, A.—Cyanide Practice, Proc. Inst. Min. & Met., 1895, vol. 3, p. 369.

To these should be added two papers on the testing of gold ores in general without special reference to the cyanide process, but which contain valuable references to it. These are:

CHARLETON, A. G.—Trans. Inst. Min. Eng. (Newcastle), 1893.

WARWICK, A. W.—Jour. Soc. Chem. Industry, Feb., 1898.

Short summaries of the more essential tests are contained in several of the monographs on the cyanide process:

PARK, J.—The Cyanide Process of Gold Extraction.

BOSQUI, F. L.—Practical Notes on the Cyanide Process.

JAMES, A.—Cyanide Practice.

GAZE, W. H.—Practical Cyanide Operations.

JULIAN, H. F., AND SMART, E.—Cyaniding Gold and Silver Ores.

MILLER, A. S.—The Cyanide Process, Moscow, Idaho, 1903.

BYRN, G. A.—The Laboratory in its Relation to the Cyanide Process, Melbourne, 1897.

Among the publications describing experiments made on particular ores and tailings may be mentioned the following:

MERRILL, C. W.—The MacArthur-Forrest Process, Experiments in the Metallurgical Laboratory, MINING AND SCIENTIFIC PRESS, April 23, 1892, vol. 64, p. 296.

JANIN, L., JR.—The Cyanide Process, Min. Industry, vol. 1, p. 239.

LODGE, R. W.—The Cyanide Process as Applied to Concentrates, Trans. A. I. M. E., 1895, vol. XXV, p. 90; Tech. Quarterly, vol. 8, p. 389.

CLAUDET, A. C.—Notes on the Experimental Treatment of a Gold Ore, Proc. Inst. Min. & Met., 1897, vol. 5, p. 327.

JOHNSTON, W. S.—Cyanide Experiments on Ores of the Slocan District, Can. Min. Review, Aug., 1898, vol. 17, p. 212.

CHATARD, T. M., AND WHITEHEAD, C.—Examination of Ores of the Republic Gold Mine, Washington, Trans. A. I. M. E., 1901, vol. XXX, p. 419. Eng. & Min. Jour., Apr. 28, 1900, vol. 69, p. 497.

BROCKUNIER, S. H.—Experiments with Bromo-Cyanogen, Trans. A. I. M. E., 1901, vol. XXXI, p. 793, MINING AND SCIENTIFIC PRESS, Apr. 26, 1902, vol. 84, p. 230.

JANIN, L., JR.—Cyaniding Tests at Chainman Mine, Nevada, Pac. Coast Miner, Jan. 24, 1903, p. 59.

ALLAN, J. F.—Notes Upon Preliminary Tests and Cyanide Treatment of Silver Ores in Mexico, Trans. A. I. M. E., 1904.

JAKMAN, A., AND BRERETON, E. L.—Laboratory Experiments on the Use of Ammonia and its Compounds in Cyaniding Cupriferous Ores and Tailings, Proc. Inst. Min. & Met., 1905.; Eng. & Min. Jour., April 27, 1905, vol. 79, p. 802.

An original paper by M. A. Knapp on "A Cheap Cyanide Plant" appeared in the MINING AND SCIENTIFIC PRESS of October 10, 1896, and was copied by the New Zealand Mining Standard in 1897, without acknowledgment. An abstract of it appeared in the Eng. & Min. Jour., Oct. 30, 1897, and again in the Mineral Industry for 1897 (vol. VI); the S. A. Min. Journal also copied it in 1897, and the Jour. Chem. & Met. Soc. of S. A. reprinted it in July, 1903, from the Mining Journal, all of them crediting the N. Z. Mining Standard with the article.

CHRYSOBERYL is beryllium aluminate. It occurs in varied shades of green, from light green to grass green and yellowish green, sometimes yellow, pale red or dark red. It has a hardness of 8.5 and is used as a jewel.

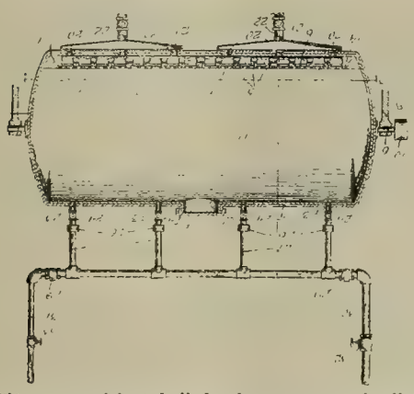
THE American Mining Congress meets this year at El Paso, Texas, from the 14th to the 18th inst., inclusive.

Mining and Metallurgical Patents.

PATENTS ISSUED OCTOBER 24, 1905.

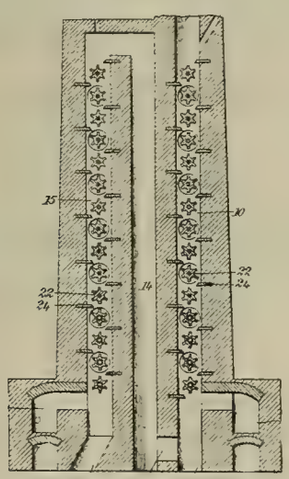
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

METALLURGICAL FILTER.—No. 802,242; E. Stewart, Colorado City, Colo.



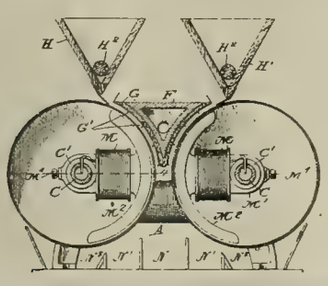
Filter comprising shell, having non-corrosive lining, ledges extending longitudinally within shell in spaced relation, filter plates secured upon ledges, supports between ledges at intervals longitudinally of plates, decanting pipes having heads, pipes connecting each of heads with interior of filter beneath filter plates, pipes leading into shell at opposite sides of filter plates from heads, and means for connecting fluid supply pipes with last named pipes.

DRYING AND ROASTING FURANCE.—No. 802,191; C. E. Ballow and E. Stein, Guanacevi, Mexico.



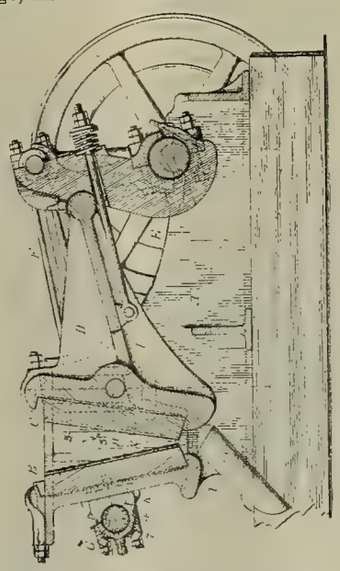
Furnace provided with drying stack having discharge into atmosphere at upper end, and ore discharge at lower end, roasting stack having ore discharge at lower end, downtake flue passing from top of roasting stack to base of drying stack, means for heating roasting stack, auxiliary heating means at base of drying stack, corrugated agitating rollers mounted in drying and roasting stacks, and shelves carried in stacks, and projecting between rollers, certain of rollers having tubular axles projecting through walls of stacks to permit circulation of cooling medium through axles.

MAGNETIC ORE SEPARATOR.—No. 802,170; R. R. Moffatt, Brooklyn, N. Y.



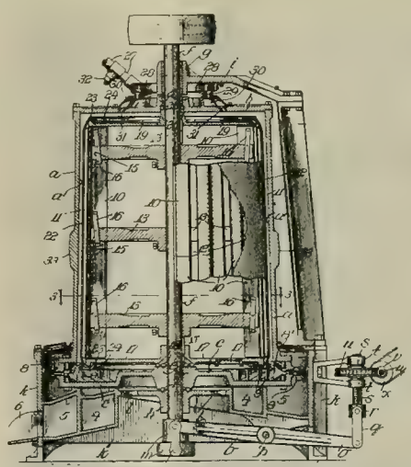
In magnetic ore separator, combination of framework, two stationary shafts, two rotating drums for separating material on shafts disposed so as to converge in curvilinear direction, and whose axes of rotation are in same horizontal plane, two standard blocks at each end of drums having transverse sockets, one of which supports ends of stationary shafts, two electro-magnets disposed at right angles to drums at either side of same and adjustably supported in other of two transverse sockets of standard blocks, whereby distance between two drums can be increased or decreased, magnetic bridge interposed between drums in field of force above plane of rotation for reducing magnetic resistance, and means for vertically adjusting magnetic bridge.

CRUSHING MACHINE.—No. 802,842; A. Cameron, Chicago, Ill.



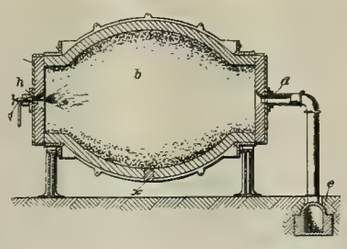
In crushing machine, crushing jaw supported for oscillatory motion about axis arranged between upper and lower portions and reciprocative laterally to plane of jaw-face and along line inclining downwardly and forwardly; pitman with which jaw has jointed connection; and swinging arms or links having jointed connection with pitman and tied to swing about axis forward of jaw.

CENTRIFUGAL ORE SEPARATOR.—No. 802,779; W. H. Peck, Chicago, Ill.



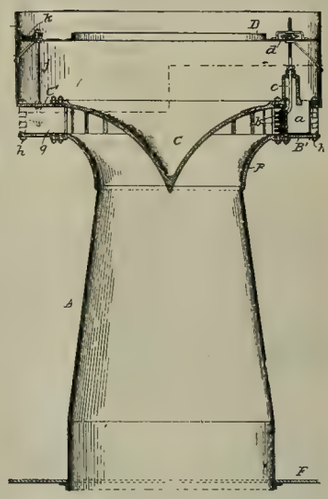
In centrifugal ore separator, combination of rotatable treatment vessel having separating surface therein, expansible and contractible deflector within vessel having sections provided with channels adapted to receive retaining devices and removable flexible covering around deflector, having retaining devices with one of parts embedded in covering and another of parts removably engaging channels.

PROCESS OF REDUCING METALLIC OXIDES.—No. 802,493; T. S. Blair Jr., Woodmere, N. Y.



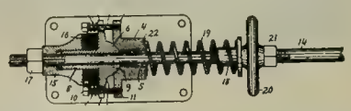
Process of reducing metallic oxides mixed with gangue, consisting in removing oxygen therefrom by subjecting same to contact with reducing gas at temperature sufficient to cause required chemical reactions, but with insufficient supply of free oxygen to consume reducing agents, changing reducing temperature to non-reducing one by supplying more air, raising temperature sufficiently to fuse gangue or extraneous matter and burn out metalloids, but not to extent required to fuse metal, separating fused gangue or extraneous matter from metal by melting gangue therefrom and balling metal while gangue is being melted away therefrom.

HYDRAULIC AIR COMPRESSOR.—No. 802,575; W. J. Linton, Woodstock, Canada.



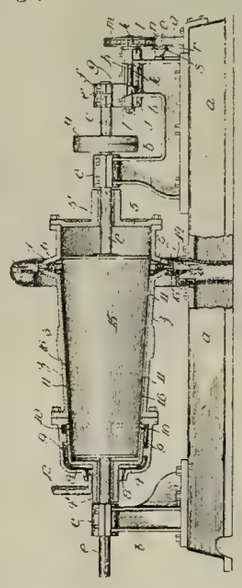
In hydraulic air compressor, headpiece forming mouth through which water is admitted to apparatus and a series of air inlet chambers arranged within mouth and dividing it into separate water passages, each of which chambers is connected with air outside and is open to water at inner end, and means for regulating size of water passages.

ACTUATING MECHANISM FOR ORE CONCENTRATORS.—No. 802,374; E. Deister, Fort Wayne, Ind.



In actuating mechanism for concentrating tables and similar devices, table suitably mounted to be vibrated; bracket fixed to table; block adjustably seated against bracket; bolts having loose connections with block and rigidly fixed in bracket; springs in connection with respective bolts and acting against block toward bracket; reciprocating driving rod having actuating connection between driving rod and block; and spring in connection with driving rod and acting against bracket.

CENTRIFUGAL ORE SEPARATOR.—No. 802,726; P. H. Adams, Chicago, Ill.



In centrifugal ore separator, combination of rotatable tapering treatment vessel having separating surface therein, and provided with discharge openings for material and water, rotatable longitudinally travelable deflector within vessel, and means for feeding material and water into vessel distance from its small end substantially as great as distance of longitudinal travel of deflector, deflector of sufficient length and adapted to at all times cover points of feed of material and water into vessel, and operate to effect separation on surface.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

The petroleum production of 1904 was greater than that of any previous year. The total output of crude petroleum in the United States in 1904 was 117,063,421 barrels. The total value of all the petroleum marketed in the United States in 1904 was $101,170,466. The gain over the production of 1903 was 16,602,089 barrels in quantity and $6,476,416 in value. The quantity of oil produced has increased 2½ times in ten years. For the first time in the history of the petroleum industry the quantity of oil produced west of the Mississippi river was greater than that produced east of that river. New pools were discovered during 1904 in Texas, California, Kansas, Indian Territory and Oklahoma, and many extensions were made to the old fields. An immense section beginning in southeastern Kansas and extending southwestward into northern Indian Territory and Oklahoma, over 180 miles in length and 50 miles in width, was proved to be locally productive of petroleum and natural gas. All indications point to an increase in the production of petroleum in the United States for a series of years. Most of the petroleum produced in these western localities is, however, inferior in quality. It is not suitable for the manufacture of the most refined products, but its high heating value and its freedom from the more volatile constituents renders it comparatively safe to transport and consume and make it a most valuable fuel. The oil report of E. H. Oliphant of the U. S. Geological Survey contains an account of the oil production in the United States by fields, States and districts, with historical and statistical matter, comprising statements concerning imports, exports and prices of petroleum, as well as the tariff duties, descriptions of methods of transportation, analyses of United States petroleum and its derivatives, and a discussion of the caloric value of petroleum. The last hundred pages of the report are devoted to an account of the operations of the petroleum industry in 1904 in the other countries of the world.

ALASKA.

The development of placer mining in Alaska is having an effect on the total gold output of the country. The estimated production of the Territory last year was $9,000,000, and it may be $11,000,000 for this year. The open season of mining closed unusually early in the Nome districts, owing to freezing weather. A greatly increased production is reported from the Tanana valley. The returns from the custom houses indicate the increased production of the Alaska mines, and it is a significant fact that for the first eight months of the present year the shipments of Alaska gold exceeded those from the Yukon Territory to the United States. This is a new condition in gold mining in Alaska, for heretofore the Alaska output has always been considerably smaller than that of the Klondike and the tributary region in British territory. In the first eight months of this year the shipments of native gold from Alaska to the United States amounted to $5,887,672, as against $5,148,155 of foreign (Canadian) gold. The combined shipments of native gold and silver from Alaska in the same months amounted to $5,889,729, as against $3,524,703 in the first two-thirds of 1904. A small part of the shipments of native gold from Alaska was taken from the ground in 1904, but, on the other hand, the largest shipments of this year's product were made subsequent to August 31.

Passengers from Nome bring news of the freezing up of some of the big mining plants in the Solomon River district before the winter cleanup was made, leaving the gold of the entire season's workings in sluice boxes. Thomas Mulligan, who has been in the Solomon country for years, says the season was thirty days short of any previous year. The season opened July 15, and September 18 everything was frozen up solid. It was impossible to work hydraulic plants and winter drifting has commenced. On some of the creeks the freeze up occurred as early as September 14.

ARIZONA.

Coconino County.

(Special Correspondence).—It is reported that the Standard Iron Co. of New York is sinking a shaft 6 miles south of Diablo station, on the Santa Fe railroad, half way between Winslow and Flagstaff, to recover and smelt a meteor. This meteor is said to have torn a hole in the earth 600 feet deep and fragments of it are scattered over the surrounding country. The fragments have been analyzed and are found to contain iron and gold. The Standard Iron Company began working to locate the meteor about a year ago and a shaft from the bottom of the hole has been sunk.

Flagstaff, Nov. 7.

Gila County.

The Old Dominion C. M. & S. Co. during October produced 3,170,000 pounds of blister copper 99½ fine, which is a new high record, exceeding the output of May of this year—the previous record month—by 85,000 pounds. A reverberatory furnace of 250 tons capacity is to be put in to treat the flue dust and slag. The working shaft has been sunk to the fourteenth level and a crosscut started toward the main lode, 500 feet to the southeast.——The Tri-Bullion S. & D. Co., who own the Starlight mine in Kelly gulch, near San Carlos, are making regular shipments of their lead-copper ores to the El Paso smelter, and have made arrangements to ship their carbonate copper ores to the Old Dominion smelter at Globe. The company will extend their crosscut tunnel by contract. Superintendent Frank Weast may put in machinery for sinking on the vein to the sulphide ores at depth.

Maricopa County.

The Gila Gold Lode mines, in the White Tank mountains, west of Phœnix, are opening up considerable ore under the direction of S. W. Haines. Maddox & Towers are putting a mill on the Little Jessie mines, in the same district.

Yavapai County.

(Special Correspondence).—L. V. Wilkinson may develop a kaolin deposit near Wickenburg.——The Sunrise mine near Walker has been sold to an eastern company, who will start work December 1.

Prescott, Nov. 6.

E. W. McClave is developing the Easy Boss mine, near Stoddard.——The Planet Saturn mine, between Congress and Octave, is said to have passed into the possession of the Alvarado G. M. Co., of which F. L. Wright of Prescott is president and Paul Johns secretary and general manager.——M. L. Buckley, who owns the Victor mines on Lynx creek, 6 miles from Prescott, has developed them to a depth of 100 feet, and proposes to put in a gasoline hoist at once, and as soon as possible a 5-stamp mill.——The Black Dike group of claims on Cherry creek has been bonded to Julius A. Goerdeler of New York.——The cyanide plant at the Richinbar mine is now in operation, and it is proposed to add ten more stamps to the mill at Richinbar.

CALIFORNIA.

According to a recent bulletin of the United States Geological Survey, natural gas is produced from wells in San Joaquin, Sacramento, Santa Barbara, Ventura, Orange, Los Angeles and Tehama counties. Most of the domestic consumers using gas in California are supplied from wells in San Joaquin and Sacramento counties, the towns of Stockton and Sacramento being supplied. During 1904, however, 9 gas wells were drilled in Ventura county, the product of which is supplied to domestic consumers in Ventura and Oxnard. At Fairview, Orange county, is located a well, the product of which is used in a hotel and in cottages. At Tuscan Springs, Tehama county, are two wells, the product of which is used at the hotel and grounds for fuel and lighting. The wells in Santa Barbara are small gas producers. Gas from Los Angeles county wells is produced with the oil and partially utilized.

Amador County.

The 5-stamp mill at the Burlington mine, near Sutter Creek, will soon be started on ore that has been on the dump for some time past. A short test run has been made. G. H. Allen will act as millman for Superintendent Sibole.

Unless rain falls soon nearly every mine on the mother lode will have to close down, owing to the scarcity of water. In many cases the mines depend upon water power to operate the mill machinery, and even where electric power is used water is required in the mills. The storage reservoirs upon which depends the generation of electric current are getting low. Mines are being shut down at Jackson, Angels, Amador and other places along the lode, and hundreds of men are being thrown out of employment.

El Dorado County.

Work is to be resumed at the Scherrer mine at Georgetown.——It is reported that Frick & Ball will put in a mill at the Idaho mine, near Kelsey.——At the Sunrise mine, near Kelsey, Superintendent Ranney has had men opening up new ground. Grading has been done for the new mill. —— The Toombs property at White Rock has been bonded for $15,000 to C. E. Seymour of Georgetown.

Kern County.

The Greenback copper mine at Woody is to be worked after being idle for five years. Joseph Werringer, one of the owners, has leased the property.

Lassen County.

At Hayden Hill it is reported that the Golden Eagle mine has 100 men on the payroll. Ore from the Golden Eagle is treated by the cyanide plant that has a daily capacity of 120 tons.

Mono County.

The first shipment of ore from Masonic mountain, near Bodie, has been made from the Eastwood & Weitfle lease. Sorena is the name of the new camp in the Masonic Mountain district. Carson City is the shipping point for the district.

Nevada County.

At the Austin mine in Willow valley, near Grass Valley, the new double-compartment vertical shaft is down 25 feet. The machinery from the Posey mine has been moved to the Austin and is now all on the ground, waiting to be placed in position.

The big new concrete dam constructed by the Omega Co. in Scotchman's creek, 1 mile above Washington, has been completed and inspected and it is expected that a permit will be issued by the California Debris Commission to the Omega Co., allowing them to hydraulic this winter. The dam is built between two bluffs that extend into the creek. It is 50 feet high and 30 feet wide at the base and 15 feet wide at the top. It is a solid mass of rock and cement. In the center of the dam there is an outlet for the water, while a hard rock tunnel will also carry away the surplus water. There is a great basin back of the dam and tailings will be impounded for a mile or more up the creek. Over 250 tons of cement have been used, it being brought in from Emigrant Gap by freight teams. The work has been under charge of Superintendent W. M. Wilson and Foreman E. Brindle. As soon as the company receives a permit to hydraulic they will get their mine at Omega in readiness for the winter. The new dam is so located that at any time it can be raised and a total height of 80 feet can be secured.

At the Spanish Ridge mine, near Washington, Superintendent J. H. English has made arrangements for a new compressor. The Spanish Ridge secures free water from the head of Poorman's creek, but this season it failed on account of the dry spell, forcing the mill to shut down. Arrangements have been made to secure 400 inches of water from the McCarty ditch. The new sulphurets house is completed and will be used for holding sulphurets during the winter months, when not much hauling can be done.

At Graniteville the Birchville mine has been started after being shut down for thirty-five years. The old incline is being cleaned out and retimbered and a steam pump put in. Fred Medlin is in charge.

Placer County.

Superintendent R. Jones of the Cash Rock mine, near Forest Hill, has pulled out their machinery for the winter. They will open up again next spring.——A large force is working at the Baltimore, near Forest Hill.——There is prospect of the Gold Run Gravels, Ltd., being worked again. The company owns the gravel beds at Gold Run. J. D. Stewart of 214 Pine Street, San Francisco, has recently been appointed manager.

San Bernardino County.

The estate of H. L. Drew and J. B. Osborne have sold to the Guggenheims claims in the Ord mining district for $300,000. The property lies on the western slope of the Ord mountains, 144 miles from Daggett. The purchasers have had experts inspecting the property for several months. The claims affected are the Rio Vista, Plainsville, Bluff, Central, Coupon, Last Chance, Josephine, Modesto, Aztec, Sunflower, Brilliant, Keystone, Climax, Wild West, Cliff, Tehachapi, Atlantic, Conception, Sunset and Empress. The Guggenheims have a large force already employed, and machinery will be shipped from San Francisco.

San Diego County.

(Special Correspondence.)—Gold has been discovered near the Sweetwater dam.——Calcium carbonate has been discovered on the El Cajon grant, near Lakeside. A lime kiln may be built.——Calcium tungsate has been found on the road to Yuma from San Diego.——Mispickel has been found near Pine valley, and, from specimens received, seems to be very rich in the compound. ——The Stonewall mine at Cuyamaca has closed down indefinitely.

San Diego, Nov. 8.

Shasta County.

J. W. Neill, of Butte, Mont., representing an Eastern syndicate, has bonded the Uncle Sam mine and the Shasta copper claims, near Kennett. T. A. Varden is foreman at the mine. The mill on the Uncle Sam will be started when the rains come.

The mining industry of the French Gulch district is unusually prosperous this season. The Gladstone mine is employing more men than ever before and twenty stamps are kept dropping on ore. —— Stratton Bros. have struck high-grade ore in the Wheeler mine.

Sierra County.

The North American gravel mine near Gibsonville is being worked by 20 men under the direction of Elias Squier.

At the Oriental mine, near Alleghany, active development work has been resumed by Superintendent H. L. Johnson. The Alleghany M. Co. at Balsam Flat recently struck pay gravel in an upraise from their main tunnel.

J. H. Patterson is driving a tunnel to develop the Twenty-One and Rainbow Extension quartz claims near Alleghany.——The recently reconstructed 10-stamp mill at the Rainbow mine, near Alleghany, has been started regularly.

The Fillmore M. Co. is prospecting with Keystone drill in placer ground at the head of Port Wine ridge. E. O. Pieper of San Jose, Cal., is interested.

Trinity County.

Jas. Treadwell of the Bonanza King, near Trinity Center, was in San Francisco last Saturday with $20,000, representing a 2-weeks clean-up.

The quicksilver camp of Cinnabar is the scene of renewed activity after suspension of operations since a big flow of water was struck a few years ago in the Altoona. A company composed of Redding men has resumed operations in the Altoona. The quicksilver is shipped out by pack trains 17 miles to Castella, the nearest railroad point.

Tuolumne County.

About seventy men are employed at the Confidence mine at Confidence. —— A body of ore 8 feet wide has been uncovered on the 700-foot level in the Black Oak mine, near Soulsbyville.

COLORADO.

(Special Correspondence).—A large mineral exhibit is being arranged for by the Bureau of Mines to be placed in the State Capitol. This when completed may be the second largest in the country, according to statements given out by the parties interested in the work. The World's Fair of St Louis and the Exposition at Portland have enabled the Bureau to make a fine collection. It is believed many private individuals will contribute to the collection.——Many of the camps throughout the State report increased shipments for the month of October. A visit to the different machinery houses and machine manufacturers of the city demonstrates the fact that the mining industry is in excellent condition. A majority of the firms are doing a large business and the prospects for the future are bright.——E. Lyman White, State Mine Inspector, has asked for suggestions as to the best method for protecting mine tunnels in case of fire similar to the one at the Percy-LaSalle mine, near Aspen. Operators and mining engineers are invited to make suggestions.——A walkout has been reported from the San Juan district by the men, numbering forty in all, on account of the poor food being served by the boarding house, which is said to be under different management from the mine.

Denver, Nov. 6.

(Special Correspondence).—Efforts are being made by Secretary Callbreath of the American Mining Congress to have as large a delegation from this and other States to leave this city in a body arriving in El Paso, Texas where the Congress is to hold its next annual meeting, on the morning of Nov. 14th. A number of the delegates have signified their willingness and intention o

take advantage of this special arrangement. It is expected a large company of representative men will attend the convention from this city and State. Governor McDonald has already made public the names of the delegates appointed.

Denver, Nov. 6.

Boulder County.

It is reported that the Ottumwa Co.'s mill, near Sugar Loaf, is to be sold to the Virgilia G. M. Co., which has sold the Rugged Top mine.——The 50-ton mill being put up at the Corona mines by the Pollock M. & M. Co. is expected to be finished by December 1.

Chaffee County.

The St. Elmo Co. at St. Elmo have closed the mine and mill for the winter.

Clear Creek County.

(Special Correspondence).—Mining near Empire and Lawson shows increased activity.——Red Elephant mountain is being worked by the Red Elephant M. Co., in which A. C. Monson and G. E. Soderholm of Denver are interested, and by the Commodore Co. through their crosscut tunnel which has reached and cut some of the veins. Into this mountain, also, is being driven the Gold Valley tunnel, which is in 300 feet. In 150 feet more the Belvue Hudson vein will be cut. The Millington, Dictator, American Sisters and Joe Reynolds are all producing.——President Snavely of the Big 40 M. & M. Co. has started work on mines on the top of Columbia mountain, west of the Joe Reynolds.

Empire, Nov. 6.

Thomas Barnard, superintendent of the Clarence Stevens properties in Banner district, near Idaho Springs, has temporarily suspended work in the Fairfield tunnel and is now sinking the shaft upon the Nathan lode, at the head of Banner gulch. The shaft is 90 feet deep and has a good prospect of an ore body. The tunnel has been driven 700 feet on the Fairfield vein.——The Hansbrough claims, on Democrat mountain, are receiving active development.——H. M. Vincent of Denver, owner of the Vincent claims in East Argentine, is driving his crosscut tunnel.

The Montgomery-Ward tunnel, being driven by the Prudential M. Co. of Georgetown, is to be driven an additional 1000 feet.——The Pay Rock extension lode will be cut within the next 100 feet. It is now in 400 feet. Drifting is to be started in addition to the driving of the tunnel ahead. Manager W. C. Hood hopes to put up a power plant, at which time machine drills will be put in.

The Anglo-Saxon mill, erected for treatment of the ores of the Mrs. Wiggs and Anglo-Saxon tunnels, near Georgetown, has been finished. The tramway is carrying ores from the Saxon-Extension tunnel to the bins at the new mill. Manager J. K. Brown will work throughout the winter on the crosscut tunnel being driven by the Leavenworth Mountain M. Co., near Georgetown.——The Lafayette shaft on the Lamartine mine is to be sunk an additional 100 feet. This shaft is down 300 feet, and is 6000 feet west of the Lamartine shaft. A lateral will be run from the 400-foot level to connect east with the Lamartine shaft.——The Pelican mill, near Georgetown, has resumed work. The retimbering of the old stope in the Bismark workings has been completed. During the suspension of work at the mill, manager Frank Graham made a number of changes in the setting of the machinery.——A. Roberts is at work on the Sunburst Extension group, on Democrat mountain, near Georgetown. The crosscut tunnel is in over 200 feet.

Near Georgetown, the Mineral Chief is to be worked. A concentrating plant is to be put in, with a capacity of 100 tons daily. This property is owned by the Linn Consolidated M. Co., and Manager Hood is employing men in driving No. 2 and No. 4 levels ahead and in cleaning out and retimbering No. 6 level. Nos. 3 and 5 levels are both in over 1000 feet.

Gilpin County.

The Gold Rock mine is being unwatered and will be developed by J. J. Elliott of Russell Gulch.——New machinery has been put in and a shaft house built at the Ralls County mine, near Central City, by Manager Chas. Gage.——The working force at the Freedom mine, near Central City, has been increased by Manager Borcherdt. The main shaft, down over 800 feet, has been unwatered and the intention of the Eastern operators is to sink it down to the 1000-foot point during the winter. They intend to drive the tunnel in from Chase gulch to cut the Freedom shaft.——The Pozo mine, in Nevada gulch, near Central City, is being operated under a lease and bond from W. J. Lewis & Son of Central City, under the management of A. M. Rucker. The shaft is down 165 feet. The smelting ore is handled in Denver by the Lanyon Zinc Co., where the zinc is separated with magnetic and electric apparatus, the zinc product being afterwards shipped to zinc smelters at Iola, Kan., the lead and iron going to the Denver smelters for further treatment.

Gunnison County.

The Grand Prize claims, in the gold belt west of Pitkin, has been sold to T. M. Lyons, of Denver, and South Dakota capitalists for $25,000 The shaft is down 106 feet and has two levels into ore. The new owners contemplate extensive work——Near Maple Leaf and Sillsville, a 10-stamp mill is being put on Cooper mountain by Colorado Springs parties. This company has opened a lead of free gold quartz. A. L. Whitehorn and R. Jones are promoting it. It is expected the mill will be ready to operate within the next three or four weeks.

The Spring Valley G. M. & R. Co., which is operating the Midland mine, south of Gunnison, on a lease and bond, has started a tunnel to cut the vein 100 feet below the present workings.

Lake County.

In addition to the iron that is being shipped from the Tom Sargeant shaft, at Leadville, a good body of zinc has been opened at the lower level.——T. D. Kyle and associates, leasing on the Gold Basin, are shipping 30 tons daily of ore that will average $15 per ton. Work is also being carried on at the lower levels, and it is expected that the ore shoot above will be caught in the lower workings.——During the month of October Leadville produced 79,000 tons of ore of all grades, an increase of 1000 tons over September, and an increase of almost 4000 tons over August. Of the 79,000 tons produced, the Arkansas Valley smelter treated 20,000 tons. The remainder went to other smelters in the city.——The properties on Yankee Hill, between Fryer and Carbonate hills, Leadville, are shipping considerable ore, mostly iron.——The Hayden shaft, recently put into commission, has completed the dead work, and while prospecting in one of the drifts at the 375-foot level a good body of ore has been opened, and shipments from this part of the mine have started.

(Special Correspondence.—The Damascus M. Co., H. W. Hinckley, manager, shipped during the month of October 500 tons of ore from their property on the northeast slope of Iron Hill, near what is known as Adelaide Park. The ore was shipped to the smelter at Salida.

Leadville, Nov. 6.

The Result shaft of the Small Hopes Co., which has not been worked for years, has resumed operations. New machinery will be put in at once, and when the shaft and old drifts are repaired prospecting from the lower level will be started.——The Bullion shaft at the head of East Fourth street is shipping 200 tons per month of a fair grade of iron from the 125-foot level. Good progress is being made on the Bohn shaft, East Second street, and an average of 4 feet per day is being maintained. The shaft is in contact with no water to handle.——Sinking has been started on the Silver Nugget and will continue without interruption until the 700-foot mark is reached. This shaft is expected to develop the extension of the Little Jonny ore shoots, and also to catch the Garbutt vein. Larger pumps are being put in at Ollie Reed No. 1 shaft with a view of sinking the shaft deeper. When the pumps are in place hoisting ore from the different levels will be resumed. From the Little Jonny 7000 tons per month are being shipped by the lessees.

Ouray County.

York & Rathmell, who have been doing extensive development at the Union on Bear creek, near Ouray, have shipped their first car of ore.——Superintendent Frank Carrol of the San Pedro, near Ouray, has driven the development tunnel 1800 feet. Total length of the tunnel is to be 1 mile.

San Juan County.

Another carload of high-grade ore has been shipped from the Highland Mary mine, near Silverton, to the Durango smelter. Development work is being done on the property, and it is probable that this will be kept up all winter. The high-grade product will be shipped to the smelters, while the milling ore will be piled on the dump to await the starting up of the company's mill in the spring.

Theodore Ivens of the Eureka Exploration Co. has ordered machinery, roasters, tanks, etc., for an experimental plant for the Silver Wing mine, above the town of Eureka, for the treatment of copper ores. The new method is known as the Waterbury leaching process and consists in first crushing the ore and roasting it; second, in leaching it with sulphuric acid and then precipitating it upon steel plates, producing, it is claimed, a 90% copper product.

In Red Mountain district nearly every property will be worked all winter. All the large properties will continue active and many of the smaller properties that have been idle for the past fifteen years will be worked.

Arrangements have been made to continue work on the King mine on Sultan mountain, 2 miles south of Silverton, all winter. This property belongs to the Royal M. Co. During the winter operations will be confined to the Mazeppa and Turk veins and the upraise on the King vein proper.

Summit County.

(Special Correspondence). — The Old Union Co. of Breckenridge is producing thirty tons of concentrates per day. The Laurium is also shipping concentrates, as well as the Washington and Lucky mines. The Lucky mine is also shipping ore from workings. The Morning Star and the Carbonate, on Mount Baldy, the Gold Dust, on Nigger hill, and the Wellington, on Mineral hill, are also shipping high-grade ores. Mining on Mount Baldy is active. Besides the Morning Star leasers and the Beaver Creek M. & M. Co., working the Carbonate, both of which properties are shipping, are the Gold Belle, which is working twenty shifts on the main development tunnel; the Klondyke group, on which the owners are sinking a new shaft to strike the lime and porphyry contact, and the St. Johns group, being worked by the Summit County Mining Exchange.——The French Creek Tunnel Co. have driven their tunnel over 1600 feet and a drift is being run on one of the ledges passed through. Mark Evans is general manager. The other properties working in French gulch which are making good showings for themselves are the Wellington, which continues its shipments of lead and zinc ores; the Old Union, with its 100-ton mill, kept running night and day. The Rose of Breckenridge is being systematically prospected. The owners of the Mono group have decided to work throughout the winter. They have started raising from the lowest level to the middle level, by which they will provide circulation.

Breckenridge, Nov. 6.

On the Bannerot group, on Cowan mountain, 3 miles southwest of Cripple Creek, A. A. Bannerot of Pittsburg, Pa., has driven the Garfield tunnel 900 feet, and has cut several veins.——The mill of the Little Giant Co., in the same district, will soon be ready to crush ore from the Johnson group.——The Summit mill at Gillett, which during the summer has treated tailings at the old chlorination mill, has been closed down for the winter and no further work will be done until spring, when a cyanide plant of 100 tons capacity will be put in. The dump is under lease to George Kimball and associates of Idaho Springs.——Good ore has been found on the Requa Savage, on the south slope of Beacon hill, Cripple Creek, at a depth of 485 feet. This property is under lease to a company of which Ed. Chase and Robt. Austin of Denver are the principal owners. They gave out a contract for the sinking of the shaft to 315 feet. At that depth a contractor cut a 4-foot vein.

After a close-down of several months operations have been resumed on the Midget mine, on the west slope of Gold hill, Cripple Creek. The property is under lease to Charles Smith. The shaft of the Midget is down 850 feet.——A strike is reported on the Ellen McGregor claims of the Fair Chance M. Co. by Lessee Kellogg while working in a tunnel.——Operations have been resumed on the Hoosier mine, on Globe hill, Cripple Creek, by B. G. Shell. The shaft is to be sunk 100 feet from the 670-foot level.——Sinking has been started on the Finn lode on Ironclad hill.

C. J. Jackson & Co. have struck a 3-foot ore body in the Mary Nevin property, on Rosebud hill, Cripple Creek.——The shaft on the Montrose, on Ironclad hill, is 300 feet deep, but it is to be continued to the 400-foot level before doing any development.

The new machinery on the Burns lease of the Acacia, on Bull hill, Cripple Creek, has been started. The shaft on the Burns is down 400 feet and drifting for the Shurtloff vein has been started.——Lessees operating on the Christmas, on Bull hill, are sinking an additional 200 feet. The shaft is now down 800 feet. After the 1000-foot depth has been leased a crosscut will be run in an effort to tap the big ore bodies extending from the Golden Cycle.

Teller County.

The October output from the mines of the Cripple Creek district exceeded in tonnage and total value of that of any month during the past three years. The total tonnage treated is the highest in the entire history of the district. That the total value is not greater than ever before is because of the large tonnage of low grade ore treated by cyanide process in the district, this amounting to 16,000 tons, the lowest grade treated being $2.75 per ton at Gillett, and at this figure some profit being obtained. The balance of the total tonnage was handled by the mills at Colorado City, the Dorcas at Florence and the smelters. The October tonnage was 14,260 tons greater than for the preceding month with a total valuation of $110,487 in excess of the October production.

	Tons.	Av. Values.	Total
Smelters	12,000	$60.00	$78,3000
U. S. R. & R. Co	25,000	24.00	650,000
Portland	8,100	25.00	202,500
Dorcas	3,300	35.00	115,500
Anaconda	2,550	6.00	15,300
Wild Horse	2,300	6.00	13,300
Santa Rita	400	7.00	2,800
Sioux Falls	1 000	3.00	3,000
Los Angeles	500	5.00	2,500
Homestake	9,300	3 00	27,900
Summit	250	2 75	687
Economic	6,600	28.00	184,800
Totals	71,200		$1,956,287

IDAHO.

Boise County.

The United Idaho M. Co. has been formed to work placer and quartz claims near Placerville. W. P. Rowe, of Nampa, is superintendent.

Idaho County.

I. E. Warner, manager of the McKinley G. M. Co., says the mill near Lucile is completed and in operation. A cyanide plant will be put in.——It is reported that the owners of the North Star mine, near Pollock, intend to put in a mill next summer. Jas. Potter is manager.

Kootenai County.

The Conjecture M. Co. has started a long tunnel to develop its claims near Lakeview. H. D. Payne is superintendent.——The Panhandle Development Co. is opening up the Venezuela mine, near Lakeview. A. W. Thayer is manager.——The Keep Cool mine, near Lakeview, is being worked under the superintendence of W. W. Thibadeau.

Latah County.

The White Cross M. Co., owning property on Moscow mountain, 7 miles northeast of Moscow, is advertising for bids on a 100-foot extension of the lower tunnel. It is expected this will tap the main ledge 400 feet below the surface. Experiments are being made preparatory to putting in a cyanide plant.

Lemhi County.

The Gilmore M. Co., working on the headwaters of the Lemhi river, near Gilmore, hauls silver-lead ore 85 miles to Dubois, the nearest shipping point. In the same district the Silver Mountain mine is being operated by J. D. Wood and associates.

Shoshone County.

The Springville M. Co. has been formed to work claims between Mullan and Wallace, by C. Amonson, W. Graham, H. L. Bard, L. L. Leighty, John Frederick, O. Miller and D. M. Edmonds.

Washington County.

The Oregon Smelting & Refining Co. of Sumpter, Or., has purchased 4000 tons of Seven Devils copper ore, which will be hauled from Landore to Council and shipped to Sumpter. The ore belonged to the Ladd Metals Co., which recently closed down its smelting plant. The Oregon Smelting & Refining Co. has also taken a bond and lease on an iron sulphide copper mine 20 miles from Weiser, and will commence work on it. The ore will be hauled to Weiser and shipped to Sumpter. Tuzon & Stevens have their supplies for the winter at their Cuddy Mountain mines near Dale. R. Wilkie, who has a mine on Cuddy Mountain near Dale, has leased his property to the Ladd Metals Co. which will operate it and use the ore for fluxing purposes in the smelter at Landore.

MONTANA.

Fergus County.

The North Plum Creek Co. will start work with a diamond drill near Kendall. The Montana Hog, Grey Hound, Black Bird, Triumph, Troy, Mendota, Independence, Mayflower, Gold Ledge, Blue Bird and Magpie claims, and the Plum creek claims Nos. 1, 2, 3, and 4, have been transferred to the company. H. L. Arnold of Kendall is agent.

Madison County.

F. Thurston of Mammoth and A. Laden and S. Arthur of Butte have sold the Cliff mine, near Mammoth, to Ohio men, who will drive the tunnel 800 feet farther. —— At the Oro Cache, near Virginia City, J. Allbright has purchased the interest of Jack Devlin in the lease from the Granite Mountain Co., and the work is now carried on by Walker & Allbright, under the management of F. Walker.——Superintendent J. B. Salisbury, at the Shafter, near Virginia City, has been working the mill and cyadide plant on custom ore. The recent frost congealed the cyanide pulp to such an extent that a warm spell will be necessary to thaw out the returns.

Silver Bow County.

(Special Correspondence).—There is great activity in the East Butte district. The Amalgamated, United Copper, East Butte and Pittsburg & Montana companies are getting options on a lot of mining ground. The Pittsburg last week cut a big copper glance vein 11 feet wide, and the East Butte Co. is mining some of the richest ore in Butte from its mines. One shipment from the Oneida averaged 60% copper and 10 ounces of silver. The Pittsburg has acquired the Carlisle, but the Pacific is owned by the Butte Mines Exploration Co., which has not been working the mine for several years. Work has been started on the Mary MacLane, one of the East Butte Co.'s mines. It has a 4-foot vein of copper ore. Sinking on the Yankee Boy is down 320 feet. New machinery capable of working to a depth of 800 feet has been placed on the Dutton. Owing to a scarcity of cars on the Great Northern Railroad, the shipment of ore from the Boston & Montana mine at Butte to Great Falls fell off in October about 10,000 tons. The railroad company promises to furnish a sufficient number of cars by the middle of November. The new engine has been put in at the Mountain Con. mine of the Boston & Montana, but will not be put in operation at once. All mines of the Butte district, with the exception of a few that are shut down by injunction, are running up to their usual capacity and the district is yielding about 15,000 tons of ore a day. The Belmont mine, one of the new properties of the United Copper Co., is shipping 200 tons of ore daily, and the output is gradually increasing. The Pittsburg & Montana Co. has made the first shipment of copper, consisting of 100 tons, to New York. The metal so far turned out is better than 99% fine. The company is rushing its mining operations and is increasing its output of ore daily. The work of sinking a new shaft has begun. The North Butte Co.'s new hoisting engine, capable of working to a depth of 4000 feet, will arrive about the first of December. The new steel gallows frame being built will be 127 feet high. Work by leasers has been resumed on the Ophir mine in the southwestern part of Butte.

Butte, Nov. 6.

MISSOURI.

Secretary J. W. Marsteller of the Bureau of Mines of Missouri gives the value of the minerals produced in that State during 1904 as follows:

Ore.	Quantity.	Value
Zinc, pounds	476,786,000	$8,255,174
Lead, pounds	270,052,000	6,451,418
Coal, tons	4,368,129	7,003,078
Copper ores	.....	6,865
Nickel	.....	25,382
Cobalt	.....	89,706
Iron ores	.....	190,311
Barytes	.....	176,644
Kaolin and tripoli	.....	40,380
Total		$22,238,960
For 1903		20,352,976
Increase in 1904		$1,885,985

To the 1904 output should be added the value of the marble, granite, building stone, cement rock, lime rock and fireclay, amounting to $4,218,426, making a total of $26,451,097. The copper, nickel and cobalt ores were mined in Madison county. Iron ores were mined in thirteen counties, Crawford, St. Francois and Christian furnishing most. Barytes came from nine counties, Washington and St. Francois being the largest producers. Tripoli came from Newton county; kaolin from Miller and Morgan. The output of zinc and lead ores is given in the following table, in short tons:

County.	Zinc Ore. Tons.	Lead Ore. Tons.
Barry	312	.....
Benton	183	50
Camden	.....	31
Christian	275	95
Cole	.....	120
Crawford	.....	27
Dade	140	60
Franklin	.....	1,362
Greene	1,350	480
Hickory	12	17
Howell	4,115	.....
Jasper	202,513	27,891
Jefferson	1,475	461
Lawrence	13,579	1,101
Madison	.....	9,153
Miller	.....	30
Moniteau	213	187
Morgan	90	190
Newton	14,131	1,650
Oregon	30	.....
Ozark	60	.....
St. Francois	.....	89,354
Washington	15	2,634
Webster	.....	32
Wright	.....	51
Totals	238,393	135,026

Zinc ores show a product of 238,393 tons, which embraces 21,601 tons of the silicates and carbonates. This is an increase of 45,368,000 pounds over 1903. The value of the 1904 product is $8,255,174, and compared with 1903, shows an increase of $1,464,960, or 17.7%. The average price received for all grades of zinc for the year 1904 was $36.33 per ton. The silicates and carbonates averaged $17.50 per ton. The lead ore product amounts to 135,026 tons, of which 1276 tons represent the dry-bone mined. Of this total amount, the eastern district produced 103,682 tons, or 77.6%. The latter ore does not average as well per ton in price as in the Joplin or western district, as it averaged but $45.61 per ton. The 30,068 tons of lead proper averaged in the western district $56 per ton, while the 1276 tons of dry-bone averaged $30.85 per ton. The Joplin district leads all other sections of the State, as well as the nation. Its output for the year of zinc ore amounts to 467,790,000 pounds, while the remainder of the State produced 11,996,000 pounds of zinc ore. Jasper county produced during the year 91% of all the ore mined in the Joplin district, having to her credit for zinc and lead production during the year the sum of $8,869,607. St. Francois county, in the eastern district, like Jasper county in the west, continues its great lead in the production of lead ore. It furnished during the year 86.3% of all the lead ores produced in the eastern district—this, too, in the face of the closing down of three large plants on account of strikes for a considerable time. The product of the county for the year is valued at $4,038,094 in all.

NEVADA.

Elko County.

Manager G. L. Moats of the Ohio Lead M. & S. Co., operating the Latham and other properties at Sprucemont, south of Wells, will put in power drills to hasten work on the Juniper tunnel.

Humboldt County.

The Federal Mines Co., operating the placer mines in Spring valley, near Winnemucca, has bought a dredger and will rebuild its present pipe line over Indian Summit in order to begin work on a large scale.

Lander County.

There is a rush from Austin to Gold Park. A strike was made on the Peterson claim.

Lincoln County.

It is reported that the Searchlight M. & M. Co. will at once put in a 10-stamp mill, in addition to the 3-stamp battery which has been used for prospecting purposes. Sinking has again stopped on account of an increased flow of water, which taxes the capacity of the new pump.——F. Carlsen will develop the Oregon group, near Searchlight.

NEW MEXICO.

Otero County.

The Excelsior Co. will put in machinery on its property at Jarilla.——The Jarilla branch of the El Paso & Southwestern Railroad is to be extended through the gap near the Lucky at Jarilla to the Bi-Chance property, on the north side of the Lucky Flat. The shaft is to be equipped with a modern hoist.——The Southwest Co., operating at Jarilla, intends to carry on diamond drill operations to prove the ground on its properties.

Sierra County.

The Empire G. M. & M. Co. is preparing to transfer ore from the Bonanza mine, near Hillsboro, to the mill by rail. Track laying is in progress. Ten additional stamps for the mill are on the ground and they will be in operation before Dec. 1.

OREGON.

Baker County.

The shaft at the United Elkhorn mine, near Baker City, is down to the 400-foot level. Stoping is being done mainly on No. 3 level. Manager E. O. Field has seventy-five men at work.

Grant County.

The Buffalo Monitor mines, near Granite, are to be opened up by N. Berkeley.

Josephine County.

Manager A. C. Hoofer of the Mount Pitt Quartz & Placer M. Co., near Grants Pass, has purchased supplies and placed a crew on his company's mine. Development will be done all winter.

The Mines Development Co., of which S. W. Blasdell is superintendent and manager in charge, is building a flume to work its 400 acres of hydraulic placer ground on Grave creek, 5 miles west of Leland. The water is being taken out of McNair and Reuben creeks, and will furnish a flow of 2000 miner's inches during the winter season. A head will be secured for the giant of 275 feet.

The Grouse Mountain property of Mount Baldy district, 4 miles from Grants Pass, has been bought by L. P. Larsen of Spokane from A. L. Smith, Wm. Gant, E. A. Edger and I. J. Hunter, the former being retained to superintend operations. The Southern Pacific G. M. Co. has been formed to work the claims.——A number of miners have returned to Grants Pass from Lightning gulch and Canyon creek district, western Josephine county, their pack ponies laden with 400 pounds of rich telluride ore discovered on the Luce, Kauffman & Booth claim of Canyon creek. Canyon creek district is reached from Grants Pass by way of the stage road to Kerby. The district of the strike is 12 miles by trail from Kerby.

Lane County.

The initial shipment of mercury from the new furnace at the Black Butte has been made from Cottage Grove, being more than 3000 pounds of quicksilver. The new furnace has a capacity of 240 tons daily.

Wallowa County.

Manager E. R. Trippe has let a contract to sink a 200-foot shaft on the Tenderfoot mine, near Joseph.

PENNSYLVANIA.

The new child-labor law, which will force 12,000 boys out of employment at the anthracite mines, has gone into effect in Pennsylvania. It provides that no boys under 14 years shall be employed in the breakers or outside the mines and none under 16 in the mines. It is estimated that about 12,000 of the 24,000 breaker boys employed are between the ages of 10 and 14 and will be affected by the new law. These boys will be forced into the schools by the compulsory education law. In the mines there are some 3500 door boys and helpers, many of whom are under 16, but those who are displaced there may obtain work in the breakers. The breaker boys work nine hours a day and earn an average of 10 cents an hour. The dust in the breaker, their confinement to a bench where, bent over, they pick the slate from the coal as it slides down the chutes, stunts the boys, makes them liable to various diseases and generally impairs their health. It is the intention of the officers of the Mine Workers' Union to see that the law is enforced. It provides a fine of $10 a day for each boy under age employed by a coal company, and makes the companies responsible.

SOUTH DAKOTA.

Lawrence County.

Work has commenced on the Echo claim of the Echo Gold Mining Co. near Maitland. The company is sinking a single-compartment shaft and has now reached a depth of 30 feet. Superintendent A. J. Simmons of Deadwood will sink 100 feet and then development work and prospecting will start.——The Black Hills Mining Men's Association has elected a new set of officers, which will at once take charge of the affairs of the association. The officers are: W. J. Thornby, president; J. V. N. Dorr of Lead, first vice-president. Walter Mackay of Lead, second vice-president; Otto P. Th. Grantz, third vice-president; D. A. McPherson, Deadwood, treasurer, and Jesse Simmons, Deadwood, secretary.

UTAH.

According to the United States Geological Survey's report on lead production, Utah has increased its output by enlarged operations in the Tintic district, where the Centennial-Eureka, Gemini, Grand Central and Mammoth are the principal shippers. At Park City the Daly-Urst and the Silver King are the leading producers. The United States Smelting Co. has completed a new lead-smelting plant at Bingham Junction.

Beaver County.

The shaft of the Estrella mine of the Milwaukee Leasing Co., 6 miles from Milford, is to be sunk to a depth of 400 feet. S. A. Tarbet is superintendent.

H. S. and E. R. Woolley, of the Mines Development Co., will start work on the Catalba and Odd Fellows claims, near Milford.

Juab County.

The Grant claims, near Eureka, are being worked by J. A. O'Brien and H Gustaldi.——The Tip-Top mill at Hailey, Idaho, is to be moved to the Godiva mine at Eureka.

Salt Lake County.

Work on the Snyder group at Bingham has been resumed.

Summit County.

President N. Treweek and manager of the Wabash M. Co. of Park City reports that the company now controls 220 acres. In the development of the property they have found five different veins, of which three have shown ore. For fourteen months prior to July 1, 1905, energies were devoted to running a long line of crosscut work in a general south-southeast direction; this new line of work is over 3000 feet in length. Up to Sept. 1, 1905, there had been 5597 feet of shafts sunk and drifts run at a cost of $83,755.13. Since that time additional work aggregating 6059 feet has been done: Drifts, 5709 feet; main shaft sunk (total depth now 800 feet), 200 feet; double-compartment winze, 90 feet; double-compartment raise, 60 feet.

Cost of main shaft, 200 feet at $40	$8,000 00
Cost of winze shaft, 90 feet at $25	2,250 00
Cost of raise, 60 feet at $20	1,200 00
Cost of miscellaneous surface work	1,500 00
Total cost of extra expensive work	$12,950 00
Cost of drifts, 5709 feet, at $16 48	94,091 54
Total cost of work done, 6059 feet	$107,041 54

The report covers the period from Sept. 1, 1903, to Aug. 31, 1905. In the election the old board of directors was returned. It consists of N. Treweek, president and manager; John R. Barnes of Kaysville, vice-president; W. M. Ferry, secretary and treasurer.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Ore shipments have been started from the Dominion Copper Co.'s Brooklyn mine in Phœnix, the ore going to the company's smelter at Boundary Falls. It is given out that the smelter itself will be blown in about Dec. 1. Superintendent W. C. Thomas is getting matters ready at the reduction works. A supply of coke has been obtained and Manager Drummond is gradually increasing the forces at the mine. Preparations are being made for the installation of an electrically operated air compressor at the Rawhide mine at Phœnix.

Cassiar District.

The Atlin mining division has been the chief factor in the placer gold production of the Province for some years. This district was discovered during the summer of 1898. On the south bench of Pine creek opposite the town of Discovery, hydraulicking is being done by the North Columbia Hydraulic Co., of which J. M. Ruffner is manager. The B. C. Mining Exchange states that he has succeeded in thoroughly disintegrating the cemented gravel, and has found a cheap and satisfactory method of piling tailings. He has concluded that blasts of 2000 or 3000 pounds of 75% powder are of most efficacy. Drifts are run and T's set, so that charges of powder can be placed at least every 25 feet over the whole area of ground to be blasted. He calculates that the powder has a breaking potential of 12½-foot radius. The biggest charges, about 200 pounds each, are at the back of the drifts. Time and labor are saved and the efficiency of the blast greatly increased by using water for tamping. To outward appearance, the blast is a failure. Only the top of the bank is observed to fall down. When piping begins, however, the effect of the dynamite becomes apparent. The gravel, which was as hard as cement, is found to be perfectly shattered, and the washing of it is

as easy as ground sluicing. The system of piping observed throughout is having two giants work together so that the gravel is driven into sluice boxes by two streams directed against it from opposite directions. Seven-inch nozzels are used. The pits are double-compartment, with two lines of sluice boxes. When one sluice is being cleaned, piping goes on in the other compartment. Three pits are worked. On one of them natural dumpage facilities are poor, so to dispose of tailings an elevator has been built. This elevator is 36 feet long, 10 feet wide, 8 feet high, and supported by trestles. Its lower end is two feet below bedrock, its upper end 12 feet above bedrock. In it steel bars ½ inch by 3 inches are set horizontally 3 inches apart. The floor is protected from wear and tear by being solidly blocked. Between the blocks and the bars there is a clearance of 1 foot. As the elevator can be readily moved, it is so stationed that its foot is near the giants. A constant stream of water and gravel being directed against it, the boulders too large to pass between the bars are rushed up the incline and topple over, while the fine material passes between the bars and thence to the sluice-boxes. When the tailing pile gets higher than the elevator a piper trims it off with his giant. Thus the boulders are driven back and stacked 20 feet high. The management tried placing the bars longitudinally, thinking that boulders would be forced up the elevator more easily. The bars were too light. A short run bent them badly, so their former position was reverted to. Next year the longitudinal may again be tried, but railway track will be used. The dredger on Upper Spruce creek has been completed and is working full capacity. The Northern Mines, Ltd., on Spruce creek, have successfully worked a steam shovel plant. Birch creek had a short water season,

East Kootenay District.

The Marysville smelter has determined to put in Heberlein roasters to equal the capacity of its plant. This is expected to work a saving of nearly $5 a ton on the ore treated. The second stack of the smelter will not be blown in until next summer.

Nelson District.

The Hendryx agitator and process of cyaniding ore which has been put in at the Reliance mine, near Nelson, has been declared by Superintendent D. Lay to be a success. The ore at the Reliance is a low grade, slimy proposition, which has to be crushed to from 60 to 100 mesh to give the best results. The process differs from others in that cyaniding the ore is done with a solution of $\frac{2}{10}$ of 1% to the ton in the battery. When the pulp reaches the agitator the cyanide is increased to ½ or ¾ of a pound to the ton of solution. The ore pulp is agitated from four to six hours, and the gold and silver are precipitated on the plates with an electric process. No attempt is made to separate the slimes from the sands. The mine is on Forty-Nine creek, and is connected with the mill by a 1750-foot aerial tram.

Rossland District.

The Le Roi is putting a skipway in the winze on the 1350-foot level as a preliminary to beginning the work of deepening the winze from the 1550 to the 1650-foot level, which will be explored. The development from the 1350-foot level down to the 1550-foot level has been satisfactory in disclosing the presence of ore bodies. A crosscut from the 1350-foot level of the Le Roi in another direction is intended to pierce the Josie ground of the Le Roi No. 2. The Josie workings are down 900 feet, and this crosscut will enable the Le Roi No. 2 to explore its ground at a point 450 feet below their present workings. The shipments for the week ending Nov. 4 were: Le Roi, 2220 tons; Center Star, 1590; War Eagle, 1320; Le Roi No. 2, 180; Le Roi No. 2 milled, 1200; Jumbo, 300; Crown Point, 80. Total for the week, 6890; and for the year 282,553 tons.

MEXICO.

Baja California.

(Special Correspondence).—Near Alamo it is said that the Russell M. Co. are putting up new machinery and discarding their old plant. —— The Pedrara Co. are working the Pedrara onyx mines in Lower California, extracting the onyx and hauling it 50 miles to a landing 7 miles below Canvas Point, from which it is shipped by steamer to San Diego, Cal.——A party is investigating the onyx mines owned by Wm. Denton about 30 miles north of San Luis Gonzago.——Tourmalines and a good quality of beryl have been discovered near Ensenada.

San Diego, Nov. 8.

Jalisco.

The Amparo M. Co. has put in machinery at the Canada mine, 2 miles northwest of the Santo Domingo property, and has commenced to reopen and unwater it. The Canada was worked by the former owners of the Santo Domingo, who extracted very rich ore. The Amparo M. Co. is now shipping from two to three cars of ore per day from the Santo Domingo mine to the Torreon smelter, and is milling thirty tons of low-grade ore daily.——C. Romero has commenced work on a tunnel to cut below the old workings of his Sorrillo mine, 1 mile south of Etzatlan.——The Magistral Mining Syndicate of Los Angeles, Cal., of which M. D. Graves is manager, has commenced development of the Magistral, Eden and Refugio mines, 1 mile south of the Santo Domingo.

Michoacan.

(Special Correspondence). — In the Ario district, New York and Salt Lake parties, headed by S. L. Butler, have started work on their Los Pozos properties, in the basin of the Arroya de los Naranjitos. The group consists of four claims of which the Pozos mine has been worked extensively on the surface by the antiguas.——The vein is on a slate and porphyry contact and is 11 feet wide. ——The Amplicaciones consists of 18 pertenencias northeast and southwest of the Pozos mine. —— The Veta Grande consists of 8 pertenencias. ——The Virginia concession of 12 pertenencias is being worked by the open cut method; 12,000 tons of concentrating ore lie in sight on the slate bed on the surface. A grinding mill with daily capacity of 15 tons will be put in. A concession of the water of the Arroya de los Naranjitos has been granted by the State of Michoacan.——The Carrizal M. Co., which has suspended operations, has made a 2-weeks run of their 5 stamps, realizing a bar worth $2400.——Juan Lopez is working a small force on the Cuachtemoc mine near Los Joyas. The vein averages 15 inches and carries 2 ounces values. —— The State of Guerrero has been claiming, recently, Michoacan territory, owing to the rich mineral discoveries in the latter State. Upon legal investigation it is found that the decreto number 3253 fixed permanently the Rio Balsas as the boundary line between the two States. This decree is dated May 15, 1849.

Carrizal, Nov. 6.

Personal.

W. F. BRAY of Placerville, Cal., is in San Francisco.

W. A. HENDRYX has left Nelson, B. C., for New York City.

L. L. WARDE of Mexico City, Mexico, is in San Francisco.

CHAS. READ has left Eureka, Nevada, for the Philippines.

T. E. SCHWARZ has returned from Ouray, Colo., to Denver, Colo.

CHAS. M. MCINTIRE is developing a mining property at Ely, Nevada.

SAMUEL MCINTYRE has returned from Nevada to Mammoth, Utah.

W. F. ENGLEBRIGHT has returned from San Francisco to Nevada City, Cal.

WILLIAM RUSSELL has returned to Denver, Colo., from Sheridan, Mont.

G. W. HEINTZ, traffic manager U. S. Smelting Co., of Utah, is in New York.

J. M. CALLOW has returned from Denver, Colo., to Salt Lake City, Utah.

ALGERNON DEL MAR is running the Edel mill at Enterprise, Butte Co., Cal.

SUPERINTENDENT W. A. PTOLEMY of Silverton, Colo., is in Los Angeles, Cal.

FRED W. BRADLEY of San Francisco, Cal., is in Colorado on professional business.

J. C. SCOBEY, consulting engineer Cinguieta C. Co., Sonora, Mex., is in Denver, Colo.

J. S. WALLACE, secretary Oriental M. Co. of Korea at San Francisco, Cal., is in Colorado.

J. B. ROSS, manager Ross M. & M. Co., has returned from Bisbee, Ariz., to Denver, Colo.

N. C. BONNEVIE, who has been in Chicago the past few weeks, has returned to Denver, Colo.

W. J. ROBINSON, of the British-American Dredging Co., Atlin, B. C., is in San Francisco, Cal.

T. A. RICKARD returns from Mexico to-day to his residence, 2335 Warring St., Berkeley, Cal.

JOHN H. MACKENZIE, of San Francisco, Cal., has left Rossland, B. C., for London via New York.

A. S. ROSE, manager Gilmore M. Co., near Gilmore, Idaho, will spend the winter in Pittsburg, Pa.

F. M. LELAND is reported making a success of the White Knob copper property, Mackay, Idaho.

JAS. MAHER has succeeded Samuel Treloar as superintendent Lexington mine, at Butte, Montana.

C. A. HOPKINS of Boston, president of the Quartet mine at Searchlight, Nev., is in San Francisco.

CHAS. HORNBACK is manager American Tungsten & Mining Co., working properties near Eldora, Colo.

CHAS. P. OLIVER is now mine superintendent Colorado Tungsten Corporation, Nederland, Colorado.

E. E. NICHOLSON has been appointed superintendent Carizzo copper mines, west of Autlan, Jalisco, Mex.

P. C. MCCARTHY, manager Hidden Treasure mine, Lake City, Colo., has returned there from Denver, Colo.

L. W. VIDLER, who has been examining mine property in New Mexico, has returned to Georgetown, Colo.

J. M. GOODWIN has returned to Silver City, Idaho, from a mine examination in Humboldt county, Nevada.

J. B. TOMLINSON, manager Swansea mine, Cananea, Sonora, Mexico, has returned to the mine from Denver.

JOHN YEATMAN, engineer with the United Iron Works, has returned to San Francisco, Cal., from Yuma, Ariz.

JNO. YATES, A. R. S. M., has been appointed professor of mining at the Transvaal, S. A., Technical Institute.

FRANK E. SHEPARD, president Denver Engineering Works, Denver, Colo., has returned there from a trip to Mexico.

O. A. STRANAHAN is now sales manager power department Allis-Chalmers Co., with headquarters at Milwaukee, Wis.

DR. F. R. CARPENTER has returned to Denver, Colo., from Nova Scotia, where he has been examining mining property.

JOHN J. DALY, president Daly-Judge mine at Park City, Utah, has returned from California to Salt Lake City, Utah.

C. F. SCHILLING of Kelvin, Ariz., has been appointed superintendent White M. Co., working near Wickenburg, Ariz.

ARTHUR WARREN has resigned the position recently held by him in the publicity department of the Allis-Chalmers Co.

C. A. VAN HORN, manager Fortune Dyke M. & M. Co., has returned to Sugar Loaf, Boulder Co., Colo., from Michigan.

S. A. KNAPP, of Tonopah, Nev., who has been examining mining property at Pine Grove, Nev., is in San Francisco, Cal.

E. A. ADHAMS of Milwaukee, Wis., president Milwaukee Leasing Co., has returned home from his mines near Milford, Utah.

W. E. DEFTY of Phœnix, Ariz., will be making examinations in Durango and Chihuahua, Mex., during the month of November.

H. L. JOHNSON, owner Tightner mine at Alleghany, Sierra county, Cal., has returned to the mine from a visit to San Francisco.

E. J. MOORE, the Colorado manager of this journal, will represent it at the American Mining Congress at El Paso, Tex., next week.

CHAS. HUTCHINSON of the Union Iron Works of San Francisco, Cal., has gone to El Paso, Tex., to attend the American Mining Congress.

V. C. HEIKES, of the U. S. Geological Survey, is preparing a bulletin on the mineral statistics and development of Mohave county, Arizona.

R. MCF. DOBLE, consulting engineer of San Francisco, Cal., has severed his connection with the Abner Doble Co. in order to resume his individual practice.

JOHN W. CLEAVER, manager Santa Rosa Mexican Mining Co's. smelter, San Javier, Sonora, Mexico, arrived there Nov. 4, after an absence of five years.

MARK B. KERR, having completed an investigation of mines on the Cuyamaca Grant, in San Diego county, Cal., has gone to New York City on mining business for the Cuyamaca Co.

H. V. CROLL, manager Salt Lake City office of The Wellman-Seaver-Morgan Company, has been at the general offices at Cleveland for a number of weeks, and will return to Salt Lake City today.

JAS. ANNAND, for the past year superintendent of mill for Ashanti Goldfields Corporation, Ltd., Abuassi via Sekondi Gold Coast Colony, West Africa, has resigned his position and is now at Hotchkiss, Colo.

W. C. RALSTON and traveling representative W. A. Desborough will be present at the coming session of the American Mining Congress, at El Paso, Tex., in the interests of the Fulton Iron Works, San Francisco, Cal.

PRESIDENT ROOSEVELT has appointed the following delegates to the Mining Congress at El Paso, Texas: S. F. Emmons, T. A. Rickard, J. W. Holman, W. R. Ingalls, A. F. Lucas, J. A. Holmes, F. W. White, L. A. Coate, F. C. Barrett and C. W. Hayes.

N. S. KEITH is installing a plant for the Pahaquarry Copper Co., Dunnifield P. O., to treat 200 tons per day of their cupriferous sandstones at their mines in Warren county, N. J., as noted in the article on treatment of low-grade copper ores in the issue of this journal of Sept. 9.

GOVERNOR PARDEE of California has appointed the following delegates to the eighth annual American Mining Congress, to be held at El Paso, Texas, November 14th to 18th: E. C. Voorhies of Sutter Creek, R. N. Bulla, Thomas Ewing, H. Z. Osborne and G. H. Hooper of Los Angeles, Frederick W. Corkhill of Berkeley, J. H. West of Needles, Prof. S. B. Christy of Berkeley, W. F. Detert of Jackson, David McClure of the Gwin mine, J. H. Neff of San Francisco, W. P. Hammon of Marysville, John Daggett of Siskiyou, Harold T. Power of Bullion and Frank A. Leach of Oakland.

Books Received.

In Bulletin No. 268 of the United States Geological Survey, R. M. Bagg describes "Miocene Foraminifera from the Monterey Shale of California with a few Species from the Tejon Formation."

Water Supply and Irrigation Paper No. 136, "Underground Waters of Salt River Valley, Arizona," by W. T. Lee, is a valuable contribution to the literature of the bearing of geology on water supply.

As extracts from "Mineral Resources of the United States," the United States Geological Survey has issued "The Production of Platinum and Allied Metals in 1904," by D. T. Day; "The Production of Zinc in 1904" and "The Production of Lead in 1904," by Chas. Kirchhoff.

Proceedings of the American Institute of Electrical Engineers, Vol. XXIV, No. 10, Oct., 1905, contains "Some Experiences with Lightning Protective Apparatus" by J. C. Smith, and "Notes on Lightning Arresters on Italian High Tension Transmission Lines" by Philip Torchio.

Water Supply and Irrigation Paper, No. 123, of the United States Geological Survey, describes the "Geology and Underground Water Conditions of the Jornada del Muerto, New Mexico," by C. R. Keyes. This is a valuable paper, showing the relation of geology to a possible water supply for an arid region.

As Bulletin No. 270, the United States Geological Survey has issued "The Configuration of the Rock Floor of Greater New York" by W. H. Hobbs. It presents results of studies of the depth and nature of bedrock beneath New York as shown by various wells and borings, bridge and tunnel sections, Government dredgings, etc.,

with the intention not only of studying the geological problems, but also to aid engineers in future work.

As an extract from "Mineral Resources of the United States for 1904," the United States Geological Survey has issued "Natural Gas," by F. H. Oliphant, which contains much information regarding the production, distribution and uses of natural gas in the several States. The production was valued at $38,496,760, of which Pennsylvania produced 47%, and West Virginia, Indiana and Ohio 46.3%. The United States produced 99% of the entire known world's production of natural gas.

As Professional Paper No. 41, the United States Geological Survey has published "Geology of the Central Copper River Region, Alaska," by W. C. Mendenhall. This paper presents the scientific results obtained in 1902 by two combined geologic and topographic parties in the upper Copper, the Nabesna, Chisana, south and west slopes of the Wrangell mountains, and the southern face of the Alaska range that is drained by the tributaries of the Copper. The author details the geography, historical geology, physiography, and economic geology of the region.

In the "Geology of the Tonopah Mining District, Nevada," Professional Paper No. 42 of the United States Geological Survey, J. E. Spurr presents the results of an exhaustive investigation into the occurrence of the Tonopah ores. The author describes the general geology, the mineral veins, subterranean water, physiography, and the descriptive geology of mines and prospects. He also discusses rock alternation connected with mineralization, origin of mineral veins, increase of temperature with depth, and comparison with similar ore deposits elsewhere. The paper contains much material pertinent to the theories of ore deposition. In his conclusions as to the genesis of Tonopah ores the author says: "The Tonopah district was, during most of the Tertiary time, a region of active volcanism, and probably after each eruption, solfataric action and fumarolic action, succeeded by hot springs, thoroughly altered the rocks in many parts of the district. At the surface, during those periods, the phenomena of fumarolic and solfataric action and of hot springs were similar to those today witnessed in volcanic regions, but the rocks now exposed were at that time below the surface. The veins fill conduits which were formed by the fractures due to the heavings of the surging volcanic forces below, and along which the gases, steam, and finally hot waters, growing gradually cooler, were forced, relieving the explosive energies of the subsiding volcanism. The water and other vapors, largely given off by the congealing lava below, carried with them, separated and concentrated from the magma, metals of such kind and of such quantities as are present in the veins, together with silica and other materials. The nature of the metallic minerals in the vein in this case is believed to depend largely upon the particular magma where the emanations pro eeded. In the chief Tonopah veins this was the earlier andesite. Other factors, such as relative depth, have evidently an important controlling influence." The paper will probably furnish much material for geologic discussion. It contains some practical information that may be valuable in the further development of the region. It will be interesting to see how the author's contentions are borne out with depth.

Commercial Paragraphs.

THE Salt Lake Hardware Co., Salt Lake City, Utah, is supplying a new power plant to the Sevier Con. G. M. M. & P. Co., Kimberly, Utah.

THE Dow Steam Pump Works of San Francisco, Cal., have bought ten acres of land with tidal frontage at Alameda, Cal., as a site for their new and enlarged works.

FROM Manager W. B. Dennis of the Blackbutte quicksilver mine, Blackbutte, Or., comes "one flask Hg." as a souvenir of the first run of the new Dennis furnace.

W. H. MOTTER & SON, Eighteenth and Lawrence streets, Denver, Colo., are installing one of their 25-ton roasters at Silverton, Colo. Same will be in operation about Nov. 20th. They also have orders for two 50-ton plants, one for New Mexico and the other one for Gunnison county, Colo.

ON the wall of the manager's office hangs the latest diploma accorded the MINING AND SCIENTIFIC PRESS, it having been conferred by the jury of awards of the Louisiana Purchase Exposition at St. Louis, Mo., in 1904, which accorded a gold medal to the MINING AND SCIENTIFIC PRESS. The diploma is 16x18 inches and finely printed. The gold medal weighs 3½ ounces and is a handsome affair. The Chicago Exposition in '93 and the Paris Exposition in 1900 sent similar diplomas for awawded excellence to the MINING AND SCIENTIFIC PRESS.

THE Wellman-Seaver-Morgan Company of Cleveland, Ohio, have been awarded by the United States Government the contract for crane service over two ship building berths, at the United States Navy Yard at Mare Island, Vallejo, Cal. This is one of the most important contracts in this line that has been placed for a long time, comprising an immense steel trestle and a powerful high-speed cantilever gantry crane, mounted on same, and traversing over the two berths. C. W. A. Koelkebeck, mechanical engineer, for the past four years with the Garrett-Cromwell Engineering Co., and for ten years previous with Julian Kennedy, has joined the engineering staff of the Wellman-Seaver-Morgan Co., where his attention will be given to blast furnace, steel plant and rolling mill construction.

THE Lindholm Manufacturing Co., 1643 Champa street, Denver, Colo., are receiving orders for their patent candlestick. A list of firms carrying same in stock throughout the country is as follows: Anaconda M. Co., Butte, Mont.; Cripple Creek Mine Supply Co., Cripple Creek, Colo.; Hibbard, Spencer & Bartlett Co., Chicago; Holly, Mason & Marks, Spokane, Wash.; A. N. Holter Co., Helena, Mont.; Krakuer, Zork & Moye, El Paso, Texas, and Chihuahua, Mexico; McGowan Bros., Spokane, Wash.; Missoula Mercantile Co., Missoula, Mont.; A. E. W. Miles Co., Livingston, Mont.; Morrell Hardware Co., Cripple Creek, Colo.; Pacific Hardware & Steel Co., San Francisco, Cal.; E. G. Pryor & Co., Victoria, B. C.; Pacific Coast Borax Co., Borax, Cal.; Scott S. & T. Co., Denver, Colo.; Salt Lake Hardware Co., Salt Lake City, Utah.

Trade Treatises.

Bulletin No. 358 of National Electric Co., Milwaukee, Wis., intimately shows the details of construction of their belt-driven A. C. generators and gives data relating to various types.

Brown & Sharpe Mfg. Co. of Providence, R. I., send their 1905 catalogue and price list of fine mechanical machinists' tools, including rules, scales, protractors, calipers and gauges.

Latest Market Reports.

SAN FRANCISCO, November 10, 1905.

METALS

SILVER. — Per oz., Troy: London, 29 1/8d (standard ounce, 925 fine); New York, bar silver, 63c, refined (1000 fine); San Francisco, 63c; Mexican dollars, 51c, San Francisco; 48½c, New York.

The price of silver quoted to-day is higher than in many months—63 cents. Within the past month the price of the metal has advanced from 61⅝ to 63 cents, a gratifying increase, though small.

COPPER.—New York: Standard, $16.35½; Lake, $16.35½ @16.67½; Electrolytic, $16.62½; Casting, $16.00@16.37½. San Francisco: $16.75. Mill copper plates, $17.50; bars, 18@24c. London: £71 10s spot per ton.

The copper market remains at a standstill. The conditions of supply and demand remain almost stationary, and the price shows no change.

LEAD.—New York, $5.40; St. Louis, $4.50; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £14 18s 9d ℔ long ton.

SPELTER.—New York, $6.25; St. Louis, $6.00; London, £28 5s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $32.80@33.25; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔ lb., 40c. London, £149.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $16.85; gray forge, $16.35; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¼c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 13½c; Hallett's, 14½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12½c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50: Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

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OILS.—Linseed, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

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MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

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New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING OCTOBER 24, 1905.

802,545.—CLOTH SPLITTING MACHINE—J. F. Ames, Portland Or.
802,729.—MEAT TENDERER—J. D. Atkinson, Olympia, Wash.
802,905.—TIRE INFLATER.—G. A. Bobrick, Los Angeles, Cal.
802,912.—HOSE CARRIAGE—H. B. Cary, Los Angeles, Cal.
802,367.—CAN FILLING MACHINE—A. Cerruti, San Francisco, Cal.
802,443.—FLEXING MACHINE—A. Cerruti, San Francisco, Cal.
802,627.—FOUNTAIN BRUSH—Chrisler & Kays, Eugene, Or.
802,372.—DESK—F. A. Creed, Petaluma, Cal
802,556.—FIREPROOF PARTITION—Depew& McCall, San Francisco, Cal.
802,630.—GRUBBING MACHINE—A. I. Dunavan, Izee, Or.
802,375.—DRIVING BIT—G. T. Duncan, Seattle, Wash.
802,744.—HOLSTER—W. J. Foister, Myrtle Point, Or.
802,852.—BOAT—E. Fournier, North Yakima, Wash.
802,747.—CURRENT MOTOR—H. H. Granger, Davenport, Wash.
802,750.—SHAFT BEARING—J. H. Gray, San Francisco, Cal.
802,693.—BROODER—J. H. Huff, Fresno, Cal.
802,695.—BICYCLE—Ingham & Robinson, Roche Harbor, Wash.
802,816.—STRAP POLISHER—W. C. Lawrence, Portland, Or.
802,578.—VENDING MACHINE.—W. F. MacArtor, Los Angeles, Cal.
802,460.—FLOWER POT—A. Marshall, Los Angeles, Cal.
802,775.—PUMP—E. P. McMurtry, San Francisco, Cal.
802,466.—HARNESS SADDLE—T. I. Morrish, San Francisco, Cal.
802,654.—DIRECTORY—P. C. Murphy, Seattle, Wash.
802,876.—FIRE HEATER—O'Connor & Covey, Riverside, Cal.
802,706.—BALING PRESS—G. W. Pearson, Fresno, Cal.
802,413.—ELECTRICAL APPARATUS—J. F. Seeley, Los Angeles, Cal.
802,480.—VIBRATOR—J. F. Seeley, Los Angeles, Cal.
802,893.—CHECK BOOK—Slane & Corbaley, Spokane, Wash.
802,828.—ROTARY ENGINE—N. R. Smith, Seattle, Wash.
802,604.—FLOOR SURFACING MACHINE—Spence, Prugh & Zimmer, San Francisco, Cal.
802,605.—FLOOR SURFACING MACHINE—Spence, Prugh & Zimmer, San Francisco, Cal.
802,606.—FILE CABINET—M. R. Stapp, Aberdeen, Wash.
802,537.—SWIVEL—A. Uren, Seattle, Wash.
802,787.—QUARTZ MILL—R. A. Vaughn, Ballard, Wash
802,944.—ELECTRIC VALVE—I. G. Waterman, Santa Barbara. Cal.
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37,575.—DESIGN—G. L. Price, Seattle, Wash

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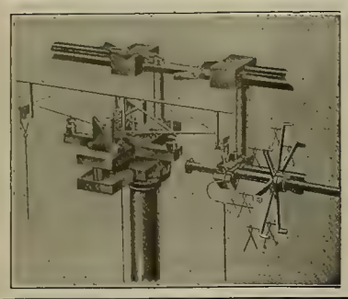

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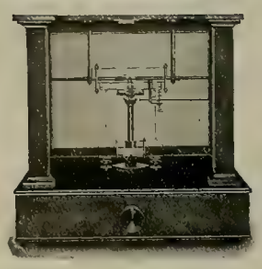

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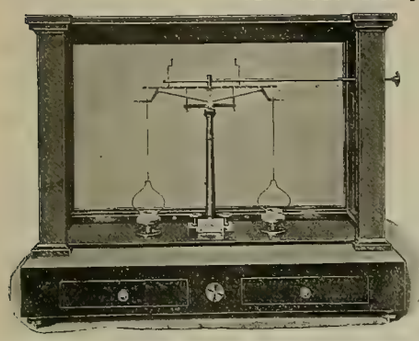

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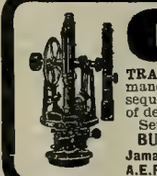

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MINING AND SCIENTIFIC PRESS.

Whole No. 2365.—VOLUME XCI. Number 21. SAN FRANCISCO, CAL., SATURDAY, NOVEMBER 18, 1905. THREE DOLLARS PER ANNUM Single Copies, Ten Cents.

Needed Amendments in Mining Law.

One of the most interesting of the papers read before the American Mining Congress at El Paso, Texas, the past week was that of R. S. Morrison on needed changes in the existing mining laws. The one feature which, above all others mentioned, seems the most timely and urgent is that suggesting the need of uniform legislation, which shall be adapted to every State and Territory in the Union. The Federal Statutes are good enough, perhaps, as far as they go, particularly since almost every character of contention which may arise under existing laws has already been considered, and the laws have been interpreted by the State and Federal judiciary up to the highest—the United States Supreme Court—until we now understand fairly well what may be anticipated in the courts on nearly every question that may arise, but the laws of the several States lack uniformity, and, as pointed out by Mr. Morrison, what may be legal compliance with the law in one State or Territory may not be sufficient in another. The Congress of the United States should repeal the Act giving to the States, Territories and mining districts the right to enact local mining legislation, and define more clearly the acts of discovery, location and possession, and enforce more strictly the requirements of the law, the main objects being to secure to bona fide locators their rights, and to bring about more promptly the development of the mineral resources of the country by requiring certain work to be done as a part of the act of location. This has been attempted by several of the mining States, the only fault being the lack of uniformity in these State laws. Something should be done to lessen the evil of wholesale location of the mineral lands of the public domain by those who claim large tracts without performing any other work than setting a discovery stake, or possibly completely staking or monumenting a claim.

Another phase of the Federal mining law is that relating to discovery. The law distinctly states that the initial act of the locator is his discovery. This law undoubtedly contemplated an ideal condition—the outcrop of a mineral vein, or deposit, which might be easily seen and recognized by the prospector. There are many places where valuable mineral deposits and veins lie buried beneath the surface, covered by gravel and soil, rock slides or later formations, either volcanic or sedimentary, and where considerable exploratory work is necessary before a discovery can be made. The bedded deposits of Leadville, Colo., form an excellent example of such occurrence. In the Black Hills of South Dakota the veins in the Algonkian schists at many places pass underneath hundreds of feet of the later Cambrian sedimentaries, or are buried by porphyry sheets. In California many quartz veins are hidden under valley alluvials or beneath the later Tertiary lavas, and basalt flows cover valuable ore deposits in Arizona. Many other instances of similar conditions might be mentioned, but it is clear that a bona fide discovery by the prospector is not always easily possible. He often needs time and money to prove his belief that valuable mineral exists beneath the unpromising superficial strata. He should be permitted to locate unclaimed public land, and to show his good faith by the performance of certain acts. such as making an excavation of stated dimensions within a given time after location, and thereafter the annual performance upon the claim of not less than $100 worth of work or the expenditure of an equal amount in improvements, the same as required by the law at present. There are many things to be considered when a change in existing statutes is contemplated, but as the laws now are there certainly is room for decided improvement in several directions.

The Concentrators of the Cananea Copper Co., Cananea, Mex. (See Page 342.)

THE statistical bulletin issued in October by Julius Matton of London, Eng., shows the lead production of the world to be increasing annually. According to this statement, the total production in 1902 was 903,000 English tons; in 1903 it was 912,600, which was further increased in 1904 to 981,100 tons. The five largest producers in the world in 1904 were the following: United States, 298,820 English tons; Spain, 183,014 tons; Germany, 133,498 tons; Australia, 117,105 tons; and Mexico, 100,000 tons. Of the production of the United States in 1904 of 318,679 tons, 108.854 tons was produced in Idaho, chiefly in the Cœur d'Alene district. Colorado and Utah came next, with 51,884 tons and 56,470 tons respectively. The lead fields of the Mississippi valley and including Virginia (small output) produced 92,275 tons. The Idaho, Colorado and Utah mines also produced considerable silver and gold.

A View of Cananea, Mexico, From the Mesa. (See Page 342.)

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SAN FRANCISCO, NOVEMBER 18, 1905.

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Mine Extension and Equipment.

Whenever a mine undertakes the broadening of its scope of operations, or the management announces to the public that the property is about to be equipped with a smelter, or a mill, such announcement is usually the occasion of rejoicing in the camp where the proposed improvement is to be located, and this, with absolute disregard of the needs of the property in question for such smelter or mill. The local papers published in the numerous mining districts throughout the West frequently contain announcements of this character. There have been a number of such within the past two weeks. In most instances these proposed installations are legitimate and needed to accomodate the mines building them, but in a number of instances it is positively known to those who are well informed as to the condition of some of the mines where it is proposed to make these extensive improvements, that there is not enough ore available in them at present to keep a small smelter or mill employed a week. Why, then, a large mill or smelter, when neither are required, and will not be needed for a long time, if ever? Such installations work a vast injury to the district where they are made, the only advantage being in the temporary distribution of the money paid out for labor during the period of construction, but which is short lived. Soon the actual condition must become manifest, and not only will the mill or smelter be closed for lack of ore, but the probability is that work on the mine will also be suspended. As to the effect on the legitimate investments of capital in other properties of the vicinity, it cannot be said to be conducive, but rather the reverse. It is no new thing to find a promising district held back by the premature building of reduction works on undeveloped property. Legitimate mining should be encouraged in every possible way, but there is another kind of mining conducted largely for the purpose of using other people's money to maintain a few men in good positions with liberal salary attachments.

State Mining Bureaus and Mining Schools.

In his address before the American Mining Congress at El Paso, Texas, the past week, Victor C. Alderson, of the Colorado State School of Mines, at Golden, laid great stress upon the co-operation of State mining institutions for the common good. All who are interested in the mining industry and familiar with State mining bureaus and the State mining schools will agree that such harmony and co-operation are desirable, but a mining bureau such as contemplated by Mr. Alderson would be merely a repository for valuable specimens, maps and literature, representative of and referring to the mineral resources of the State, under the direction of a competent business man, aided by several practical miners. This idea is not at all in accordance with the requirements of a Mining Bureau, such as that created by the government for the Philippine Islands, to which Mr. Alderson refers in his address. To properly carry out the intention of Congress along the lines of this Statute would require men of the highest technical ability as well as men trained in practical mining. The first mining bureau in the United States was that organized by legislative act, in 1880, in California. Previous to this the State had for years maintained a geological survey, as had also general Eastern States, but the purpose of the California State Mining Bureau contemplated much more—in fact, the same scope of operations as those outlined in the bill creating the Mining Bureau for the Philippine Islands. The California State Mining Bureau has done a vast amount of excellent work in investigating the mineral resources of that State, and its reports, bulletins and general information is in demand throughout the world. Several States, as well as foreign countries, have patterned after the California State Mining Bureau as exemplifying the highest and most useful type of public institution of this kind. That institution does not make free analysis and assays for the public of the State, for the reason that there are a large number of assayers, chemists and analysts who follow their profession for a livelihood, and with whom the gratuitous work of the mining bureau would come in direct and disastrous competition.

If the State Mining Bureau is to be required to furnish technical information on mining practice, engineering and metallurgy as suggested by Mr. Alderson, then the State institution at once comes in competition with the graduated technical engineers who have their offices in the cities of the State and who depend largely upon the patronage of the people of the State in supplying just this class of information. If the State institutions, whether as mining bureaus or as schools, are to usurp the privileges of the technical engineers, there is little incentive for the young man to take up the engineering profession.

Ore Weights and Values.

Frequently it is announced in the periodical official reports of various mining companies that a given number of tons of ore have been milled, or smelted, or subjected to other metallurgical operation, with the result of a stated amount of gold, silver, copper, or other merchantable metallic product. This stated tonnage and resultant product establish an average valuation per ton on the ore treated. Occasionally, when a change in management occurs, the new manager is unable to come up to the standard set by his predecessor, on the same class and value of ore. Usually an investigation will result in the discovery of a discrepancy in the methods of arriving at the tonnage treated. In one instance a mine manager gave strict instructions that all buckets on the aerial tramway be loaded to their utmost capacity. He figured the tonnage treated on a basis of the number of buckets delivered at their normal capacity. This, as a matter of course, gave him a greater output than the theoretical tonnage would call for. His successor gave orders that the buckets be loaded somewhat under their normal capacity, as the tram was showing signs of wear. The result was that the output per calculated ton was considerably below that previously recorded by the former manager. This resulted in his removal for incompetency, owing to his inability to keep up the record of output. Too many mines have lax methods for arriving at the tonnage treated, the most common method being the estimate of weight by the number of cars sent to the reduction works. At a few mines, where the management is more exacting, the cars of ore are actually weighed at some convenient point between mine and mill, and a correct record thus secured. The practice is one deserving of more universal attention than it receives.

The Value of Cost Sheets.

Cost keeping in mines and metallurgical works is comparatively easy of accomplishment, if a proper system be devised to apply to the several departments. It is, perhaps, somewhat more difficult to compile the necessary data for operation in mines than in mills or smelters, owing to the well-known prejudice of the miners against any system of checks on their work, but by the aid of competent foremen and shift bosses, who faithfully report on the cards provided for the purpose the time and materials consumed in a given operation, the costs may be arrived at with a surprising degree of accuracy. It is essential that stores and materials of every description be placed under a storekeeper, and that nothing be given out or sent into the mine without a requisition and signed by the proper person, which card states definitely where the thing called for is to be used. This places a reliable check on everything, from a nipple or a small valve to heavy timbers and explosives. The storekeeping system, where perfected, will be found to make it possible to account for all stores, supplies and materials consumed. It may be divided into as many departments as are deemed necessary, but to make it effective and of practical value the system must not be enveloped in too much of the official authority known as "red tape." The requisitions must be recognized by the storekeeper if signed by any of the under officers, or those in authority, from the shift boss up, and even in case of necessity by one of the miners. The card will be a sufficient check against misappropriation if placed on a separate file, to be later endorsed by the foreman or superintendent. The hours of work performed at any particular place (a raise, stope, crosscut, winze or drift) in the mine must be determined by some one in charge. When the system has been properly organized and applied, it will at a moment's notice be possible to ascertain the cost of performing any particular operation, together with the kind, quantity and value of all material consumed.

THE last annual report of the Minister of Mines for New Zealand, for the year 1904, shows that there were in operation in that island 186 dredgers, and that the business of dredging for gold had been reduced to a commercial basis, the speculative features having largely disappeared. He says, however, that there is small likelihood of the number of dredging boats being materially increased, though those already at work will continue to find profitable employment for many years to come. The experiment of tree planting on flat areas over which the dredgers have worked has proved successful. The Minister, in summarizing the accidents of the year, says that 4757 men were employed in quartz mining. There were 6 fatal accidents in this branch of the industry, a rate of 1.26 per 1000. In hydraulic and alluvial mining, including dredging, 6141 men were employed, and the fatal accidents numbered 9, of which 4 occurred on dredgers. This was at the rate of 1.46 per 1000 employed. In coal mining—a branch of the industry ordinarily considered as extra hazardous—there were 3228 men employed, with only 4 fatalities, a rate of 1.35 per thousand—a lower rate than in any of the other branches of mining in New Zealand, probably due to the extraordinary precautions taken to avert disaster.

THE collapse of a vertical shaft of the Driefontein mine at Johannesburg, S. A., on the 13th inst., by which one white man and sixty-seven native laborers were killed, will probably require considerable explanation. It is one of the deep shafts on the Rand, timbered with what in the United States would be called material of small dimensions. The cause of collapse is not mentioned in the press dispatches.

CONCENTRATES.

TO FIND the pressure of water under a given head in pounds per square inch, multiply the head by 0.433.

THE American Institute of Mining Engineers meet in their ninetieth session on February 21, 1906, at Lehigh University, South Bethlehem, Pa.

FORMERLY a flask of quicksilver was 76½ pounds, net. In 1904 this was changed, and now the quicksilver mines of the world place only 75 pounds, net, in a flask.

ANDESITES throughout the world were erupted during Tertiary times. The lavas of recent times are almost wholly basic and are chiefly basaltic in character.

GOLD mines are now being worked in Africa in the following countries: Transvaal, Natal, Rhodesia, Congo Free State, Egypt, and at several places on the West Coast.

MINERAL VEINS and deposits that are known, but not located, are reserved from townsite patents. Such may be located and patented the same as veins in the unappropriated public lands.

VENTILATING FANS are sometimes employed to withdraw the very fine pulp and dust from dry crushing machines, the coarser ore falling into a receptacle from which it is carried away by spiral conveyors.

SERPENTINE is derived from a variety of minerals, but chiefly from actinolitc, biotite, bronzite, chondrydite, diopside, enstatite, hornblende, humite, hypersthene, muscovite, olivine, pyrope, sahlite, and spinel.

THE Anaconda mine at Butte, Mont., is producing the lowest average grade of any copper mine in Butte district—about 2½% copper—but the output of that mine is larger than that of any other about Butte, being nearly 8,000,000 pounds in October last.

WHAT is known to the trade as standard cast iron water pipe 20 inches diameter weighs 185 pounds per running foot. Doubling the inside diameter of a pipe increases its carrying capacity four times, with a somewhat smaller coefficient for friction.

WHERE copper glance is present in ore to be treated by acid leaching, and subsequently by the cyanide process, this mineral would probably cause a large consumption of KCN, for the reason that the glance is not readily soluble in weak solutions of sulphuric acid.

IN order to take the extralateral right on a lode claim it is not necessary that the outcrop, or apex, shall extend the full length of the claim, crossing both end lines, or either of them. If enough of the apex can be determined to ascertain the probable strike, this will be sufficient.

MINIUM is the native red oxide of lead. It is of brilliant red color with an orange-yellow streak. It is of uncommon occurrence. It was found occasionally with other lead ores in the oxidized zone in the Leadville, Colo., mines. It is also found in several European localities.

THOSE doing assessment work at the close of 1905 for this year may continue to work during January, completing the assessment for 1906. This would carry the work along for nearly two years, or to the close of 1907. Many who have to go a long distance to their claims adopt this method.

A MAN may be able to properly perform the operation of thoroughly sampling a mine in all its mechanical details, and still have little knowledge of geology, though the latter is desirable and gives a broader knowledge, and consequently better judgment, in deciding as to the possibilities of the vein or deposit.

THE force which causes a syphon to operate is the difference in head between the surface of the water in the reservoir and the discharge end of the pipe. The greater this head the more rapid will be the discharge or flow. An inverted syphon operates simply through the tendency of water to seek its own level.

WHERE patent has been applied for, and the money paid into the United States land office, the mere pendancy of patent proceedings does not excuse the performance of annual labor prior to the issuance of a certificate of purchase. Until the receipt has been received, therefore, the annual assessment work must be performed.

THE Federal mining law does not require any assessment work on claims during the year in which they are located. Thus a claim located on any day during 1905 requires no work for this year, but next year, 1906, $100 worth of work or improvements must be made. Any work done during 1905 under these circumstances cannot be credited to 1906, simply because the law required no work during 1905. No matter how large an amount of work or improvement is made on an unpatented claim during any one year no portion of it in excess of $100 can be credited to the following year's work.

WHEN powder, supposed to be what it is represented to be, fails to perform the work that may reasonably be expected of it by an experienced miner, it may be due to the fact that the powder is either inferior in composition or that from some cause it has deteriorated. In either case it would be wise to employ powder of a different brand.

THE Great Boulder Proprietary mine of Western Australia is capitalized at £175,000 and has paid £1,500,-550. The Lake View Consuls has also paid dividends in excess of its capitalization, being capitalized at £350,000 and having paid in dividends £1,317,500. The Oroya-Brownhill of Western Australia has also paid dividends in excess of its capitalization.

WATER may be caught up on the several levels of a shaft or mine and collected in tanks cut in the rock at a safe distance from the shaft, from which it may be removed by pumps or drawn off into skips and hoisted to the surface. When dumped at the surface, care should be taken that the water pouring from the skip does not flow or seep back into the shaft, thus increasing the expense of mine drainage.

THE precussion-figure is a star-shaped six-rayed figure produced in all of the micas when a plate is struck with a blunt-pointed instrument. Chlorite mica (clinochlore) is a dark-green, translucent mica, flexible and tough, but very slightly elastic. It also produces the precussion-figure or pressure-figure when indented with a blunt point. Occurs in talcose rocks, serpentine, etc., and is also sometimes associated with biotite and phlogopite.

ONLY rarely since 1857 has tin been so high as during the present year. In 1871 the highest price was £157 and the lowest £123. In 1872 the highest price was £160 and the lowest £130. In 1887 the highest price was £167 and the lowest £100 (a very wide range), and in 1888 the highest price was £170 and the lowest £75, a difference within that year of £95 per ton. The highest price thus far in 1905 is £153 and the lowest £130. The total visible supply at present is about 15,400 tons.

THE drilling of bore holes 8 to 10 inches diameter is a good way to prospect gravels, and the method is considered fairly reliable if the holes are sufficiently close to give a reasonable average, and the necessary and proper allowances are made for loss. The same means may be employed with success in ascertaining the depth of channels which are overlaid by volcanic or other material. In Calaveras county, Cal., holes have been sunk with well-drilling machinery to the depth of 600 feet.

THE Federal Statutes relative to mines contains the following: That where two or more veins cross each other priority of title shall govern, and such prior location shall be entitled to all the ore or mineral contained within the space of intersection; provided, however, that the subsequent location shall have the right of way through the said space of intersection for the purpose of convenient working of the said mine; and provided, also, that where two or more veins unite the oldest or prior location shall take the vein below the point of union, including all the space of intersection.

IN his study of the Comstock lode, Geo. F. Becker made the following classification of the rocks of the district: Granular diorite, porphyritic diorite, micaceous diorite porphyry, quartz-porphyry, earlier and later diabase, earlier hornblende-andesite, later hornblende andesite, and basalt. The diabase and augite-andesite shade into each other. The diorite is thought to be the result of alteration of diabase, the hornblende having been derived from the original augite. All of the more important rocks of the district pass by transition to other varieties, as in the case of the diabase and augite-andesite.

THE number of tons of ore that may be trammed in an eight-hour shift on a surface tramway depends on the distance the ore must be trammed, the size of cars used, the condition of the track, and, to no small extent, upon the man. At one mine known to "Concentrates" one car man trammed each shift eighty-five to ninety cars, containing 2200 pounds, a distance of 600 feet, of which 200 feet were in a tunnel. The ore was drawn from a chute provided with a gate operated by rack and pinion. This work was done under contract at 4 cents per car. The men on the opposite shift trammed from sixty-five to seventy-five cars, working nights.

IN case of quartz occurring "frozen" in schistose formation, the question of its origin and relative age is speculative, without definite knowledge of the existing geological conditions. If the quartz occurs in the schist as a series of lenses, the probability is that its occurrence is due to plication of the schist, which has been caused by stress, and that the quartz has been infiltrated later. If the quartz occurs in a zone of uniform width, lying parallel with the lamination of the schist—in fact, a quartzite—it would be reasonable to suppose that it was originally laid down as a bed of sand, and was therefore of an age contemporaneous with the schist. If the quartz occurs as a zone of indefinite and frequently changing width, passing over by gradual transition to the schist, it is presumable that the silica has been infiltrated since the schist was uplifted and its original rocks metamorphosed to the present crystalline condition. As the schist in question at Marysville, B. C., is stated to carry gold, silver and copper, it would be good mining and good business to follow the ore so long as it proved profitable, or, if unprofitable at the start, to prospect it by shaft or tunnel in search of better ore.

IT is often good practice to build a solid concrete wall around the collar of a shaft started in soft wet rock or soil where the bedrock is several feet below the surface. To do this properly, a pit should be sunk at least a foot larger on all sides than the proposed wall, which must rest on bedrock, and the interior dimensions should be sufficiently large to admit of placing the regular timber sets within the wall. The concrete should be permitted to set thoroughly before filling in the space between the outside of the wall and the bank of earth. If sand or tailings are available, this is good material to run into this open space, as it packs tightly and may be readily removed later, if necessary. If the ground is very soft and wet it may be necessary to drive a line of sheet piling entirely around the proposed shaft, before beginning the work of excavation. The first sets of timbers placed in the shaft may be hung by permanent iron bolts of good size to stringers resting on the concrete walls, which it would be well to provide with buttresses for additional strength and solidity at those points where the girders may rest. These sets will line up with those placed lower in the shaft, and which are wedged in the usual manner against the rock walls of the shaft. This arrangement gives solidity to the collar of the shaft and obviates a flow of surface water into the shaft through the soft material at the surface.

THE structural character of ore is usually influenced by the wall rocks in which it occurs, though this structural condition can in no case be considered an index of values, except possibly in individual mines, where close observation may make it possible to tell by its appearance payable ore from that which is too poor to pay. Quartz occurring between walls, both of slate, is likely to be banded—what is known by miners as ribbon rock. That having a massive rock on one wall and slate on the other is likely to be banded on the slate side, passing over to a massive structure on the side next to the massive rock. Quartz occurring wholly within a massive rock, like granite or diabase, usually is more or less crystallized and not infrequently exhibits a "comb structure." When the vein enters schistose rocks it may be stratified, something like the ribbon rock, or it may be brecciated, consisting of angular fragments of the rock walls much silicified and otherwise altered and carrying iron and other sulphides. Veins occurring in granite usually present characteristics peculiar to themselves and often somewhat different from those found in other veins. Mineralized zones often have very indefinite walls, the so-called wall being sometimes found to be merely an interior plane of movement within the mineralized zone. The chemical composition of veins often bears no apparent relation to the wall rocks. Thus a system of veins at one place occurring in rocks containing abundant lime-soda feldspars have no calcite, but do develop a large amount of heavy spar (sulphate of barium).

THE Cassel-Hinman process is a process covered by numerous patents for the use of bromine in connection with cyanide of potassium in the extraction of gold and silver from its ores. The method comprises crushing the ore, roasting when necessary, leaching in vats with a nascent bromine solvent, recovering the bromine and recovering the gold. Eissler states that "a clean siliceous ore, or a well-roasted sulphide, requires for a good extraction of gold per ton of ore about seven pounds of bromine. The bromine is prepared for shipment by adding bromine to a nearly saturated solution of a hydrate or carbonate of an alkali, or alkali earth metal. The solution is evaporated nearly to dryness and the resulting powder forms the salt employed. Per ton of ore treated, a quantity of this salt, containing 7 pounds of bromine and 3½ pounds of NaOH, is dissolved in about 100 gallons of water. This constitutes the leaching solution. After having charged the pulverized ore, if it is not sufficiently acid, a dilute solution of acid is leached into it, which is then followed by the leaching solution proper. If the acid is added at the beginning of the leaching, the solution after the leaching, which ought to be of such duration as to give from four to six hours' contact with the ore, will leave all the bromates decomposed, and if the acid be not added at the beginning of the leaching the bromates may not be entirely broken up, in which case sufficient acid must now be added to effect this. The bromine is now all free in the solution, with the exception of that which has combined as bromide with the bases of the ore, including gold." Chlorine is added to set free this bromine, and the solution, now being warmed to 150° F., has passed through it a current of air, which carries the bromine as vapor into a condensing tower, where it comes in contact with a subdivided stream of a solution of an alkali, and here the initial reaction of the production of bromide and hypobromite takes place, which constitutes the leaching solution for the next cycle of operations, the dry powder being only used at the beginning. This solution has the power of dissolving the gold without the addition of an acid.

The American Mining Congress.

On Tuesday, the 14th instant, the American Mining Congress assembled in its eighth annual session at El Paso, Tex. A number of valuable papers were read during the session of the convention, several of the most important of which have been reported for the MINING AND SCIENTIFIC PRESS by its special correspondent, but owing to the large volume of the several speeches and papers delivered at the meeting it has been found inexpedient to give more than an abstract of the most of those thus far received.

The paper by R. S. Morrison, author of "Morrison's Mining Rights," on needed amendments to the mining laws, was timely and interesting. This paper is published in full:

AMENDMENTS ADVISABLE TO THE FEDERAL MINING LAW.—Before 1866 Congress passed no law providing for the pre-emption of mining claims on the public domain or their sale or disposition. Everything was left to the mining districts or the local legislatures.

In 1866, by the act of that year, provision was made for the patenting of lode claims; in 1870, for the patenting of placers.

In 1872 both acts were combined and enlarged, and but slight amendments have been made since. The principal features of the mining act, as is doubtless familiar to all the members of this convention, are the annual labor required on every claim and the apex right of the lode claim. Its other sections are mostly details regulating the procession of title through the stages of discovery, location, advertisement and entry until the final issue of patent.

As to the matter of annual labor and the more debatable item of apex rights: Both have become so thoroughly understood, and have been crystallized into shape by so many decisions, that little or no change seems advisable—at least the subject would breed at once contention, and extreme positions would be taken.

A revision of the whole series of acts might be advisable, but would involve so many items of detail, the subject of work in the committee room of Congress, that mention of them in this address will not be made.

But the practical and immediate need which, in my judgment, would produce the desired object of uniformity of mining titles in the regions of the Rocky mountains is the repeal of the first clause of Section 5 of the act of 1872, Revised Statutes, Section 2324, which allows each State and Territory to regulate the details of location, or to the mining district the same right, where the State or Territory fails to pass any act on the subject. There are only three of the details or conditions of location enumerated in the act of Congress itself, which are:

1. There must be an actual discovery of mineral on which to base the location.

2. The location must be distinctly marked on the ground so that its boundaries can be readily traced, and

3. The record of the location must contain the names of the locators, the date of location and such a description, by reference to natural objects on permanent monuments, as will identify the claim.

These enumerations are preceded by the clause giving to the State, Territory or district the right to regulate all other details, and, as a matter of course, the result is that in every State and Territory the statutes on this subject disagree, and a title which would be good in one State would be void in another, for the want of compliance with some technical and perhaps useless detail of location provided for in the local statute.

In Montana and Nevada, for instance, it is required that the location certificate or record describe each corner, with the markings thereon. This requirement is perfectly useless, and yet it has been held mandatory, and titles prior in time and associated with every feature of good faith and integrity have been held void by the courts for want of conformity to such provision.

In Arizona, the two Dakotas and Washington it must be stated in the location certificate whether or not it is a relocation of abandoned property, which is an unnecessary hardship; for often the prospector cannot tell whether the old pits he finds on the ground are mere prospect holes, which were never staked, or form the work of a claim which has been recorded but abandoned.

The State of Washington requires the boundaries of the whole claim to be blazed, which seems a unique and wholly unnecessary condition to impose.

It is not right to impose unnecessary and trifling conditions the neglect of which, however inadvertent, may lead to litigation and perhaps to the loss of a valuable claim.

Some of the incidents of location are declared mandatory, others directory; and the result is that the essential details of location in no two States are alike, and what is a perfect location, in some of them, is difficult to determine even by a competent lawyer with all the facts before him.

This result is directly chargeable to the first clause of Section 2324, above referred to. That clause was a concession to mining districts and district rules, which in most of the States have been absolutely obliterated and passed to the condition of innocuous desuetude.

As a concession to the legislatures of the several States and Territories it is not much less productive of evil, for no two of them agree in all particulars and uniformity becomes impossible. The law should be such that a lawyer in Montana could pass on a mining title in Nevada, or vice versa, knowing that the conditions or facts which make a perfect claim were the same in all the States.

A single amendment to Section 2324, detailing the necessary incidents of a location, and not making them needlessly rigid, and repealing the grant of sub-legislation to the districts and the local legislatures, would remedy this most glaring defect in the present mining law.

A further section should limit the right of tunnels to 750 feet on each side of the bore of the tunnel, or at least compel them to elect definitely at the starting of the tunnel how many feet they will claim on each side of the bore.

Section 2338, which gives to the local legislatures the right to regulate easements, which includes drainage and rights of way, should, in my judgment, be repealed, and in its stead should be a section defining in terms the extent of such easements.

The "Known Lode Clause," in the placer section, 2333, should also be amended. A placer location of 160 acres, a half a mile square, can be staked on a hillside known to be seamed with rich veins, and under a recent decision of the National Supreme Court, in the Eli-Clipper case, all prospecting is prohibited within that area. This defeats the practical benefit of the reservation of the lodes existing within placer bounds. On the other hand, the patent to the placer, containing the loose exception of "all lodes known to exist," diminishes the value of the patent; for there is nothing of record or in the abstract to tell whether or not a known lode exists, or is claimed to exist.

The entire placer area should be open to the lode prospector until actual entry in the land office. Up to that time the discovery of a lode within a placer should be legalized, but if such lode location be made it should be compelled to adverse and assert its existence, or otherwise allow the placer applicant to take his patent uncloaded by a vague reservation which impairs its value to the holder with no compensatory good to any other party.

These are the amendments which I consider both important and advisable. Any radical change, such as adopting a block system, or making all claims square, with a large acreage and taking away the apex rights, I do not consider wise at this day, though it might have been a better plan if originally adopted. The act of May 10, 1872, has now been thoroughly analyzed and explained by hundreds of authoritative decisions, and an old statute so explained and understood is always better than a new statute on a new theory which is sure to suggest as many points of doubt and contention as the one it supplants.

It is not every charge that means improvement or reform. In 1840 the New York Code of Practice was adopted with the promise by its authors that it would do away with all the technicalities of the common law practice and reducing pleadings to rules of common sense and simplicity.

It has been since adopted, with more or less change, in most States of the Union.

And during the sixty-five years of its growth it has been found that its technicalities are more and greater than ever Chitty or Blackstone dreamed of. The simplicity of code pleading vanishes with the simplicity of the case. It is a loose and lazy practice appealing to the lawyer who loves ease and hates study. It has therefore come to stay because it coddles to the natural disposition to take what seems the easiest, not the best, way of doing things.

The promise of reform would, in my judgment, be no better kept in case of the passage of an entirely new mining act based on theories entirely different from those of the act of 1872.

The tendency of modern thought in the United States is toward nationalism and uniformity. In banking, divorce, insurance, railroad and commercial law the effort is everywhere toward uniformity and to an act of Congress where Congress has power to cover the subject. That Congress has this power in the matter of mining is not disputed. It arises from its being the original proprietor as a feudal lord of all the Louisiana purchase and the cessions from Mexico.

When the district rules were first adopted around the camp fire it was the only government practicable. There were then no railroads to bind the country together. The reason for their existence has passed and I see no legitimate or convincing argument whatever to prohibit Congress regulating the subject of mining titles in all their details until patent issues, when, of course, the State assumes the sovereignty of the subject matter.

The first persons to be protected are the prospectors. There is an army of them scattered everywhere — above timber line and in the desert — out of access to lawyers. They are men of intelligence and originality above the average of any one special class or trade, because from the nature of their occupation they are compelled to be thinkers as well as toilers.

They are best protected by knowing just what is essential to perfect their discoveries into marketable titles. This knowledge fixed in advance is better for them than the sentimental right of making their own laws, for if there be defects in the original title it keeps back the buyer, prevents development, and the real value of the mine is perhaps exploited by strangers who have not bought, but fought, his property from the man who under plain and fixed laws would have been protected in its enjoyment.

An interesting subject was introduced by F. E. Wire on the ways and means of attracting Eastern capital to Western mining enterprises. His paper was in part as follows:

ATTITUDE OF EASTERN CAPITAL TOWARD WESTERN ENTERPRISES DURING DEVELOPMENT STAGE, AND HOW TO ATTRACT IT.—The subject under consideration seems to be one of vital importance to all of us. Any practical knowledge and studied observation that will bring Eastern capital and the Western enterprise together in their development stage, help them to better understand each other, and appreciate each other more, is well worth our while.

To you pioneers in the mining industry, you who have blazed the trail and blazed the way, opening up and making possible a greater and richer Western civilization and development, by being interested in mining, during the cradle days of our Western mining region; and to you Eastern capitalists and investors who joined hands with your Western brothers, I offer a word of cheer and appreciation. It will be generations before the pioneer and the prospector's work is fully appreciated.

Truly you were the advance agents of civilization. You did much to cherish and foster the spirit of Western progress and development, imbuing in young men the desire to go West, and when they could not go they sent their money for you to use for your joint good. Western opportunity offers to Eastern capital the means by which they both may grow strong and useful to all mankind. By "Eastern capital," I mean all the sources from which Eastern money is raised to aid in developing Western enterprises, such as mines, railroads, irrigation propositions, and the like.

For convenience I will divide the people who contribute to these Western propositions into three general classes—first, the capitalist; second, the well-to-do investor, and third, the small investor. I have had experience with all three of these classes of investors, have studied them, and read much on the subject. My experience has been uniformly successful. My desire is that my experience and observation may help to pave the way for a better understanding between the prospectors, miners and promoters on the one hand, and the investor and general public on the other.

The capitalist is the hardest man to interest in a new mining or other proposition. He is liable to be critical regarding conditions generally. He is trained in investments, and is likely to be acquainted with speculation. He is usually a busy man, whose time is taken up fully by his regular business affairs and financial interests. Occasionally he has been a promoter himself, in one way or another, and understands the plans, policy and means usually used in promotion. This type of investor is experienced and clever, and can size up a prospect or any new proposition. Such a person will usually see possibilities of a proposition at a glance, as well as understand the undesirable features. He has many opportunities, but it is impossible for a moneyed man to have the time to consider the merits of all of the new propositions of the West. As a rule, rich men do not care to spread out their investments. They believe in concentration. Ordinarily, they associate themselves with their kind. To the capitalist is left the necessity of promoting and financiering the bigger schemes, such as railroads, big mines, smelters, ship building, irrigation, and the vast number of large undertakings.

The well-to-do investor is usually a progressive business man, a politician or salaried man, who has more funds than he needs in his business or vocation, consequently has surplus for miscellaneous investment. Generally he is clever and alert to opportunities and is ready to consider new Western propositions when handled by some friend or known reliable party. As a rule, there is very little of the plunger, and not much of the speculator, in this type. He is not as critical as his richer brother, is more easily approached, and likely to be more reasonable. He cannot afford to be as independent as a richer man. I believe the well-to-do investor furnishes the most money for the great bulk of ordinary mining propositions that are not in close, or semi-close, corporation. This class of men forms the brains and sinew of our best public mining and kindred Western propositions in the development stage.

The small investor, while in a class of his own, is worthy of our attention. He is likely to be a person whose opportunities along the investment line are limited. In consideration of his financial limitations, he must invest small amounts in any one thing. On account of the smallness of his investments, this type of investor is frequently not as careful as he should be. He is quite inclined to follow some prominent man's lead and invest because "Mr. So and So did." The real small investor does not as a common thing hold a large enough interest to make him the support to a proposition that a larger stockholder would be. Thus it frequently happens that a company composed of the smallest stockholders has some trouble in having as large a representation at the stockholders' meetings as they should have. The characteristic small stockholder is likely to buy without mature deliberation, and he often is the first one to grow impatient. The more conservative element of this class of small investors is a source of support and strength to any Western corporation. But the thoughtless, unstable variety is an element of weakness in any proposition. The right sort of a small investor is very desirable, and, sandwiched in with the other classes, conduces to the good of the proposition.

Now as to the attitude of Eastern capital toward Western enterprises during the development stages, I will admit at the outset, it is not what it should be. But this attitude is very positively and noticeably changing for the better. The campaign of education which mining journals are carrying on is working wonders in changing the attitude of money toward these Western enterprises. Their work, so well begun, but far from finished, strikes at the root of the evil.

Under the dawn of the new order of things, the public generally are looking upon mining prospects, undeveloped mines, and all Western enterprises in a far more favorable light.

The public is beginning to realize that promoters, next to the actual pioneers of these undeveloped propositions, are entitled to great credit. Clean, legitimate promoters are a very necessary factor or medium between the Western opportunity and Eastern capital.

The attitude of Eastern capital toward Western undeveloped propositions is not as yet what we wish. There is no disguising the fact that the East is suffering with too much fake promotion and wildcatting, notwithstanding the fakirs are much scarcer than heretofore.

While there are many and unmistakable signs of a more favorable attitude, we must take conditions as we find them, and not as we would like them, as to deceive ourselves in this matter is simply to weaken our efforts and strengthen the enemy.

It is gratifying to see public sentiment look favorably toward a mining district that is proven, and toward a promoter, officers, or a company that is acting on the level. There is a tendency toward letting every new proposition rest on its merits. The spirit of investigation is spreading among people with money. Investing in mining is no longer looked upon as a gamble, but as a legitimate business proposition. People do not invest "on the sly" as they used to, as it is no longer looked upon as a questionable act.

The proposition seeking the aid of capital should be

truly meritorious; it should be founded on principles and conditions that will win. If a prospect, it ought to be one where the chances of making a pay mine are excellent. There ought to be a minimum of outstanding stock, when going to the public, seeking its aid and co-operation. The proposition should be capitalized on a conservative basis. There should be no evidence of "graft," "waste" or "extravagance" on the part of those in charge of any corporation's affairs, up to the time they seek the investor's money. To ignore these common-sense fundamental essentials is to court disaster and failure.

It is useless to go before the intelligent investing public, and try to befog and mystify, on the pre-organization facts and conditions. Any equivocation on the part of officers or managers, on these vital points, are justly construed against them.

The several varieties of investors are perfectly willing that the prospector and promoter shall receive a fair and even liberal consideration of stock or moneys for their actual services rendered and property turned in, based on a conservative valuation. The public I have always found to be exceedingly reasonable along this line. The public has a right to know the whole truth on these matters. The old line promoter who used to get up to half of the capitalization of a mining, exploration, or other company, for a few indefinite and simple services and a few hundred dollars, has no place or chance now. There is very little hope for a proposition that is not shaped up on a fairly reasonable basis.

For clean, progressive promoters who are determined to start right and keep right, on any proposition they attempt to finance, and who will stay by the affair until it is in shape, there is a big field of opportunity, with reasonable assurances of success. After the right sort of a prospect has been chosen, care should be taken with the organization of the company so that when the public knows the truth about its history, it will not nauseate it.

Officers should be selected who are clean and able, and are so situated that they can and will give the company's affairs their careful attention. Too many officers give only the odds and ends of their time to their duties. A proposition looking for public subscription for their stock ought to have not less than seven directors, and nine is better.

The investor reasons that too small a board does not look well, and that cheap politics and trickery are more liable to be played. Having gotten our proposition ready to take subscriptions from the public, under ordinary conditions, I should proceed about as follows, to interest capital:

In the first place, a thorough report on the property should be obtained from some mining engineer of standing and reputation. This should be supplemented by conclusive evidence as to the title of the property. Never forget that it always pays to thoroughly satisfy the public as to the title of your property, whatever that title is, as well as to demonstrate its value and advantageous location.

Next, you should have some first class references, men whose word and opinion carry weight. Don't try to get along without references, and do not try to give "bluff references." There was a time when this sort of thing "worked" to some extent, but it does not now.

After having taken care of the matter of property, incorporation, organization, title and references, you are ready for your stationery and literature. It always pays to get a good quality of stationery. The prospectus and other printed matter should be cleverly gotten up and neatly printed on good quality paper. Be careful how you write your prospectus and the attitude you take wherever you appear in print. Always be plain spoken. Say what you mean, and always mean what you say. Avoid any and all forms of exaggeration. Don't cater too much to imagination. Advertise all you wish. Put your best foot forward. Publish mining statistics. Publish all the facts that will do you good. Publish letters and statements from reliable sources, regarding your proposition. Discuss mining and the opportunities of the West generally, once in a while. Don't urge people to buy stock. Don't promise dividends; if you do, nine times out of ten your cake is dough right then. Reason with people how it is necessary to sell stock cheap to get the development funds to explore and develop the property. Show them how this is nearly always done. Show how money is high and scarce in a new Western country. Have the right kind of officers and a strong directorate; that is the best talking capital you could have. You can use this fairly and honorably, to convince the investor of a square deal.

When you can convince capital that everything is on the level your victory is half won. A large per cent of investors will at once invest if satisfied on this point. Shun guaranteed dividend schemes of all kinds. Even guaranteed stock plans do more harm than good. Any company that pays dividends while selling its own treasury stock is committing business suicide, as on its face it is an inconsistency.

I have great faith in and have always found successful the policy of excursions to the front, where your property is located. This acquaints prospective stockholders with all the actual conditions, and they each act as a sort of missionary when they return.

I have always found arguments by photographs very convincing and satisfactory. One mistake a large number of new companies make is to get their stock too high at the start. This necessitates much more advertising, more agents, and higher commissions.

I favor putting the stock out at a rather low price at first, limiting the amount of stock to any one person.

This policy secures a goodly number of stockholders early, who will be of advantage later on, when the stock is higher. My observation and experience teaches me that it is hard to interest capitalists in a Western enterprise, in the development stage, unless you get them in while the stock is low. A good way is to take a few parties out with ample money, and if the proposition shows up all right you have a good chance to secure funds enough for all immediate needs.

I fully believe that any truly meritorious Western enterprise in the development stage can, if handled with discretion and ability, secure all the funds needed for development purposes from the capital of the East, where money is cheap and plenty.

The address of Arthur J. Haskin, United States Deputy Mineral Surveyor, and professor of mining at the Colorado School of Mines, was on "A Proposed Remedy for the Difficulties Arising From Inaccurate Records of Patent Survey." After reciting the difficulties in obtaining patents to mining claims in Colorado and elsewhere, which were valid without a lawsuit, owing to defective land surveys, the suggestion was made by the speaker that a remedy might be found in the appointment of a commission to be known as the United States Mineral Survey.

It would be well to act harmoniously with the Geological Survey, which belongs in the Interior Department. Besides surveying accurately in the field, tying in every existing patent monument, it should be the duty of the Mineral Survey to determine accurately the original position of each missing mining corner, and to require the re-establishment of all such corners by the owners. These engineers should also carefully plat such monuments of the public survey (the section and township subdivision corners) as are included in mining districts, and their work should be done with such thoroughness as to be invulnerable, and as such to be accepted as final authority by everybody. Their maps and records may be then referred to and relied upon, in place of the unreliable mass of documents now on file. My proposal contemplates the correction of all errors introduced into patents that have issued prior to the completion of maps of the respective localities, and to this end each claimant is to be furnished gratis (or at a slight nominal expense) an amended document of patent correctly describing the premises in each instance, and retaining all priority or other rights due to the original dates. In this way no claimant's rights will be endangered, he will be put to little or no expense, and he will be given a guarantee of unquestionable ownership and peaceable possession of the exact ground he sought to obtain. Undeniably, such a plan would require a large appropriation, but there is no way of estimating the benefits that would accrue to the nation's mining industry. The field or scope of the Mineral Survey may be enlarged easily to include the construction of maps giving a graphical description of the extent of mining operations. These would be a valuable adjunct to the compilation of statistics of production and labor involved in the mining business of our nation.

The Brooks law and the Mineral Survey would work admirably in conjunction. But neither alone can cope with the situation to a successful issue. The law, supplemented by the proposed Mineral Survey, will have the desired effect of settling all existing difficulties, and will further prevent troubles hereafter. All mineral claim boundaries will be authoritatively defined, and every claimant will be obliged to abide by such metes and bounds. Maps and records will thus be acquired that will be accurate. A not insignificant benefit following such a course will be the prevention of much fraudulent practice.

Another interesting paper was that by Victor C. Alderson, president of the Colorado School of Mines, on co-operation between State Mining Bureaus and State Schools of Mines. His address follows in part:

DEMAND FOR INDUSTRIAL EFFICIENCY.—The most pressing demand of the present age is for industrial efficiency. Between nations, the constant struggle in the industrial warfare is to train workmen who shall become influential factors in the industrial world. The great problem before the consulting engineer, before the designer of labor-saving devices, before the contractor, before the business man, before the mining engineer, and the metallurgist, is the securing of increased efficiency. In the mining industry the same conditions prevail. In each mining State there are two great influences of an institutional character whose hearty co-operation is necessary for the advancement of mining interests within the State—the State Bureau of Mines and the State School of Mines.

FUNCTION OF THE STATE BUREAU OF MINES.—The work of a State Bureau of Mines is well described in the law of Congress establishing a Mining Bureau for the Philippine Islands, as follows: "To make, facilitate, and encourage special studies of the mineral resources, mineral industries and geology of the Philippine Islands; to collect statistics concerning the occurrence of the economically important minerals and the methods pursued in making their valuable constituents available for commercial use; to make collections of typical geological and mineralogical specimens, especially those of economic and commercial importance, such collections to constitute the museum of the Mining Bureau; to provide a library of books, reports, drawings, etc., bearing upon the mineral industries, the science of mineralogy and geology, and the arts of mining and metallurgy, such library constituting the library of the Mining Bureau; to make a collection of models, drawings, and description of mechanical appliances used in mining and metallurgical processes; to preserve and maintain such collections and library as to make them available for reference and examination, and open to public inspection at reasonable hours; to maintain, in effect, a bureau of information concerning the mineral industries of the Philippine Islands; to make an annual report to the Secretary of the Interior, setting forth the important results of the work of the Bureau, such special reports as may be called for by proper authority, and such bulletins concerning the statistics and technology of the mining industries and of the geological and mineralogical and other office and field work of the Bureau as may be approved by the Chief of the Bureau and ordered published by the Secretary of the Interior."

FUNCTION OF THE STATE SCHOOL OF MINES.—The primary work of a School of Mines is to train young men for active and successful work in the mining profession. To do this it must have a competent faculty composed of experts; have large working collections and well-equipped laboratories. The students should make frequent visits to mines, mills and smelters to become familiar with the applications, on a commercial scale, of the principles taught in the lecture room. This work, however broad, thorough and valuable it may be for the embryotic mining engineer, does not advance the interests of the mining profession except as it graduates well-trained men, who may, later in life, do creditable work. The primary function of the school, therefore, is to develop as far as it can the future mining engineer.

EXAMPLES OF CO-OPERATION IN COLORADO.—It seldom happens that a School of Mines takes up seriously or continuously the work belonging to the Bureau of Mines, and it is also true that the Bureau of Mines seldom touches upon the educational aspects of the mining industry. In some isolated cases this is true, but the exception only proves the rule. In Colorado the State Commissioner of Mines, E. L. White, has shown unusual interest in the educational aspect of mining, and his efforts have been of great service to the Colorado School of Mines. The School of Mines has, on its part, rendered to the State Bureau of Mines every assistance that it could. Such co-operation, however, should not depend upon the personal relations existing between the Commissioner of Mines and the president of the School of Mines, but should be the result of legal enactment, so that the business and educational sides of the mining industry may work in thorough harmony. Recently a large number of coal analyses were needed in order to arrive at an estimate of the value of certain coal lands belonging to the State. These were referred to the State School of Mines, where the work was easily done, because the school had both the men and the facilities for so doing.

Not long ago attention was called to the fact that certain lands in the southern part of the State of Colorado contained extensive soda deposits. The question of the value of the deposits was referred to the School of Mines. One of its experts was sent to investigate, and, on the basis of his report, a lease of the land was made which proved very favorable to the State. Whenever a new mining camp is exploited by the daily newspapers it is fitting that the Bureau of Mines should immediately make a preliminary report for the guidance of prospectors and investors. Such investigations can easily be made by the School of Mines in conjunction with the Bureau of Mines, the former supplying the expert geologist, mineralogist, surveyor or mining engineer, while the latter supplies the practical mining men. The Bureau is also frequently called upon for information along the strictly technical lines of mining and should be in a position to inform the community upon such important subjects as proper ventilation and mine drainage, the best safety devices, the results of scientific tests on hoisting engines, air compressors, rock drills, and many other subjects dealing with the engineering lines of mining. It should also be in possession of the latest and best information concerning ore dressing, roasting of ores, cyaniding, and the general subject of the treatment of low-grade refractory ores. No Bureau of Mines in this country has either the force of experts or the scientific facilities for making original experiments in these lines. A State School of Mines fully equipped with laboratory facilities, with expert mining engineers, metallurgists, chemists and geologists on its staff can take up such subjects as the Bureau desires to have investigated, and treat them in a scientific manner.

BENEFICIAL RESULTS.—The future of the mining and metallurgical industry will depend upon the careful observance of a few well defined principles; prevention of waste in time of operation, in labor employed, and in capital invested; correct business principles; the application of the latest and best technical skill and knowledge; and an appreciation of the value of scientific research. The idea of the conservation of values should ever be uppermost in the mind of the mining engineer. We are now and for many years shall be living on the waste of the past. Values that could not then be recovered can now, thanks to increased scientific knowledge, be easily recovered.

Magnetic Separation.

The North Queensland Register says an ingenious method is employed at the Loudon mill, Irvinebank, to separate the iron from tin concentrates. The ore from the Vulcan mine contains magnetic iron, and the trouble always was to eliminate so undesirable a substance. The specific gravity of the tin and iron, however, so nearly approximates that separation was exceedingly difficult, and was never satisfactorily accomplished. James Tunnie, assayer at the Irvinebank Tin Mining Co., owners of the mill, proposed using electricity to overcome the difficulty. With Mr. Moffatt the scheme, which has acted so well, was evolved. Water containing the tin and iron was charged with electricity, which increased the magnetic influence of the iron, and this created cohesion between the iron particles. The ore was then run over vanners, and the united iron particles, irregularly joined, offered much greater resistance to the water, and were more affected by the vanning motion than the close lying tin. As a result separation was easy, the iron particles fairly dancing off the table along with the lighter stuff. The device gives much more effective treatment, and the reduction in the cost is also considerable.

WHEN you want to meter a load on a 220-volt circuit, and have nothing but a 110-volt meter in stock, says H. E. Ryder in Electricity, run the line through the field of the meter in the usual manner, and the other side of the line goes to the lamp. Then for the shunt tap bring a wire from the center line, or the 110-volt side, and you are all right by using a constant of (2).

Plant of the Cananea Con. Copper Co., Cananea, Sonora, Mexico.*

Written for the MINING AND SCIENTIFIC PRESS by O. P. FINDLEY.†

The Cananea Con. Copper Co., the property of the Greene Con. Copper Co., affords an example of successful accomplishment ranking among the largest producers of copper in the world, its present output averaging about 6,000,000 pounds per month. The ore is of complex character and has required patience and skill to work out a proper scheme for its economic treatment. By intelligent application of advanced practice the plant has been brought up to a high state of efficiency.

W. C. Greene, president of the company, has a staff of advisers who are experts, practically and technically, in their respective departments, and to his acumen and good judgment is primarily due the credit for the achievement of such results. A. S. Dwight, assistant to the president and general manager; J. H. Kirk, manager mining division; R. L. Lloyd, superintendent of the reduction division; D. Cole, superintendent of concentrators; V. R. Walling, superintendent of railways, and N. B. Roper, superintendent of construction, are thorough students of the science of mining as related to their respective departments, and ever ready to avail themselves of any new ideas or discoveries which promise to yield greater results, with less expenditure of energy and money.

The management has virtually solved the fundamental problems which confronted it; the question with which it has to deal at present is that of reducing waste to a point where it will be an infinitesimal quantity. The results which have been accomplished along this line are commendable, and the means by which they have been attained should prove interesting.

WATER SUPPLY.—The supply of water for the entire camp comes from the company's pumping station at Ojo de Agua, situated 9 miles from the smelter. The receiving tanks are located above the smelter and 1000 feet above the source, which is a well sunk to the bedrock, with a subterranean gallery which taps a living stream of water capable of furnishing 3,000,000 gallons per day. The water is practically free from organic matter and carries only a small percentage of scale-forming solids, thus making it desirable for boiler feeding. Two centrifugal pumps driven from the flywheel of the main pumping engine are used to lift the water. The main plant consists of two pumping engines, one being a cross-compound differential duplex engine, the other a duplex-compound steam pump. The feed water is ordinarily delivered to the boilers at a temperature of 180° F.

The total length of the pipe line is approximately 9 miles, the pipe being 10 inches in diameter. The water is delivered to a steel tank of 600,000 gallons capacity, located above the power house, and also a brick reservoir of 250,000 gallons capacity, which supplies the power house and the smelter. The concentrator and the mines are supplied from the tank mentioned. The pipe line is tapped 1½ mile from the tank to supply water for domestic use in the municipality of Cananea and the lower part of Ronquillo.

The main pipe line is composed of three sections of varying weight, the first section being of standard wrought iron, weighing 40 pounds per foot. The pipe in the middle section weighs 35 pounds per foot, and that of the upper section, where the pressure never exceeds 200 pounds per square inch, is 10-inch casing, weighing 22½ pounds per foot. The line was tested at the factory to a pressure of 1000, 750 and 600 pounds respectively per square inch. The pipe is buried throughout its entire length with the exception of three points where ravines are crossed. Owing to the warm temperature of this climate in the winter, no trouble has been experienced as a result of freezing.

POWER PLANT.—Power for operating the reduction works is generated at one central plant, consisting of the boiler house 45x216 feet in size, and the engine house 65x245 feet, each built of steel and corrugated iron. The boiler plant consists of five duplex boilers, rated at 300 H. P. each; four water tube boilers of 250 H. P. each, and two horizontal water tube boilers of 250 H. P. each.

The equipment for generating the air blast for the smelting furnaces consists of one 225 H. P. compound duplex blowing engine, steam cylinders 13 inches and 24 inches, air cylinders 57 inches with 42-inch stroke, and a capacity of 20,000 cubic feet of free air per minute; one 380 H. P. tandem-compound engine, steam cylinders 16 inches and 28 inches with 36-inch stroke. This engine is connected with a No. 10 blower, with a capacity of 30,000 cubic feet of free air per minute; one tandem-compound engine, steam cylinders 10 inches and 18 inches with a stroke of 24 inches, and 121 estimated H. P. This engine is direct connected to a No. 8 blower, and under a pressure of 2½ pounds per square inch will provide 12,500 cubic feet of free air per minute; one tandem-compound engine with cylinders 16 inches and 30-inch by 36-inch stroke, directly connected to a No. 10 blower of the Anaconda type. This set furnishes 30,000 cubic feet of free air per minute and will operate under a pressure of 2½ pounds per square inch.

Before the present power house was completed a part of the machinery was operated in an auxiliary building, from which most of the machinery has now been transferred; however, there still remains in this building the following equipment, which is operated in conjunction with the main plant, viz.:

One 14-inch by 36-inch engine belted to two blowers, and one 18-inch by 18-inch balance valve engine connected direct to a blower. These two engines will furnish a maximum of 40,000 cubic feet free air per minute. They are used only for regulating the blast, or, in cases of emergency, to relieve the engines in the main power house.

With the entire equipment of the plant there can be provided 132,000 cubic feet of free air per minute, with a blast pressure of 2½ pounds per square inch. The air blast for the converter plant is provided by three cross-compound duplex Corliss blowing engines, two having steam cylinders 20 inches by 36 inches, air cylinders 44 inches by 44 inches, with a common stroke of 42 inches, the third engine having steam cylinders 22 inches by 40 inches, air cylinders 46 inches by 46 inches, common stroke 48 inches, and will deliver 10,750 cubic feet of free air per minute at a pressure of 15 pounds, developing 650 H. P.

There are two blast pipes leading to the smelting furnaces, one being 44 inches in diameter and the other 42 inches, made of riveted steel. There is also a third blast pipe, which conveys the air to the converters. This pipe is of $\frac{3}{16}$-inch riveted steel, 30 inches in diameter. Both the smelter and converter blast pipes are equipped with relief valves. The blast furnace blowing engines are equipped with recording gauges, which give a continuous record of the air pressure furnished to the furnaces. The converter blast engines are similarly equipped. All engines in the main power house are operated condensing and are connected with independent surface condensers located in the basement.

At the west end of the power house is a cooling tower 12 feet by 24 feet and 49 feet high. The frame work is steel, covered with wood. The warm water from the circulating pumps is distributed uniformly at the top of this tower through perforated pipes,

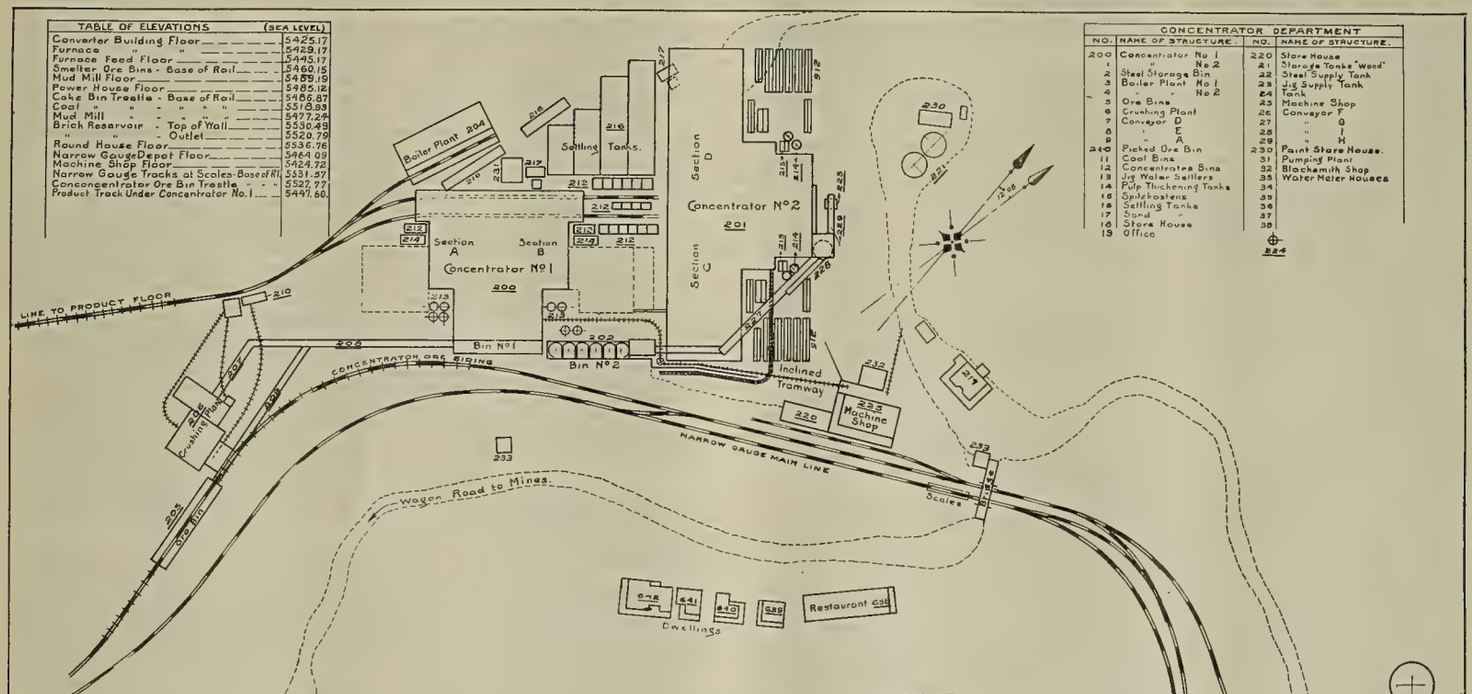


TABLE OF ELEVATIONS (SEA LEVEL)
Converter Building Floor 5425.17
Furnace " 5429.17
Furnace Feed Floor 5445.17
Smelter Ore Bins - Base of Rail 5460.15
Mud Mill Floor 5459.19
Power House Floor 5485.12
Coke Bin Trestle - Base of Rail 5496.87
Coal " " " " " 5518.83
Mud Mill " " " " 5477.24
Brick Reservoir - Top of Wall 5530.48
" " - Outlet 5520.79
Round House Floor 5536.76
Narrow Gauge Depot Floor 5464.09
Machine Shop Floor 5424.72
Narrow Gauge Tracks at Scales-Base of Rl. 5531.57
Concentrator Ore Bin Trestle 5527.77
Product Track Under Concentrator No. I 5497.60
CONCENTRATOR DEPARTMENT
NO. NAME OF STRUCTURE. NO. NAME OF STRUCTURE.
200 Concentrator No 1 220 Store House
1 " No 2 21 Storage Tanks "Wood"
2 Steel Storage Bin 22 Steel Supply Tank
3 Boiler Plant No 1 23 Jig Supply Tank
4 " No 2 24 Tank
5 Ore Bins 25 Machine Shop
6 Crushing Plant 26 Conveyor F
7 Conveyor D 27 " G
8 " E 28 " I
9 " A 29 " H
240 Picked Ore Bin 230 Paint Store House.
11 Coal Bins 31 Pumping Plant
12 Concentrates Bins 32 Blacksmith Shop
13 Jig Water Settlers 33 Water Meter Houses
14 Pulp Thickening Tanks 34
15 Splitchutens 35
16 Settling Tanks 36
17 Sand 37
18 Store Houses 38
19 Office
Boiler Plant 204
Settling Tanks.
Section A
Section B
Section C
Section D
Concentrator No 1
400
Concentrator No 2
201
LINE TO PRODUCT FLOOR
Bin No 1
Bin No 2
202
CONCENTRATOR ORE SIDING
Inclined Tramway
Machine Shop
233
NARROW GAUGE MAIN LINE
Wagon Road to Mines
Scales
Crushing Plant
Ore Bin
Dwellings
Restaurant
MAP OF
CONCENTRATOR DEPARTMENT
Cananea Consolidated Copper Co.
La Cananea Sonora Mex.
Scale 1"=100ft.
Sept 15t 04
No 341
Drawer No 1

*See illustrations on front page.
†Condensed.

of 100 K.W. each and the fourth 200 K.W. From a main switch board 6 feet by 14 feet, the current generated by these dynamos is distributed to the various circuits at a voltage of 250.

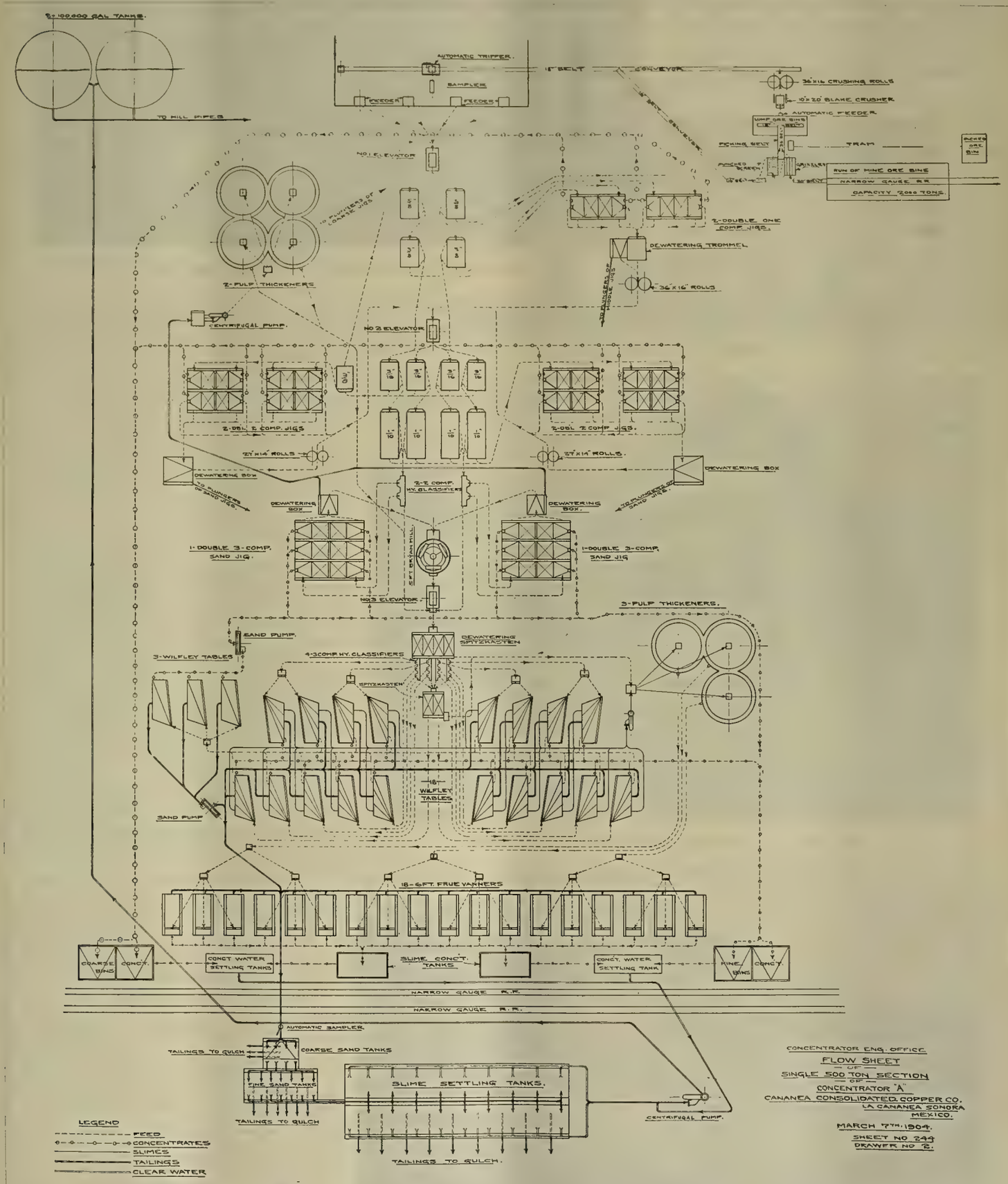
Each conductor leading from the three smaller dynamos has a 600 ampere circuit breaker; the 200 K.W. dynamo has a 1200 ampere circuit breaker. The 100 and 200 K.W. generators are also equipped, respectively, with 700 and 1200 ampere ammeters. Two 250-volt voltmeters are available for use upon any of the various circuits. Three ammeters of 200 amperes each are ready for use in connection with any additional circuits.

In addition to the present electrical plant the company is arranging to install two alternating current generators of 300 K.W. capacity, which will deliver three-phase alternating current at 2300 volts, to furnish power for the mines and more distant works tributary to Cananea which are too far from the power house to be reached by the present equipment of direct current machinery.

The coal used in the power plant is delivered to the boilers direct from standard-gauge cars, which are emptied through chutes on to the floor of the boiler room and immediately in front of each boiler. The ashes are loaded into tram cars, which convey them to receiving bins, thence transferred to narrow-gauge cars and transported to points on the line of the company's railway, where they are utilized for ballast and the filling in of bridges and trestles.

(TO BE CONTINUED.)

A TANK 60 feet long, 5 feet deep and 20 feet wide will hold approximately when full 45,000 gallons.



Notable Events in Connection with Gold and Silver.

Following are some of the more notable events, with the dates of their occurrence, as related to gold and silver:

Egyptian gold mines worked 2000 years B. C.; Mines of Ophir worked by Solomon 950 B. C.; Conquest of Peru, and opening of its silver mines, 1535 A. D.; discovery of silver mines at Guanajuato and elsewhere in Mexico, 1548 A. D.; discovery of gold in Brazil, 1577; discovery of placers of Minas-Geraes, Brazil, 1680; silver mines opened in Russia, 1704; discovery of gold in the Urals of eastern Russia, 1743; discovery of gold in California, 1848; Plattner's chlorination process introduced at Reichenstein, in Sile-

sia, 1848; discovery of placers in Australia, at Ballarat, 1851; hydraulic mining introduced in California, 1853; chlorination process introduced at Grass Valley, Cal., by Deetkin, 1858; gold discovered in Colorado, 1859; discovery of the Comstock Lode, Nevada, 1859; gold discovered in the Black Hills of South Dakota, 1875; lead-silver ores discovered at Leadville, Colo., 1877; discovery of the gold mines of the Rand, S. A., 1886; discovery of gold at Cripple Creek, Colo., 1890; first practical application of the cyanide process, 1887, and on the Rand in 1890, in April of that year; discovery of rich placers in the Yukon basin, Alaska, 1897.

Milling in Gilpin County, Colo.

Written for the MINING AND SCIENTIFIC PRESS.

There are a number of rules pertaining to mining and milling still in vogue in Gilpin county which were adopted during the early days of mining in that section. Gilpin is the smallest county in the State, and has the distinction of being the first county in Colorado in which gold was discovered. In the early days of mining in that commonwealth, before scales came into general use, the ore was measured and sold by the cord. A cord consists of 128 cubic feet—the same measurement as a cord of wood—and contains from seven to twelve tons, varying according to the character of the ore. This rule applies to a majority of the mines in the district. With but few exceptions, neither mines nor mills are equipped with scales. Many of the mills do custom work, i. e., they treat the ore from the different mines of the surrounding camps. The mills of the district have all agreed upon a scale of prices to be charged for handling the ore. The prices were recently increased, owing to the fact that the mill men work but eight hours instead of twelve hours, as heretofore. The flat minimum rate for treating the ore is $10 per cord. A customer sometimes secures the use of a section of a mill, or 5 stamps, and is charged $8 50 for 24 hours. The mill work consists of automatically putting the ore through the battery, running the pulp over copper plates and then over the bumping tables. This has been the system, with but few changes in the type or kind of machinery, for many years. The customer receives from the mill the gold taken from the plates and the concentrates from the tables. The concentrates are shipped to the smelters at Denver or Pueblo, Colo. Sometimes the concentrates are disposed of to the samplers. The amount saved on the plates varies from 10% to 30% of the values. In many of the plants a large percentage of the amalgamation is done inside of the batteries. Most of the stamps weigh 550 pounds and drop from 28 to 30 times per minute. A blanket sluice is also used in some of the mills before the material passes to the tables.

Central City, Colo., from the Dump of the Ontario-Colorado Mine.

Surface Plant of the Ontario-Colorado Mining Co., Central City, Colo.

45-Stamp Mill of the Gregory-Buell Mining Co , Gilpin County, Colo.

In the Gregory–Buell mill, illustrated herewith, they do custom work as well as treat ore from their own mine. The stamps—45 in all—are of the heavy rapid-drop type. After the ore passes under the stamps in this mill, and over the plates, it goes to bumping tables and other concentrating devices.

The Boston mill, which is operated by the Gregory-Boston M. Co., contains eighty 1000-pound stamps, which drop 95 times per minute, using 24 mesh screen, and crushing, per stamp, an average of 3½ to 4 tons in 24 hours. After leaving the stamps the ore passes over 4½x16 foot copper plates in front of each 5-stamp battery and through spitzkasten on to Woodbury tables. When this mill was erected there was considerable comment from different sources as to whether it would be a success on the ores of Gilpin county. It was a revolution in the milling practice in that section.

In the custom mills the ore is seldom assayed before going into the mill, and the tailings are allowed to pass into the creek without knowledge of how much is being lost, no sampling being done. The mill man is not interested in how much is being saved or lost, as he is being paid a stipulated sum for handling a certain amount of ore.

The average value of the ore that is being put through the mills does not exceed $4 per ton, and the average value of the concentrates does not exceed $13 per ton.

The milling ore is a mixture of feldspar and quartz, carrying sulphide of iron (pyrite) and at times a small percentage of copper sulphide, chiefly chalcopyrite.

On account of the scarcity of water for milling purposes in the district it is inexpedient to erect mills at the mines for handling the low-grade material to advantage. When this material is hauled either by team or rail several miles to the mills, and the treatment charges taxed against the ore, the profits cannot be very great. There is some agitation at present for the formation of a company for the purpose of getting water from the higher range of mountains and piping it to the mines for milling and power. The scheme is claimed by responsible engineers to be perfectly feasible.

The smelters have made a low treatment charge on certain grades of ore from this district, and instead of the ore being treated at the mills, as heretofore, it goes direct to the smelters, which in itself has a tendency to cripple the progress of the milling industry in that county.

The Avon mill at Nevadaville, above Central City, has been closed for some time past on account of shortage of water. This mill was securing water from one of the neighboring mines, but the shaft buildings at the mine were destroyed by fire and they were compelled to suspend operations at the mine as well as the mill. It is understood arrangements are about completed for starting the mill.

A mill operator was doing some experimental work

in another district in the State, using different machines for handling his ore, and received a letter from a fellow mill man in Gilpin county to the effect: "You may make a trial of this new-fangled concentrating machinery and use it if you desire, but I fear that it may drive you in sorrow to the grave." That is a sample of what one has to contend with in the mining and milling of ores in that section of Colorado.

On Gregory hill, between Central City and Black Hawk, the Ontario–Colorado G. M. Co. is doing development work as well as shipping several tons of crude ore and concentrates each month. The main shaft is down 878 feet, and is equipped with 12x14 double-cylinder geared hoisting engine; 80 H. P. boiler, compressor and Rand drills. About 7000 feet of drifts and 800 feet of winze, raises and other shaft work has been done on the property. The vein on this property is an extension of the old Gregory vein, where gold was first discovered. The different levels are being connected with winzes to the ore bodies, and shipment is being made of the ore taken out during development work. The bulk of the ore in this property is susceptible of concentration and amalgamation. The surface plant of this property is illustrated in one of the accompanying engravings. Air hoists are used in the winzes.

Another engraving shows a portion of Central City as seen from the dump of the Ontario–Colorado Co In the background can be seen James peak and other high mountains. It is from these mountains that it is proposed to bring the water supply, as mentioned above.

It would seem, after visiting a number of the plants and conversing with many of the operators in the district, that the milling industry has not kept pace with some of the other mining camps throughout the State.

The Yukon-Tanana Region, Alaska.

L. M. Prindle, of the United States Geological Survey, has recently returned from the Alaskan field. During the last summer he has been making a geologic reconnaissance between the International Boundary and Fairbanks. This was Mr. Prindle's third season in the Yukon–Tanana region, and he has therefore had exceptional opportunity to note the rapid development of the country. He reports that the output from the mines has increased tenfold each year. The gold production of Fairbanks amounted to approximately $40,000 two years ago, and to more than $400,000 last year. It is estimated that it will be worth between $5,000,000 and $6,000,000 this year. The productiveness and prosperity of this region are attested by these remarkable figures.

Fairbanks is now a thriving town of about 2500 inhabitants. Alfred H. Brooks, chief of the Survey's Alaskan Division, passed over its site in 1898, and knew it then as naught but a howling wilderness, unvisited by white men. The nearest Indian village was 75 miles away. The region now is humming with industry. The town of Fairbanks is lighted by electricity and heated by steam. It supports three banks, one daily paper, one weekly paper, and a public school system. Business in all lines is good. Although every valuable claim was said to be staked a year ago, the books in the recorder's office show that his receipts are nearly double what they were last year.

Among the most important improvements of the district is the railroad which has been built since the season of 1904. It connects Fairbanks and Chena and has been extended along Gold Stream to the junction of Gilmore and Pedro creeks. The railroad has already proved of great advantage to the miners, and in connection with the government wagon road to be built from the termination of the railroad over the divide to Cleary creek will greatly facilitate the handling of freight.

This year's production makes the Fairbanks district the peer of the Nome region in output, if not its leader. The diggings at Fairbanks are mostly deep, extending to 80 or even 100 feet, so that shafts have been sunk. The gravels are frozen, and mining is usually done by steam point process. Work is carried on the year round. The character of the deposits makes mining more expensive here than in the Nome district, so that the profits from an equal production is not so great.

The gold from the Fairbanks district has come from Cleary, Pedro and Fairbanks creeks, and the greatest of these, in point of production, is Cleary creek. Since the summer of 1904 Cleary City, a town of nearly 300 people, has made its appearance. It is situated on Cleary creek, a tributary of Chatanika river, itself a tributary of the Tanana. This creek is remarkable in that pay has been found along almost its entire course. Gold has been mined from its headwaters to a point 4 miles below the place at which gold was first discovered, that is, to a point at which the creek widens into the valley of the Chatanika river. At Cleary City an electrical plant is now in process of construction which will furnish light for the town and power for the operation of mining machinery.

Dome creek and Ester creek, to the southwest of Cleary creek, are promising streams. Considerable work has been done on Dome creek, and pay has been located at a few points. Ester creek is already a producer.

To the east of the Fairbanks region, on the tributaries of the Salchaket, prospecting is active.

The main excitement at present is, however, in the area west of the Fairbanks district, on the headwaters of the Kantishna river, a tributary of the Tanana from the south. Some gold has been found there in shallow diggings, and between 700 and 1000 people are now on the ground.

Battery Stem Guide.

Herewith is illustrated the Pacific battery stem guide, made minus bolts, nuts, set screws, wedges or keys. It will be observed that the device consists of a guide frame with sockets to receive removable shells, which the manufacturers say are its only wearing parts. The accompanying diagram shows the dimensions of these frames, with bolt sizes and centers for standard 5-stamp batteries. The guide is made by the Angels Iron Works, Angels, Cal.

Guide Frame for Stamp Mills.

Adjustable Sockets for Battery Guide.

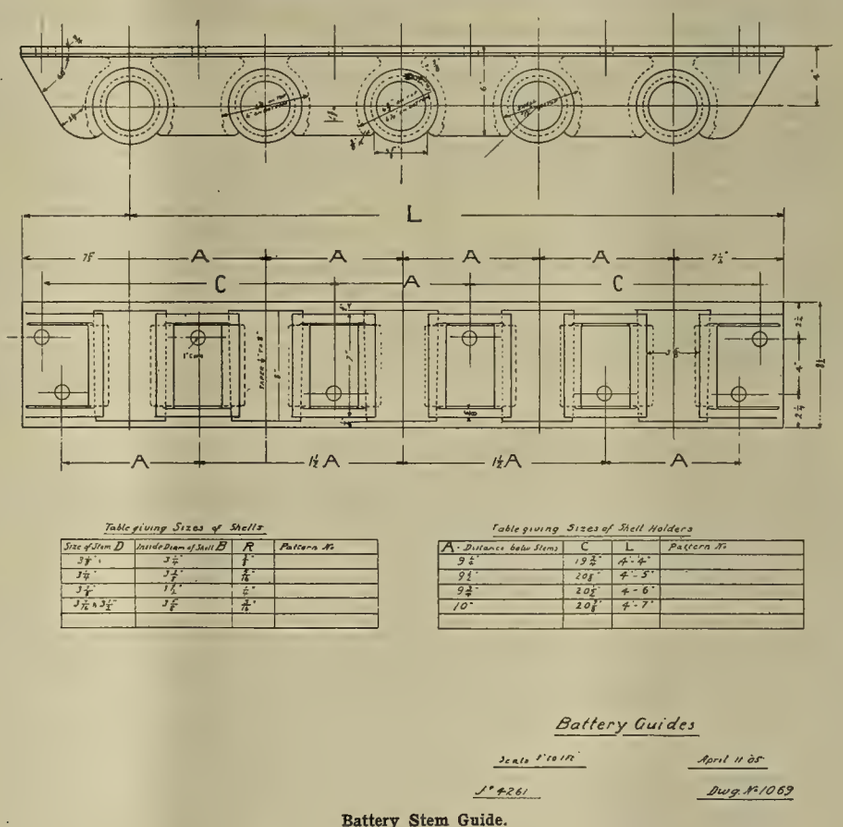


Table giving Sizes of Shells

Size of Stem D	Inside Diam of Shell B	R	Pattern No.
3¼"	3⅝"	1"	
3⅜"	3¾"	1⅛"	
3½"	1⅞"	1¼"	
3⅝" & 3¾"	3⅞"	1⅜"	

Table giving Sizes of Shell Holders

A - Distance betw Stems	C	L	Pattern No.
9½"	19⅝"	4'-4"	
9¾"	20⅛"	4'-5"	
9⅞"	20⅝"	4'-6"	
10"	20⅞"	4'-7"	

Battery Guides
Scale 1"=1'0" April 11 '05
J° 4261 Dwg. N°1069

Battery Stem Guide.

THE Journal of the Worcester Polytechnic Institute states that in unloading iron ore at the Lake Erie docks, the shovelers are paid by the ton, and the following records have been made: The prices paid are 13 cents per ton on straight work, and a maximum of 18 cents per ton cleaning up, after 80% of the cargo has been removed by automatic machines. Men working at the 18 cent rate have made as high as $12 per day of 10 hours, which means 6.67 tons of ore were shoveled in one hour. Working at the 13 cent rate, with eight men in the hold shoveling into 1-ton buckets, each man can handle from 5 to 6 tons of ore per hour and sometimes a rate of 8 tons per hour has been reached, the daily wages running up to $6.50 to $7.80.

A TON of the highest grade of anthracite should measure 32 cubic feet—that is to say, it should fill a bin 4 feet long by 4 feet wide and 2 feet high, says Fuel. The poorer coals will run as high as 40 cubic feet. The coal weighs lighter, and consequently more of it is needed to make up the ton, hence an increase in the cubic measurement. A coal that contained a considerable proportion of stone would measure less than 32 feet, but the best grade will every time fill that space.

Dredging for Gold in the Nome Goldfields.

Written for the MINING AND SCIENTIFIC PRESS by OTTO HALLA.

Six years ago the world was astonished by reports of wonderful discoveries of gold in the beach sands on the Bering sea, and it is now six years since the town of Nome sprung into existence.

A continuous and steadily increasing harvest of gold is being sent from this northern town to the mints in the United States; the commerce with the States has assumed large proportions, the little town of Nome keeping ten ocean vessels engaged in supplying her with foodstuffs, building materials, machinery, railroad iron, etc., and when one understands that the gold deposits of the Nome goldfields have hardly been commenced to be developed, one may imagine the vast possibilities of this most western portion of United States territory.

It has taken only these short six years to devise methods of working the vast deposits of auriferous gravels systematically and profitably, either by the hydraulic method, or, where the ground is favorably situated, by dredging and steam shovels.

The first successful attempt in this direction was made by W. L. Leland, manager of the Three Friends Mining Co., on Solomon river. At an expense of $140,000 this company erected a 54-bucket dredger, with a capacity of handling 4000 cubic yards of gravel in twety-four hours. It is operated by two 110 H. P. steam boilers and a crew of only five men.

The operations last season were satisfactory. The ground which is not frozen averages $1 to the cubic yard; the depth of gravel is about 15 feet, but the steel buckets cut into the soft mica schist bedrock about 8 feet.

This dredger was shipped to Solomon in sections

during the last summer, was set up and in running operation for about fifteen days.

Solomon river is very favorable for big operations of this kind, the ground being unfrozen, the gold distributed evenly in the gravel and the gravel deposits sufficiently extensive to justify a large investment.

Another enterprise which has been started on Solomon river this season, and has proven a success, was the steam shovel operated by Vinal & Webb on the Halla bar. A 1-yard railroad shovel was used to first cut a drain 1500 feet long, 25 feet wide and about 12 feet deep, to the mica schist bedrock to open up the property. The gravels were taken up by the shovel, dumped into 2-yard cars and these pulled on rails to the flume, 1000 feet distant, where a ditch with a capacity of about 800 inches supplied the water to wash the gravels. The ground on this property averages about $1.50 to the cubic yard; the cost of operating is about 18 cents per cubic yard. The average capacity last season was about 500 yards in ten hours; but by some needed improvements in the handling of the cars faster the capacity can be doubled.

It was possible to get only a few days of actual mining operations on this plant the last summer season, the time having been consumed in installing the machinery and cutting the drain—the freeze-up coming this year about three weeks earlier than usual.

The Seward Peninsula Mining Co., Wilkins manager, has built a 60-bucket dredger—the Philadelphia—above Dexter creek, on Nome river. It did not have any chance at mining operations, the winter season closing in before its completion.

Mr. Johnston is building a big bucket dredger on Snake river, and by next season there will be in operation several of the latest improved dredgers, which will materially increase the output of gold in the Nome goldfields.

The successful operation of these dredgers and steam shovels has proven that the possibilities of this section of Alaska, as far as producing gold is concerned, can at present hardly be estimated.

The new discoveries on the tundra, where eight men take out during one season a half million dollars, as on Little creek, or, again, the strike on Jess creek during the last summer season, where $100 to the pan is common, makes an observer wonder what will be the result when Snake and Nome rivers are worked by dredgers.

The entire valley of Snake river, as well as Nome river, is favorable to dredging operations, the ground being unfrozen and the distribution of gold sufficient to pay large profits, even if the operations are confined to the three summer months.

It is safe to say that a few years hence Nome will be one of the largest gold-producing sections of the United States.

THE PROSPECTOR.

While "The Prospector" learned long since not to judge the value of ore wholly from its physical appearance—particularly gold ore—the sample marked Atwater No. 1 has a most promising appearance, and should be assayed for gold and silver, particularly the former.

The rock samples from the north side of Bear river, Nevada county, Cal., are: No. 1, a much altered dike rock. No. 2, gabbro. No. 3 is a felsitic dike rock. No. 4 is syenite. No. 5 is serpentine. No. 6 is halloysite, a product of the alteration of feldspar (orthoclase).

The rock samples from Lida P. O., said to have come from Death Valley, Cal., are principally magnetite—no oxide of tin. One of them is coated with copper carbonate, and is from the outcrop of what may prove to be a copper mine.

The rock specimen from Thunder Mountain, Idaho, is a typical rhyolite, showing the fluidal structure, the drusy cavities, etc. The quartz blebs are characteristic; some of them appear to be fragmental. The rock presents somewhat the appearance of a breccia, there being several small fragmentary looking places on the rock. A larger mass of the rock would, perhaps, show this feature more prominently.

The rocks from Mayer, Arizona, are: No. 1, a fine grained mica schist; No. 2, a metamorphic rock in which there is considerable carbonate of lime, a little quartz and considerable chlorite, which may have been derived from hornblende. It is not a typical rock and therefore can only be classed as metamorphic.

The minerals from near Ocala, Churchill county, Nev., are: No. 1, gypsum (calcium sulphate); No. 2, a variety of obsidian (volcanic glass); No. 3, red and yellow jasper with impure limonite (brown iron oxide). This rock may contain gold. It is similar to the jaspers often found in the gossan of copper deposits. No. 4 is mostly calcite (carbonate of lime), with yellow iron oxide and iron sulphide. Should be assayed for gold. The silt-like yellow mineral is similar to same at Goldfield, Nev., which is rich in gold. Similar mineral in Arizona, Colorado and South Dakota is often rich in gold.

Notes on the Assay of Gold Bullion.*

By T. KIRKE ROSE.

The following is a brief account of the principal changes in the assay of gold bullion which have been introduced at the Royal Mint, London, during the last three years.

The assays are still made in batches of seventy-two, and the object of most of the improvements is to promote uniformity of treatment, so that the "surcharge" on the cornets may be identical. Six proof or check assay pieces are distributed through the charge.

The cupels are ranged on a plumbago tray, which is lifted in and out of the muffle by means of an iron "peel" or fork with two flat prongs, each 11½ inches long, 1¼ inch wide and $\frac{3}{16}$ inch thick. The tray itself is 11½ inches long and 6 inches wide, and has a raised edge to keep the cupels in place, and two grooves below for the prongs of the peel to slide in. The plumbago tray can be used about twenty or thirty times. Iron and fireclay trays were tried, but not found to be serviceable. The use of the cupel tray makes block cupels of little advantage, as single cupels, when cold, are rapidly ranged on the tray by hand. Cupel tongs have been entirely discarded.

The seventy-two assay pieces are charged in simultaneously by means of a nickel charging tray with a sliding bottom. This charging tray was devised and introduced by Arthur Westwood, in 1893, at the Birmingham Assay Office, and has been adopted at other offices.

The draught of air through the muffle has been made independent of the draught through the fuel chamber of the furnace, so that the temperature and the air supply can be regulated separately. The muffle has been increased in length to allow of the assay pieces being placed farther away from its mouth, the distance from the front of the furnace to the first row of assays being now 7 inches. The fuel space behind the back of the muffle is filled with fireclay to prevent overheating at that point. Air is admitted only near the top of the mouth of the muffle and the front row of assay pieces is protected from the direct draught by a firebrick, 2 inches high, so as to promote the regularity of the air supply throughout the charge. With the same object, deep cupels are used, the hollow being 0.75 inch in diameter and 0.3 inch in depth. The charges, with 4 gms. of lead in each assay piece, are worked off in ten or fifteen minutes. If the draught is increased and the time shortened, the results are not so uniform.

PARTING ALLOY.—It has been the practice in the Mint for many years to add 1.375 gm. of silver to 0.5 gm. of gold in making up the "inquarted" alloy for parting. This ratio of 2.75 to 1 is convenient in some respects, but the alloy is attacked with great violence when parted with nitric acid, and small fragments of gold are often detached from the cornets, and either carried away and lost, or else become firmly attached to other assay pieces. A ratio of 2 parts of silver to 1 part of gold has, therefore, been adopted recently, after a long series of experiments, with the result that the risk of injury to the cornets has been greatly reduced and the general accuracy of the work increased.

This is a reversion to a very ancient practice. In the year 1627 Savot stated that the French assayers used the ratio of 2 to 1, but that in earlier times the ratio of 3 to 1 had been preferred. In 1830, however, the ratio of 3 to 1 was always used in France, according to D'Arcet and Gay Lussac, and the ratio of 2.75 to 1 has probably been in use in the London Mint for more than half a century.

The acids and time of boiling are the same as before. Curiously enough, the surcharge is slightly lower than when the smaller proportion of silver is used, the loss of gold being greater and the amount of silver retained in the cornet being less.

ASSAY WEIGHTS.—Attention has been drawn to the difficulty of obtaining accurate assay weights by A. Whitby. This difficulty was recognized in the Mint some years ago. Efforts were made to obtain assay weights free from errors of more than 0.025 per 1000, but without success, and since then weights have been adjusted by the assay office staff whenever necessary. If too light, the weight is increased by gilding in a cyanide bath. If too heavy, it is reduced by mechanical means. As the adjustment of small weights was found to be tedious, the use in the balance pan of all weights of less than 5 mgms. has been discontinued, and carefully adjusted riders of 5 mgms. and 1 mgm. are substituted for them, horizontal notched balance beams suitable for use with riders replacing the older form of beam. It is hardly necessary to point out that the effect of errors in riders is proportionally reduced as the rider is moved nearer to the central knife edge.

The weights are tested on an Oertling balance said to turn with 0.005 mgm. This has been slightly altered and improved in the Mint, and results are obtained, by the method of swings as shown below, correct to 0.001 mgm. A magnifying lens is used for each pointer. The pointers, which are prolongations of the beam, have been greatly reduced in thickness and made black, so as to be easily seen. In order to avoid the complication of plus and minus readings, the ivory scales read downwards from 0 to 80 at the right hand end, and from 80 to 0 at the left hand, the position of rest when the pans are empty being at No. 40 on the scale in each case. To avoid parallax, the eye is applied to holes in fixed cards placed opposite the ivory scales and about 12 inches from them. A series of readings are taken alternately on the right and left hand scales. The scale divisions are easily divided into ten parts by the eye, so that the indications are read correct to about 0.0005 mgm.

The method of comparing two weights—say 1000A and 1000B, where 1000 = 0.5 gm.—is to place 1000A in the left pan and 1000B in the right pan. The beam is then released and, after two or three swings, four successive readings are taken at the right hand end. The beam is then arrested and again released, and after two or three swings four successive readings are taken at the left hand end. This is enough in ordinary cases, but for the most exact work the double operation is repeated three times. The weights are then interchanged and the weighings repeated. Lastly a small weight, usually 0.1 mgm., is added to one side by means of a rider, and the weighings are again repeated so as to determine the value of one division on the scale. This need be done only two or three times a day if the balance is working well. Care must be taken to avoid unequal heating of the balance case.

A record actually taken is given below, l_1, l_2, l_3, l_4, being the numbers at the limits of successive swings. Then L, the position of rest, is equal to $\frac{l_1 + 3l_2 + 3l_3 + l_4}{8}$. If only three swings are observed, then $L = \frac{l_1 + 2l_2 + l_3}{2}$, but the latter value of L is not quite so exact as the former.

WEIGHINGS MADE ON NOVEMBER 14, 1901.

Left Pan.	Right Pan.	READINGS OF INDEX DIVISIONS. l_1.	l_2.	l_3.	l_4.	L.	Means.
1000A	1000B	38.1	39.2	38.2	39.2	38.69	38.65
1000A	1000B	30.2	46.6	31.0	45.9	38.61	
1000B	1000A	39.0	33.9	38.9	34.0	36.43	36.26
1000B	1000A	39.6	33.0	39.0	33.1	36.09	
1000B + 0.1 mgm.	1000A	13.0	38.0	14.3	36.8	25.84	25.65
1000B + 0.1 mgm.	1000A	12.0	38.4	13.0	37 5	25.46	

Then 0.1 mgm. = 36.26 — 26.65, or 10.61 divisions, so that 1 division is equal to 0.00942 mgm. And 1000A is equal to $1000B - \frac{38.65 - 36.26}{2}$, that is, 1000B — 0.011957 mgm. These weights are supposed to be each equal to 0.5 gm., and, taking 1000A as correct, then 1000B = 1000.0225 half mgms., only four places of decimals being retained. On repeating such observations as these, it is found that the maximum differences in the results are about 0.002 per 1000, or 0.001 mgm., so that the fourth place of decimals is of little value.

The divergences or errors in the results are, no doubt, due in part to imperfections in the balance, the knife edges being subject to slight displacement on arresting, and again on releasing, the beam, but the errors are mainly caused by vibrations of the building. The balance is placed on an ordinary table on the first floor, and the traffic in the neighboring streets and the Mint machinery cause vibrations in the swings, although these are imperceptible on an ordinary assay balance read in the usual way. By placing the weight balance on a shelf secured to the wall of a cellar 12 feet below the surface of the ground, more concordant results are obtained, but the cellar was soon given up, as the observations made in the pleasanter situation were sufficiently accurate for the purpose. In a building subject to great vibrations it would be necessary to place the balance on a wooden or stone pillar built up from the foundations and not touching the building.

It will be observed that although two weights are compared, their absolute masses are not obtained. The rider of 1 mgm. must be in agreement with the 1000A, which has been taken as correct. No allowance is made for the displacement of the air, as any such correction does not affect the results when the weights are all made of platinum. If a brass rider of 5 mgm. is used, the results are affected only in the fourth place of decimals (0.0001 mgm.) by the difference of specific gravity.

The method of building up a set of weights from 1 mgm. to 1000 mgms. is too well known to need description. The most satisfactory course for an assayer to pursue when the series of comparisons have been made is to assume that his "1000" weight is correct, and to calculate the errors of the other weights on that assumption. For ordinary work the practice at the Mint is to adjust or reject any weight having an error of more than 0.025 per 1000. Errors less than this are usually disregarded,

*Abstract Jour. Chem., Met. and Min. Soc., S. A.

but for the most exact work allowance is made for the known errors.

It is convenient to have two weights, each of 1 gm. or of 0.5 gm., the exact difference of which from standard has been observed by the standards department of the Board of Trade or the Bureau Internationale des Poids et des Mesures, or some similar institution. The absolute error of any assay weight can be obtained at any time from these two "standard" weights, and as long as they preserve their relative difference it may be assumed that they are uninjured.

Results.—Although each of the precautions described above, when taken by itself, is not of great importance, their aggregate effect on the accuracy of the assays is considerable. The number of standardized gold pots rejected and set aside for remelting at the Mint, on account of incorrect composition, has fallen from 8.55% in the year 1901–1902 to 2.06% in the year 1904–1905, and the value of the gold used for standardizing the rejected pots has fallen from £139 per £1,000,000 to £7 per £1,000,000 during the same period. These results appear to be due to the increase in accuracy of the assaying.

There is no very material difference between the British Mint methods above described and those in vogue in the United States, except that some of the later practice of the British Mint is similar to that which for years has been employed in the United States mints. There are some small differences in apparatus employed. For instance, in the English mints the rider is used in weighing minute quantities, and in the United States mints weights only are employed. Where the ratio of silver to gold is 3 to 1 in the United States mints, 28° nitric acid is employed; where it is 2 of silver to 1 of gold, 32° acid is used. The methods are practically similar in both countries, and represent the best practice.—Ed.

Transvaal Government Commission on Safety in Shafts.

A commission has been appointed by the Lieutenant-Governor of the Transvaal to consider the question of the safety of persons traveling in shafts, and the following gentlemen have been appointed to serve on the commission:

U. P. Swinburne, Acting Government Mining Engineer (Transvaal), chairman; J. A. Vaughan, Chief Inspector of Machinery (Transvaal); J. S. Fisher, Inspector of Mines, Johannesburg; F. Drake and E. Hopper, consulting engineers, representing Transvaal Chamber of Mines; R. M. Catlin, consulting engineer, Consolidated Gold Fields of South Africa, Ltd.; H. C. Behr, consulting mechanical engineer, Consolidated Gold Fields of South Africa, Ltd.; S. C. Thomson, consulting engineer, Messrs. Neumann & Co.; J. F. Cook, consulting mechanical engineer, Messrs. Neumann & Co.; G. C. Fox, consulting mechanical engineer, Messrs. A. Goerz & Co.; K. Schweder, assistant consulting mechanical engineer, Messrs. A. Goerz & Co.; E. Farrar, consulting mechanical engineer, General Mining & Finance Corporation; J. H. Johns, consulting engineer, Johannesburg Consolidated Investment Co.; D. Gilmour, consulting mechanical engineer, Johannesburg Consolidated Investment Co.; C. J. Price, general manager central administration, Rand Mines, Ltd.; A. M. Robeson, consulting mechanical engineer, Messrs. H. Eckstein & Co.; F. Hellmann, consulting engineer, East Rand Proprietary Mines, Ltd.; W. L. Honnold, consulting engineer, Consolidated Mines Selection Co., Ltd.; W. Bradford, manager, Langlaagte Deep, Ltd.; H. R. Skinner, manager, Durban Roodepoort G. M. Co., Ltd.; J. W. H. Stubbs, general manager, Randfontein Estates; E. J. Way, general manager, Kleinfontein group of mines; J. A. Hebbard, manager, Langlaagte Estate and G. M. Co., Ltd.; Secretary, J. R. Mackinlay, Mines Department, Johannesburg.

I. Sectional committees have been formed to consider more particularly the subdivisions:

1. Winding ropes—structure and material.
2. Winding ropes—preservation and examination.
3. Winding ropes—the best method of testing the same.
4. The best method of attaching the rope to the load. The reliability and adaptability of safety catches and appliances in shafts.

II. The Commission invites the attendance of all persons who are willing to give evidence who are acquainted with the matters of reference set forth in the schedule above, and which are more particularly described hereunder.

It is requested that any intending witness will communicate with the secretary of the Commission (address, P. O. box 1132, Johannesburg, or room 74, Winchester House, Johannesburg) as to his willingness to appear and give evidence; his address, whither notifications may be sent; and a short statement as to the evidence he is willing to give, specifying those points he considers of particular importance.

The Commission also invites statements from persons conversant with mining matters, who are unable to attend personally to tender evidence. Such statements may refer to any one or all of the sections of the enquiry, and should be forwarded to the secretary, supported by affidavit, and type-written if possible.

III. With special reference to the respective sections that they concern and under which they are classified, the following points are brought to the notice of persons intending to give evidence or furnish statements:

1. Winding Ropes (Structure).—(a) For what conditions of winding are the following the most suitable? 1. Ordinary lay. 2. Lang's lay. 3. Other special lays.

(b) What are the advantages or disadvantages of lays of various angles? 1. In the rope. 2. In the strand.

(c) What special advantage or disadvantages pertain to lock-coil ropes, flattened strand ropes, cables, flat ropes, many stranded ropes?

(d) For what conditions of winding are the following strand constructions the most suitable?

6 round 1—wires all the same size.

7 round 5 round 1
8 round 3 round 1
8 round 5 round 1
8 round 6 round 1
8 round 7 round 1
} Wires differing in size, outside circle composed of larger wires, and often of a little higher grade material.

9 round 6 round 1
10 round 5 round 1
11 round 6 round 1
12 round 6 round 1
} All wires practically the same size, tending to have outside wires slightly larger, say .003 in difference.

8 round a flat wire core of same grade as outside wires.

9 round 3 twisted in opposite direction to outside wire.

9 round 12 round a triangular core, etc.

(e) re Core of Strand.—What are the advantages or disadvantages of hemp, hard wire, soft wire, flattened wire, triangular wire, core of other special shape or material? What proportion of the strength of the strand can be assigned to it?

(f) The advantages or disadvantages of a strand composed of large wires outer?

(g) Should the various lengths of wire in a rope be connected, and if so, the most approved method of joining, such as brazing, etc.?

(h) The best method of construction of a tapering rope, with special reference to the difficulties in its manufacture.

(i) The most suitable material for the main core of a winding rope and its most suitable form. What proportion of the strength of a rope can be assigned to it?

(j) Other particulars of interest with reference to this subject?

Winding Rope (Material).—(a) For what conditions of winding are the various grades of steel ordinarily used in the construction of ropes specially suitable?

(b) To what extent is ductility sacrificed in the gain of tensile strength?

(c) What are the tensile strengths and ductility of the steels (untempered) of which wire ropes are drawn? 1. How do these increase or decrease during the drawing process? 2. What are limits of tensile strength and ductility of wires of the various standard sizes?

(d) What special alloys (e. g., nickel steel) have been experimented on for the manufacture of wire ropes, and with what results?

(e) How does any special treatment (e. g., galvanizing) affect the strength and ductility of the wires of a rope?

(f) Any other particulars of interest with reference to this subject?

2. Winding Rope (Preservation).—(a) To what extent this may be influenced by preservative treatment during manufacture.

(b) The composition of various preservative and lubricating dressings for ropes working in: 1. Dry shafts. 2. Wet shafts — acid, alkaline or neutral waters.

(c) The efficiency of various dressings in respect of corrosion and wear.

(d) The frequency of application of dressing under the various conditions.

(e) The method of application of dressing.

(f) To what extent the dressing obscures the condition of the rope in the customary frequent examinations.

(g) The efficiency of any metallic covering, such as galvanizing.

(h) To what extent the life of a rope is affected by working conditions such as: 1. Description of winding plant. 2. Variation in direction of shaft. 3. Use of rests in loading. 4. Speed of winding. 5. Description of guide pulleys, etc.

(i) To what extent the life of a rope is increased by periodical recapping.

(j) Any other particulars of interest with reference to this subject.

Winding Rope (Examination).—(a) Nature of examination.

(b) Frequency of examination.

(c) Appliances for assisting examination.

(d) The portion or portions of a rope that should be most carefully examined.

(e) The necessity or otherwise of relieving the rope from strain during the examination.

(f) The best method of examining a rope internally.

(g) The best method of assessing deterioration.

(h) Any other particulars of interest with reference to this subject.

3. Winding Rope (Best Method of Testing).—(a) How can the true strength of a new rope be best ascertained?

(b) How far does the true strength of a rope differ from the nominal strength (breaking load) as quoted by the manufacturer?

(c) The various methods adopted by manufacturers to assess the ultimate strength of a new rope.

(d) What considerations affect the choice of a factor or safety?

(e) In the tension test of a sample of the whole rope, what length of test piece would be considered sufficient to give a true indication of the strength of the rope?

(f) How should the specimen be gripped during the test?

(g) What other tests beside tension tests are of value in determining the quality of a new rope?

(h) Regarding the utility of a periodical test, during the working life of a rope, of its elongation under known loads. (Should the loading be in excess of normal conditions, and if so, to what extent?)

(i) In what manner, and how frequently, should such elongation tests be made?

(j) What indications in respect of deterioration of strength could such test furnish?

(k) What length of rope is it advisable should be cut off at the time of recapping, and what tests—mechanical, chemical, etc.—should be applied to such portion?

(l) During the working life of the rope what tests can be applied — mechanical, chemical, electrical, microscopic, etc.—to show the deterioration in quality of the material of which it is composed?

(m) Is the reduction in cross-section, as ascertained from circumferential measurements at various parts of a loaded rope, a reliable indication of its loss of strength?

(n) Is the visible wear on the external wires a useful indication, in itself, of the loss of strength in a rope?

(o) Can the internal wear be assessed separately from that visible externally?

(p) Any other particulars of interest with reference to this subject.

4. The Best Method of Attaching the Rope to the Load.—(a) Regarding the various methods of securing a rope to a thimble, or in a socket—their efficiencies, advantages or disadvantages—the various constructions of rope also being taken into consideration.

(b) Regarding the various methods of connecting up a load to the eye of the thimble, or socket. Should swivels be used?

(c) Regarding the advantages or disadvantages of spring connections, or other special connections designed to minimize shocks.

(d) Regarding the advantages or disadvantages of supplementary safety chains.

(e) Regarding the frequency with which connecting appliances should be annealed, and the methods adopted for this purpose. Have variations in temperature (climatic) any deleterious effect?

(f) Regarding the practice of connecting up a man-cage, as necessary, below a skip or other cage.

(g) Regarding the material of which connecting appliances should be constructed, and the proper factor of safety to be adopted.

(h) Any other particulars of interest with reference to this subject.

The Reliability and Adaptability of Safety Catches and Appliances in Shafts.—(a) Regarding the utility and reliability of the various methods of providing against excessive speed in winding.

(b) Regarding the utility and reliability of the various methods of preventing an overwind of the load in either the up or down trips.

(c) Regarding the utility and reliability of the various methods of disconnecting the rope from the load in the case of an overwind in the head gear, and the means adopted to support the load after disconnection has occurred.

(d) Regarding the utility and reliability of safety appliances designed to stop, check, or suitably govern the motion of the load in case of the rope breaking on either the up or down trip.

(e) Concerning any other safety appliances in use for winding—e. g., safety crosshead guide for sinking buckets, etc.

(f) To what extent do any of the safety appliances above referred to constitute an additional danger to winding operations?

(g) Particulars (authenticated) are desired concerning accidents that have occurred during winding operations, with special reference to the reliability or otherwise of safety appliances.

(h) Any other particulars of interest with reference to this subject.

IV.—With special reference to Section II, and in order to assist the enquiry into the reliability and adaptability of safety appliances for use in connection with the raising and lowering of persons in mine shafts. Inventors and manufacturers of such safety

appliances are invited to forward to the secretary drawings and plans of their schemes, together with full descriptions of their working.

All drawings should be on tracing cloth and suitable for sun print reproduction, of scale 1 inch to the foot for general views, and 3 inches to the foot for special details. Models may also be forwarded, but these are not obligatory.

Drawings and models will not be returned, but will remain the property of the Transvaal Government.

Practical tests under normal working conditions will be made of appliances selected, and for this purpose it will be necessary for each inventor or manufacturer when submitting drawings to also furnish written permission empowering the Commission, if they so desire, to construct or cause to be constructed the appliance in question for purpose of the test. The modifications, if such be necessary, or if such be possible, to enable safety catches or grips to be used in shafts fitted with either wooden or steel guides, should be specified.

V. Copies of the report, embodying the findings and recommendations of the Commission, will be sent to all persons whose evidence is published; to those who submit drawings or models of safety appliances; and to all papers and periodicals in which this notice is inserted.

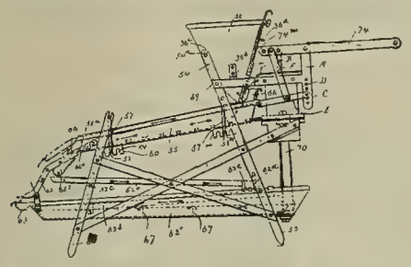
All communications, statements, drawings and models must be dispatched so as to reach the secretary not later than January 31, 1906.

Mining and Metallurgical Patents.

PATENTS ISSUED OCTOBER 31, 1905.

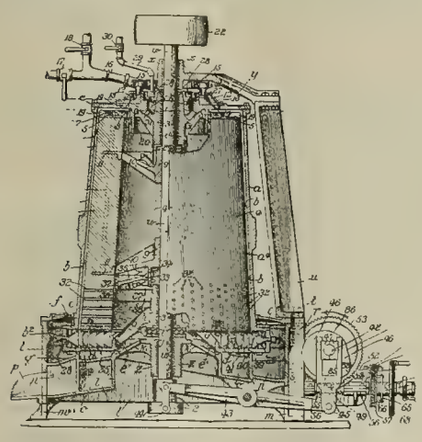
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINERAL WASHING AND SEPARATING APPARATUS.—No. 802,399; J. H. Lancaster, New York, N. Y.



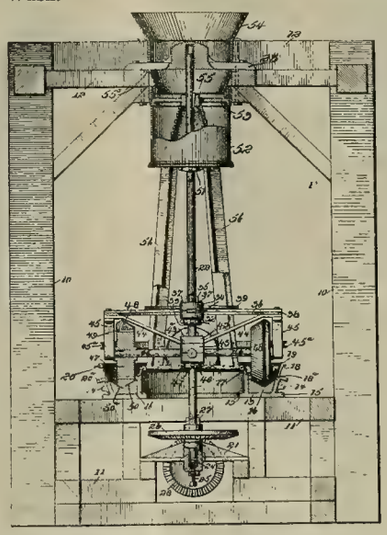
In gold separating apparatus, combination with supporting frame, of inclined riffle tray adjustably suspended for variable longitudinal vibration, removable upper screen within and carried by riffle tray and having screen surface extending from head to tail thereof, independently and vertically vibratable hopper delivering to head of screen and having adjustable gate controlled opening, and devices including a common actuating provision, located closely contiguous to hopper and head of tray for operating latter and positively and vertically jarring hopper.

CENTRIFUGAL CONCENTRATOR.—No. 802,724; P. H. Adams, Chicago, Ill.



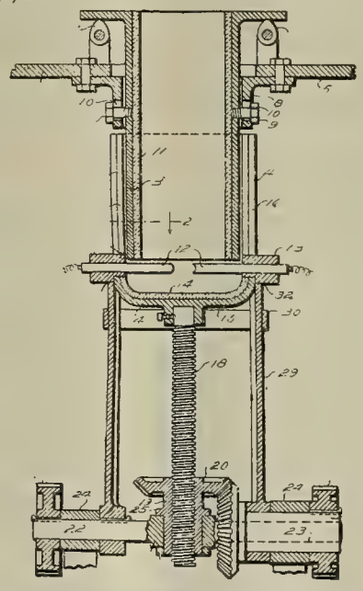
In centrifugal concentrator, combination of rotatable treatment vessel having separating surface, and hollow differentially rotatable reciprocatory deflector therein, and with one or more feed channels at one end and one or more discharge orifices at other end and having enlargement at discharge end of width approximately as great as reciprocating movement of deflector, ring or similar portion in such enlargement having chambers or recesses leading from inner side to discharge orifices, means for employment of water whereby material can be removed from desired portion of separating surface near discharge end without removing material from near feed end, such means embodying deflector, latter having water passages through lower portion of wall and adapted to alternate periods of longitudinal reciprocation and rest and means for producing such periods of reciprocation and rest.

QUARTZ MILL.—No. 802,787; R. A. Vaughn, Ballard, Wash.



Combination with mortar, of rotatable shaft, separated heads rotatable with shaft and comprising independent blocks, arms extending between blocks, means for connecting arms at outer ends, hangers fixed to arms at junctures with connecting means, shafts journaled in hangers and in one of heads, and rolls mounted upon shafts and operating within mortar.

ELECTRIC FURNACE.—No. 803,147; E. Appleby, Chicago, Ill.

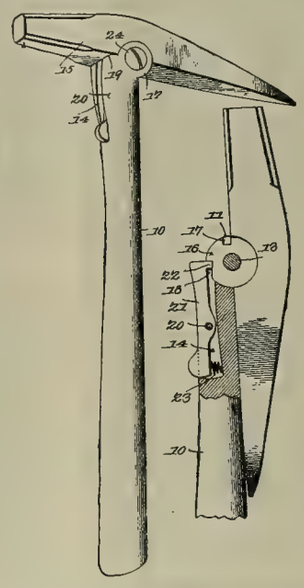


In electric furnace, combination of frame, vertically disposed receptacle mounted in frame and open at bottom; second receptacle open at top and telescoping with first; pair of electrodes mounted in frame and extending into furnace near lower end of first receptacle; mechanism for drawing second receptacle downward with respect to first; and mechanism for tilting second receptacle and discharging contents after it has been drawn out of telescopic engagement with first receptacle.

MINER'S LAMP.—No. 802,978; G. A. Duncan, Deadwood, S. D.

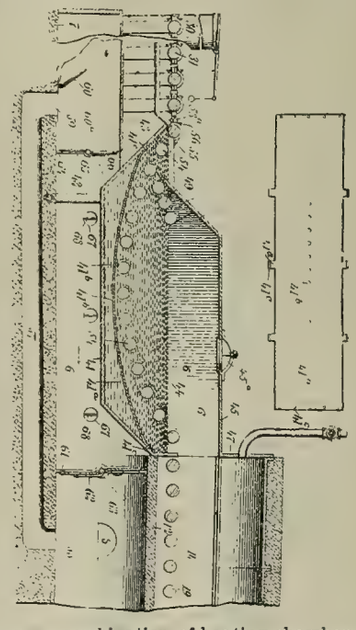
Miner's lamp comprising chambered body for holding illuminant; tubular cylindrical extension superimposed upon such body of suitable diameter and length to be held in clasp of miner's candle-stock and to protrude above clasp, such cylindrical extension being of greatly less diameter than body, and wick sheath extending through cylindrical extension and protruding thereabove with intervening air space between sheath and tubular extension and means closing air space at both ends.

MINER'S PICK.—No. 802,541; F. N. Wilson, Cripple Creek, Colo.



An implement of class described comprising handle member having spaced ears at one end offset laterally therefrom and with shoulder on end of handle adjoining ears, ears provided with transverse apertures and handle member provided with longitudinal channel extending through shoulder and communicating with space between ears, pick head having perforated tongue provided with spaced marginal notches and operating between ears and bearing upon shoulder when in operative position, pivot bolt movably uniting ears and tongue, and spring-actuated pawl operating in channel and guarded thereby with one end for alternate engagement with notches in tongue.

METALLURGICAL FURNACE.—No. 803,337; H. H. Goodsell, Leechburg, Pa.



In furnace, combination of heating chamber, pan, and wall disposed adjacent to pan and provided with by-pass merging into heating chamber, means for closing heating chamber so as to divert gases of combustion through by-pass, thereby avoiding heating of pans.

METHOD OF SEPARATING PYRRHOTITE FROM CHALCOPYRITE AND GANGUE.—No. 801,879; J. N. Judson, South Strafford, Vt.

Method of treating ores containing non-magnetic or weakly magnetic varieties of pyrrhotite, associated with chalcopyrite and gangue minerals, which consists in heating ore to degree sufficient to make pyrrhotite more magnetic than chalcopyrite and without considerable loss of sulphur, and subsequently removing pyrrhotite from other minerals by magnetic attraction.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

According to the report of the United States Geological Survey, the production of gold in the United States during 1904 amounted to 3,910,729 fine ounces, valued at $80,835,648. This represents an increase of $7,243,948 over the production of 1903. After a period of very rapid advance in the gold production from 1892 to 1900, during which an increase from $33,000,000 to $79,171,000 took place, there followed two years of nearly stationary output, and one year, 1903, of very decided decrease. The production of silver in 1904 amounted to 55,999,864 fine ounces, valued at $32,035,378. This represents an increase of 1,699,864 ounces over the production of 1903, and an increase in value of $2,713,378. There is, therefore, a total increase of $9,597,326 in the value of gold and silver produced in 1904 over that of 1903. The record output of silver in 1892, amounting to 63,500,000 fine ounces, has not been reached in late years, nor has the coining value attained the figures of that year, which amounted to $82,101,000. The price of silver in 1904, according to the Director of the Mint, varied from 55 to 61 cents per fine ounce, representing a decided increase over the prices of 1903, which varied from 48 to 59 cents, and only exceptionally rose to 61 cents in October, 1903. The principal sources of the great increase in the gold production of over $8,000,000, compared with that of 1903, are easily traceable. Colorado added nearly $2,000,000 to her production of 1903, most of this coming from the mines of Cripple Creek. Nevada's output increased about the same amount, chiefly by reason of the phenomenal yield of the Goldfield mines. The greatest progress is reported in California, whose production exceeds that of 1903 by $2,300,000, the increase being caused partly by a strong development of the quartz mining industry and to a less degree by the activity of the dredgers. Alaska and Arizona show increased yields, amounting respectively to $476,893 and $748,708. A number of States show smaller increase, while Utah, Montana and Washington have less gold to their credit in 1904 than in 1903. The increase of value in the production of silver of $2,713,378 is somewhat evenly distributed among the various States and Territories, but it is to some extent due to the better price of silver obtained. Colorado leads, with an increase of $970,320. California, Idaho, Montana, Nevada and Utah also added considerable value to their silver production. The number of producing mines in the Western States, exclusive of Alaska, in 1904, was 3254. To this should be added several hundred producers in Alaska and probably over a hundred in the Southern Appalachian States, which would make a total of about 4000. The total number of placer mines reported is 1349, and of deep mines, 1905. Colorado has the largest number (567) of deep producing mines, and is followed by California, with 474. In number of placer mines, California leads with 711, and is followed by Idaho with 263, and by Oregon with 211 mines. California has by far the greater number, 1185, of producing mines, and is followed by Colorado, in which the number is 588. One of the most important features of W. Lindgren's report is his classification of the gold and silver product according to its derivation from the placers, dry or siliceous ores, lead ores, copper ores, and zinc or zinc-lead ores.

ALASKA.

Manager R. A. Kinzie's report to the Alaska Treadwell G. M. Co. for the year ending May 15, 1905, states that development during the year comprised 4650 feet of drifts, 1332 feet of crosscuts, 4475 feet of raises, 1152 feet of stations, and 223 feet of shafts. The main shaft has reached a depth of 1155 feet and preparations have been made for sinking it farther. The average of fifty-four samples taken in the last 173 feet was $1.14. The open pits have been sunk to a depth of 600 feet. Slides of foot wall rock will prevent the extension of the open pits to the south. The cost of extraction from these open pits is now about the same as from large underground stopes. Of the 876,234 tons of ore mined and sent to the mill, 781,397 tons came from stopes, the remainder being supplied by development work. The cost of mining, hoisting, crushing and delivering to the mill bins the above tonnage was $0.96, including development and the mining of the broken ore left in the mine. The open pits and underhand stopes above the 220-foot level contributed 35% of the output, and the stopes on the 440-foot level an equal amount. Of the other levels, the 600-foot was the heaviest contributor. The average of 4716 samples taken throughout the mine was $2.65. Machine drills are employed throughout the mine. There were forty-two of them at work every day, on the average, during the year, of which twenty were stoping, eleven driving development, and the rest working in the open pits or cutting-out stations. Those in the open pits accomplished the most work. Each one would drill an average of 3.57 11-foot holes, or 39.4 linear feet, per ten-hour shift, breaking down 57.26 tons of ore at a cost of $2.77 for explosives. Those underground, cutting 7-foot holes, would average 4.8 holes, or 36 linear feet, per shift, and broke about 31.5 tons of ore apiece, at a cost of $2.66 per day each for explosives and of $2.59 for supplies, power and repairs. To break 1 ton of ore required 1.13 foot of hole to be drilled. The company has two stamp mills, one of 300 stamps, operated entirely by water power, and one of 240 stamps, capable of running part of the time by steam power, the remainder by water. Details of operations of these two mills are instructive:

	240-Stamp.	300-Stamp.
Running time, steam	125d 11h	.....
Running time, water	234d 12h	286d 7h
Lost time	5d 1h	78d 17h
Tons ore crushed	396,094	481,076
Per stamp per day	4 58	5 60
Sulphurets saved, tons	8,420	9,633
Per cent of crushed	2.126	2.003
Quicksilver used, ounces	73,810	89,007
In batteries, ounces	60,480	68,369
On plates, ounces	6,925	17,303
On vanners, ounces	357	404
Cleaning amalgam, ounces	6,048	2,931
Quicksilver lost, ounces	24,879	38,796
Supplies used, shoes	865	951
Dies	595	930
Stems	469	173
Tappets	58	51
Recovery from amalgam	$478,621	$485,139
Concentrates saved, tons	8,420	9,633
Concentrates saved, value	$460,357	$552,293
Tailings, total value	$77,949	$93,028
Per ton	$0.20	$0.19
Gross recovery per ton ore crushed	$2.57	$2.35
Value amalgam per ounce	$6.13	$6.39
Value bullion per ounce	$18.86	$18.86

Operating and construction expenses were:

	Totals.	Per Ton Milled.
Recovered in bullion	$ 970,462	$1.1064
In sulphurets	1,037,381	1.1826
Profits on stores and supplies	69,317	0.0790
Interest and dividends	18,304	0.0209
Total receipts	$2,095,464	$2.3889
Mining and development	$ 841,785	$0.9597
Milling	123,547	0.1522
Sulphuret treatment	133,253	0.1519
All other operating	36,075	0.0411
Construction and repairing charged to profit and loss	41,365	0.0472
Total operating and construction	$1,186,025	$1.3521
Net profit for year	$ 909,439	$1.0368
Balance brought forward	827,633	
	$1,737,072	
Dividends (18%)	$ 900,000	
Depreciation, etc	150,852	
	$1,050,852	
Balance carried forward	$ 686,220	

Other construction, charged against capital, amounted to $120,626. The company is capitalized at $5,000,000, and in its fifteen years has made operating profits of $7,331,644, from ore which, during that time, has averaged $2.51 in value per ton. Operating profits for the year under review were the largest ever experienced, although operating expenses have reached lower averages in past years. During the fifteen years they have averaged $1.24 per ton.

ARIZONA.

The owners of patented mines in Arizona are waiting the outcome of the suit instituted by Attorney-General Clark to enforce the payment of the increased tax levy on such mines. In August the Territorial Board of Equalization, acting on the suggestion of Governor J. H. Kibbey, raised the valuations on patented mines returned by the several assessors of the following counties, as appears below: Cochise, 1500%; Gila, 400%; Graham, 400%; Mohave, 400%, Pima, 500%; Santa Cruz, 500%; Yavapai, 100%; Yuma, 500%. These counties constitute the chief mining districts of the territory, and without exception they objected to the raise. Yavapai county, among others, refused to obey the order of the Board of Equalization, and the Supreme Court has issued an alternate writ of mandamus to the Board of Supervisors, citing them to appear and show cause why they should not obey the order. The test case will be heard this month before the Supreme Court of Arizona. The patented mines of Graham county were returned by the local officers at $595,532.66. The 634 patented mines in Cochise county were assessed by the local board at $223,015.47. This is the county in which the Copper Queen is located, and from the patented mines of this county the product of gold, copper and silver last year was $15,000,000. Last year the total product of the mines of Arizona was about $30,000,000. They were assessed at a valuation of $5,000,000.

Cochise County.

The main shaft of the Tombstone Con. Mines Co., at Tombstone, is down 840 feet and sinking continues at the rate of 9 feet per week. The water is less troublesome than some time ago and there is daily pumped out of the mine 3,700,000 gallons. The company is shipping from eighty to ninety tons of ore to El Paso, Texas, daily. Work on the mill is progressing rapidly and the company expects to have its forty stamps in operation during December. At Imperial the ore shipments are 100 tons daily. They are 80 feet below the 500-foot level, in high-grade ore, and are still sinking. The management is at work on plans for a smelter and concentrating mill. The capacity of the smelter will be 300 tons per day to begin with, but the plant will be so constructed that 300-ton units may be added as development necessitates. The present production is at the rate of 600,000 pounds of copper per month.——S. J. Entrikin, general manager of the Arizona Con. Co., near Johnson, reports that the Arizona Con. is making regular shipments of high-grade ore to the smelters while pushing development work.——The Black Prince Co. of Johnson is sinking a double-compartment shaft.——The Hershal mine of Tombstone was transferred to Douglas Gray of the El Paso Smelting Works. Miners are sinking a new shaft to cut the vein at 300 feet. F. C. Earle, manager of the El Paso Smelting Co., is president and Douglas Gray manager.

The product of copper at the Copper Queen Reduction Works, at Douglas, during October amounted to 7,100,000 pounds from a little more than 5 furnaces. During the month the old furnaces from Bisbee went out of commission to make room for No. 6 furnace, which is now being put in. Furnace No. 5 is to be overhauled and enlarged to the same capacity as furnaces Nos. 8, 7 and 6. The present force at the Copper Queen is about 900 men.——The Calumet & Arizona production for October was 16,692 tons. This is an increase for October of 392 tons and is due to the smelting of the Lake Superior & Pittsburg and Pittsburg & Duluth, which were commenced October 16. This represents an increase in Bonanza Circle production for the remainder of the year at the rate of 784 tons per month. Last year the Calumet & Arizona produced 32,000,000 pounds of copper. At the smelter the increased equipment, including the extension of the building, widening the converter room, the dust flue and the big stack, has been completed and work commenced on the final contract to complete the steel trestle and ore bins. It is estimated that when the new trestle is completed a saving of at least $100 a day will be effected over the present method of handling the fuel, etc.

Maricopa County.

The Ryland group, in White Picacho district, near the northern line of Maricopa county, northeast of Phœnix, is being worked under the superintendency of C. W. Platt.

Mohave County.

Ore shipments are to be made from the Minnesota-Connor mines, near Kingman.——The Vanderbilt shaft at Cerbat is down 300 feet.——The Oro Plata mine, near Kingman, is to be unwatered and developed. The shaft is to be sunk deeper.——James Uncapher, of Mineral Park, near Kingman, reports rich ore in the Keystone mine.——J. Dundon of Cerbat has bonded a mine fraction between the Tub and Silver, Union Basin, to E. M. Carson. The Green Linnet tunnel is to be driven under the mines, cutting them at depths of from 200 to 300 feet and draining them.

Yavapai County.

The cave-in in the fire district of the United Verde mine, near Jerome, which caused some of the surface buildings to settle, has proved to be less serious than it was at first thought it would be. Ore is still being removed from that section of the mine, and will continue to be until the entire fire zone has been exhausted. If the working of this zone proves practical it will mean that the fire has been a source of benefit rather than of harm. The ground now being worked is known as the Hampton stope and has always been considered the worst in the fire district. The fire serves to remove the excess sulphur in the ores, obviating heap roasting on the outside of the mine. The Hampton stope opened an ore body that is known to contain a body of ore 90 feet in width and as far as opened several hundred feet in length, with some distance still to go. The mine now employs between 530 and 540 men, which is the largest number ever employed at that location. The company is beginning prospecting on some of its minor claims. After many years of idleness the North and South Venture claims are being prospected.

W. Duke of Cleveland, Ohio, is working placer ground on Lynx creek, near Prescott, and by the last of January expects to have a grizzly and sluice boxes, able to handle 200 tons per day, in operation.——J. Chambers reports opening up a 5-foot ledge of ore by an open cut on the Mormon mine, 6 miles south of Prescott.

CALIFORNIA.

According to F. H. Oliphant's report on the oil production to the United States Geological Survey, the most remarkable event in the production of petroleum in the United States in 1904 was the increase in California. The output of this State has been increasing by leaps and bounds since 1899. It has increased sevenfold since 1900. For the last two years it has produced more than any other State, the output amounting to 25.33% or more than ¼ of the entire production of the United States. As a large percentage of the petroleum produced is used for fuel, it was marketed at a low value, about 63% being sold for 17½ cents per barrel, nearly all of which was produced in Kern county. The highest price paid was $2 per barrel for a small production of a superior grade of petroleum in San Mateo county. The entire value of the production in 1904 was $8,265,434, which amount placed California in the fifth place when rank in the value of the States producing petroleum was considered. The average price paid in 1904 was about 28 cents per barrel, a decline of about 2 cents compared with 1903. The largest percentages of gain in production were, in the order named, Santa Clara, Santa Barbara, Fresno and Ventura counties. The only county showing a decline was San Mateo. On December 2, 1904, a remarkable well was drilled in at a depth of 2860 feet in Santa Barbara county, a few miles southeast of Santa Maria, belonging to the Union Oil Co., which began producing at the rate of 10,000 barrels per day. The gravity is 22.8° Baume. Immense quantities of loose sand were vomited out of this well with the petroleum, which in a short time covered the derrick floor for a number of feet. At a depth of 2200 feet a deposit of petroleum was found in a loose sand which would have made from 300 to 500 barrels per day, but this was cased off and the well drilled deeper. Owing to lack of tankage, attempts were made to "shut in" this well without success. Finally the pipe parted 90 feet from the well's mouth. The petroleum is now flowing out of the cracks in the ground at different points from 2 to 3 rods away from the well, as well as through lead lines, and is collected in temporary drains across the canyon. The Union Oil Co. had about 200,000 barrels, which at first was stored in these reservoirs and subsequently was shipped by a pipe line to tanks at Gaviota. The Brooksline Oil Co. had several wells near this large gusher, and they closed down at once. One of these wells afterwards broke loose and started to flow at the rate of 4000 barrels per day. Indications are that this territory extends from 8 to 9 miles to Lompoc, and that it will contribute largely to the production of 1905. The petroleum ranges from 22° to 28° Baume. The lighter grades are found in the northern portion of the field. There were 458 wells drilled in 1904; of this number about 158 were dry, leaving 300 productive wells. There were 252 wells abandoned. During the year there were 2772 wells operated and 647 wells shut in. About 75% of the new wells drilled were in Kern and Los Angeles counties. There were 57 rigs up at the close of 1904. There were 398 wells drilled in 1903. Of these 75 were dry holes, and 77 rigs were put up at the close of the year.

The Bakersfield oil district in Kern county kept up its production of nearly 55,000 barrels per day in a remarkable manner, although at times half the wells in this field were shut in for want of transportation. The specific gravity averages 15½° Baume. There were over 3,000,000 barrels held in steel and 3,500,000 barrels held in earthen reservoirs in this field at the close of 1904. Large quantities were shipped north by the Pacific Coast Oil Co.'s lines to Point Richmond, and from 150

to 200 tank cars were shipped daily from this field in 1904.

The Coalinga oil field in Fresno county in 1904 more than doubled its production of 1903, yielding 5,114,958 barrels. The gravity of the petroleum produced in this field ranges from 12° to 45° Baume, the larger proportion being 33° Baume. There were 148 producing wells during 1904 and 11 wells shut in for want of transportation. Four pipe lines, from 5 to 10 miles in length, connect this field with the tanks on the Southern Pacific railway near Coalinga. The Pacific Coast Oil Co.'s branch line from Coalinga reaches the main line at Mendota station, 166 miles south of Point Richmond. In October a 6-inch pipe line was completed to the Pacific coast at Montgomery bay, distant about 100 miles. One of the serious obstacles to the rapid development of this field is the scarcity of water. There is a partial supply furnished by two water pipe lines operated by the Coalinga Consolidated Water Co., which secures it from wells in the valley.

The Los Angeles oil field in 1904 slightly more than maintained the production of the previous year. The production in 1904 was 2,102,892 barrels, the product of 1273 wells. There were 148 wells drilled and 99 abandoned during the year. The specific gravity averaged about 13° Baume.

The oil production in Santa Barbara county increased 158% in 1904 over that in 1903, owing to the immense wells opened up toward the close of the year near Santa Maria, with indications of a much larger increase in 1905. The particulars of the well secured by the Union Oil Co. have already been described. Wells near Summerland, in this county, have long been noted, owing to their rigs being located on piles in the ocean.

In Ventura county, the oil wells are quite deep in this field. Many are over 2000 feet, and a great part of the petroleum is as light as 25° Baume, some of it going as high as 35° Baume. There was a marked increase in the production in 1904 over that of 1903, amounting to 49%, and the price averaged 90 cents per barrel, which was the highest paid for crude petroleum in California during 1904, except for a small production in San Mateo county.

Alameda County.

The shipping of magnesite from the mines at Red mountain, 30 miles from Livermore, has begun. The factories that are to reduce and handle this ore are in Oakland. California is the only State in the Union that produces magnesite which is a native magnesium carbonate, composed of 47.6% magnesia and 52.4% carbon dioxide. During 1904 the quantity of crude magnesite produced was 2850 tons, valued at $9298. With the exception of 51 tons mined in Fresno and Napa counties, this was all derived from the deposits at Porterville, Tulare county. For 1903 the quantity reported was 3744 short tons crude, valued at $10,595, equivalent to 1361 tons calcined, worth $20,515. The demand for both crude and calcined magnesite on the Pacific coast is limited, and prohibitive freight rates have thus far prevented shipments to the East. Oregon and California consume the entire native production. In the crude state magnesite is used for the manufacture of carbon dioxide gas; calcined, it is used in the manufacture of paper from wood pulp and as a refractory material, in brick or concrete form, for lining furnaces, covering steam pipes, as artificial lumber, as composite stone for lithographing, etc. Magnesium chloride is an excellent bleaching agent. Calcined magnesite, generally in the form of brick, is now universally recognized as the best material for lining basic, open-hearth furnaces, cement kilns, etc. The distinctive characteristics of a magnesite lining are durability, freedom from moisture and silicic acid, and resistance to corrosion when exposed to the action of basic slags and metallic oxides. These qualities make the lining cheaper than most others in the long run. The magnesite bricks made in this country come from the Fayette Manufacturing Co. of Layton, Pa., the Harbison-Walker Refractories Co. of Pittsburg, Pa., and the Rose Brick Co. of Oakland. This is one of a number of companies formed to work the product of the American Magnesite Co. The Pacific Carbonate Gas Co. was formed to utilize the CO_2, and the Plastic Construction Co. to manufacture tiling from the magnesite rock. H. C. Stilwell, Kohl building, San Francisco, is manager.

Butte County.

Diamond mining is being tried near Cherokee. In the past twenty years sixty diamonds are said to have been found there.

The Dewey mine, near Forbestown, is to be opened up by new owners.

El Dorado County.

(Special Correspondence).—At the Gopher-Boulder quartz mine, near Kelsey, good ore has been developed. The mill is being repaired.——The Kelsey gold and silver quartz mine, which has recently been purchased by an Eastern company, will begin work soon. ——The Eureka slate quarry near Kelsey, under the management of C. H. Dunton, are putting in modern machinery and methods for the exploration of slate.—— At the Rosencrans mine, near Garden Valley, they are still sinking.——The Live Oak gravel mine above Placerville continues producing.——Work has been started at the Gold Bend gravel mine near Smith Flat district.—— The Snow gravel mine, near Newtown, has been bonded to a Colorado company and they are making preparations for developments. This property has been worked by Snow Bros. as a hydraulic mine for years, but the fight against hydraulic mines stopped it. The present company is running a tunnel to tap the deeper channel and will work the claim as a drift mine.——The American River Electric & Power Co. intend putting in a transformer near El Dorado, which will be a distributing point to furnish power to the Union quartz mine, also to the Church, Cook, Crusader and other quartz mines near by.——The Church mine is looking well.——At the Golden Gate quartz mine they are still sinking and have struck a fine body of ore.

Placerville, Nov. 13.

It is reported that a company has commenced mining for diamonds at White Rock hill, 2 miles northeast of Placerville.

The El Dorado County Miners' Association, at its annual meeting, elected as president A. Baring-Gould; vice-president, N. H. Berger; secretary, C. H. Weatherwax; treasurer, M. Q. Meehan, all of Placerville.

Inyo County.

(Special Correspondence).—It is reported that the lead, silver and gold mines at Resting Springs in the southeast part of Inyo county, 100 miles northeast of Daggett, have been sold to the Guggenheim syndicate by J. B. Osborn. About forty years ago these mines were equipped with smelters and extensive operations carried on, but work was discontinued because of difficulties of transportation.

Daggett, Nov. 13.

Los Angeles County.

Capital is being interested in dredging placer ground in Soledad canyon, near Saugus.

Nevada County.

Superintendent Eddie has put in an air compressor at the Delhi mine, near North San Juan. The new 10-stamp mill at the Oustomah mine, near Nevada City, will soon be ready to drop stamps.——The Deadwood mine, in Willow Valley district, near Grass Valley, has been bonded to a San Francisco company represented by J. M. Esselstyn. A new hoisting and pumping plant is to be put in preparatory to sinking a new shaft.

J. P. Myers and J. L. Bryson are developing the Celia ledge at Omega, near Washington. The Celia is being worked through open cuts and the Huntington mill is crushing 35 tons of ore daily.——At the Banner shaft, near Nevada City, the 600-foot level has been reached and the shaft is in good condition. Superintendent Kendall has put in another pump. As soon as the mine is clear of water, sinking will be commenced and the shaft will be continued to a depth of 1200 feet. Superintendent J. H. English will put in at the Spanish Ridge mine near Washington a new air compressor.

Placer County.

It is reported that the Hidden Treasure mine, at Bullion, has been temporarily closed down.

San Bernardino County.

Southern Pacific officials state that the engineers and riprappers who have been at work for months at Salton sea in an effort to check the flow of water from the Colorado river have been successful, and that the waters are now practically under control. Experiment after experiment had proved unsuccessful, and the railroad company has been compelled to build several succe-sive new tracks to get away from the encroaching water. The engineers, by constructing a heavy riprap of re-enforced piling 600 feet long across one channel of the river, forcing the water to back up and flow through the other channel and away from the company's property, have stopped the damage.

Sierra County.

(Special Correspondence).—T. K. Code, superintendent of the Empire mine at Gold Valley, is sampling the Comet mine in Jim Crow canyon, near Downieville. He reports thirty-five men at work at the Empire. The continued dry weather has caused inconvenience.—— Mr. Filting, operating a mine near Lovelock, Nev., is examining the Alice and Pappoose claims in Jim Crow canyon.

Downieville, Nov. 14.

It is hoped to have the Sierra Buttes mine and 60-stamp mill at Sierra City regularly producing by December 1. The new 40-stamp mill has been built near the mouth of the No. 9 tunnel and is connected with No. 5, the main working tunnel, by means of an aerial tram, operated by gravity and having a capacity of 200 tons per day. The old 20-stamp mill at No. 5 is being overhauled and new foundations and mortar boxes put in. The new 40-stamp mill has eight batteries of five stamps each, the foundations being set with concrete on bedrock. The batteries are in two divisions. The tailings are to be cyanided. There are eight tanks holding 150 tons each. A separate plant will treat the tailings from No. 5 mill, the tailings being sluiced down the hill. The deposit of tailings from the old operations, which had accumulated up on the hill, were sluiced down to the lower plant and have been treated in the tanks of the new mill. Hydraulic power is in both mills and mine. The water is conveyed by ditches and flumed from the high altitude lakes on the northeast slope of the mountain. James Clinton, superintendent of the Rainbow mine, near Alleghany, states that five stamps of the mill are running, and that as soon as there is sufficient water all of the stamps will be started.

Tuolumne County.

The Rising Star, owned by Jos. Maddox and situated near Confidence, has been bonded for $7,500.——The Grizzly 20-stamp mill, near Carters, will be kept running. ——The company operating the Grizzly is also working the New Albany. A tramway has been built from the latter to the Grizzly mill, through which rock from both mines will be run.

COLORADO.

Effective November 15, the American Smelting & Refining Co. announced concessions which mean that the lead miners will receive from 10 to 17 cents more a unit for their product. The new schedule makes advances ranging from 9 to 16 cents on the different percentages in lead. Railroad men, producers and buyers agree that the rearrangement of prices will give an impetus to the mining industry of Colorado. Old mines, which have been closed because of the absence of profit, are to be reopened and property which has been worked for a bare percentage over running expenses will be put on a paying basis. The smelters are preparing for an influx of ore and should the output come up to expectation it is probable that some of the Colorado smelting plants, which have lain idle for years, will resume.

Boulder County.

At Ward the San Blas mill is being remodeled by the Myrtle Co. A new furnace has just been put in and the company expects to start up for a continuous run on ore which experiments with the old furnace demonstrated could be satisfactorily treated by cyaniding.——At Jamestown the Wano mill is being overhauled and fitted for cyanide treatment. At Eldorado a change will be made from the Bailey chlorination mill to a cyanide plant.

Clear Creek County.

The Continental Mines, Power & Reduction Co. has been formed by H. I. Seemann of Denver to drive the Seemann tunnel, which has been started on Fall river, 5 miles from Idaho Springs, to be driven in a direct line toward James Peak.

Ore being opened in the eleventh level of the Terrible mine, near Silver Plume, continues to increase in value. The drift has been driven over 100 feet since the lower workings of the mine were unwatered. The fourteenth level has been cleaned out. This level will be driven east. It is not expected to run the mill during the winter.——The Mineral Chief, owned by the Linn Con. M. Co., have a concentrating mill to handle the quantity of low-grade material. The No. 2 level, which is now in 800 feet, will be driven ahead and connection made with the No. 3 level by means of a raise.——That part of the Griffith property near Silver Plume owned by the Annetta Co. is making a large output of ore.——The Independent Mining Co., which recently purchased and is operating the West Griffith, is meeting with success.—— Experimental runs are being made at the Waldorf Co.'s mill, near the Wilcox tunnel, to determine the process best adapted to saving the values contained in the copper-lead-zinc combination found in a number of the veins that have been opened in the Wilcox and Tobin tunnels. ——Manager E. J. Wilcox of the Waldorf Co. has located the Tobin millsite and a pipe line between Silver Plume and Georgetown, and has also secured by purchase other millsites in that vicinity and commenced the construction of a dam below the Pay Rock mill in order to secure water power for an electric plant for furnishing power for the operation of the Waldorf properties and the Argentine Central Railroad.

The new Dover & Brighton concentrating mill at the mouth of Fall river, near Idaho Springs, has been started up on ore from the Brighton mine at Freeland. The ore is concentrated six to eight tons into one. The concentrator was designed and built under the direction of J. G. Roberts. J. Lindstrom has charge of the mill.

Work has been started on the Pay Rock mines, near Silver Plume, by Superintendent E. F. Kendall.——The Dominion M. Co.'s claims on Payne's peak, near Silver Plume, have been sold to a new company which will start work under the management of H. J. Crist.—— Superintendent F. A. Babcock of the Southern M., M. & D. Co., has resumed work in the Robert E. Lee tunnel.

Gunnison County.

C. T. Snedaker, representing Chicago capital, is working the OO lode on Cochetofa creek above Sillsville. A shaft now 110 feet deep is being sunk and the vein will be opened by levels.

Near Bowerman, Superintendent Slaughenhaupt has retimbered the Bradley tunnel and is pushing toward the David Lee and Good Hope veins.——The Abe Lincoln, near Bowerman, is running a full force under the management of L. P. Merriman.

The Continental Group M. Co. is developing the Continental, south of Gunnison. A shaft has been sunk on the vein 150 feet and is connected with a 300-foot tunnel. ——Work on the 100-ton cyanide plant of the Raymond Consolidated Mines Co. is progressing and the company expects to have it in operation before the first of the year.

San Juan County.

The blacksmith shop and ore house at the Champion mine, at Sultan mountain, 1 mile south of Silverton, were destroyed by fire Nov. 11. The loss amounts to $5000, partially covered by insurance. The fire is supposed to have been of incendiary origin.

Work on the new mill of the Sound Democrat, near Animas Forks, is being pushed. The foundations are completed.——J. C. O'Neill, general manager of the Mayflower M. Co., of Silverton, has given a contract for 700 feet of tunnel work to Martin Semelzer of Silverton. A compressor plant will be put on the company's ground, after which stoping will commence. A milling plant will be built next year.——At the Highland Mary mill, in Cunningham gulch, near Silverton, there are twenty-five men work under the superintendency of Wm. Cole.

San Miguel County.

The Contention G. M. Co., operating the Contention mines, owned by the Smuggler-Union Co. at Telluride, has made a trial run of 567 tons and produced 630 ounces of amalgam. A. A. Clute is superintendent.

Gilpin County.

The manager of the Evergreen mine at Pine Creek, near Central City, has put in the new hoist and is prepared to sink the shaft 500 feet deep.——The Sleepy Hollow mine near Central City is being unwatered and is to be developed after ten years of idleness.

The Elk Park M. Co. has let a contract for a shaft building and a 40 H. P. hoist on its Annie H. property, near Apex. Superintendent McNeill reports that the company will overhaul its 25-ton mill this winter. New machinery has been purchased for the mill of the Boston-Occidental Co. on Colorado hill, near Apex, to treat ores from the Mascot property.

Lake County.

At Leadville the Felicia Grace Robinson has been opened with good ore in the shaft. Sinking will continue until the bottom of the ore is reached.——The President shaft, Breece hill, Leadville, will be sunk deeper. Its present depth is 330 feet, and it will probably be sunk to the 750-foot mark. Prospecting in the upper levels will continue and the shaft will be enlarged. ——It is reported that high-grade ore has been struck in the upper tunnel of the Fidelity M. & M. Co.'s Bull Hill lode, near Twin Lakes.

Summit County.

(Special Correspondence).—Breckenridge during October shipped 2080 tons of high-grade ore and concen-

trates. Of this quantity the local sampler handled 105 cars.——The Gold Pan suits have all been settled. A. B. Sculley of the Sculley Iron & Steel Co. of Chicago came to Breckenridge and on behalf of his associates and himself paid all judgments, using $75,000 in the settlement. The property will be operated on a large scale next year and a number of improvements made.——The manager of the Jessie mine, being worked under a lease and bond, has struck a rich gold vein in the Jessie tunnel workings.——The Abundance M. & M. Co. of Breckenridge have realized that they have too much water to cope with for shaft mining, so have secured a right of way from the owners of the Mono group on Mineral hill for a tunnel 1200 feet long to strike their own property. This tunnel when completed will cut their ore bodies at a depth of 650 feet, 350 feet below their present main shaft. Work has begun on the tunnel.——In the French Creek tunnel in Mount Baldy, which is now in 1650 feet, a fine looking vein of zinc has been cut.——The Carrie M. & M. Co. has its mill in shape for its trial run, and crushing and cyaniding have been started.——The Reliance dredger is still running full time and will continue to do so as long as the weather is favorable.——Boyce Bros. are shipping lead-gold ore from the Fountain Ledge on Farncomb hill, near Breckenridge.——The Kitty Innes mine, near Frisco, is being worked and a streak of lead-copper ore, carrying gold and silver values, has been cut in the main tunnel.——The power plant working the machine drills and electric lights for the North American and Mary Verna mines has been started up, and both tunnels are now being driven with machines.——The Buffalo Placer M. & M. Co. of Boston, operating at Dillon, has elected L. Kingsbury president and general manager.

Breckenridge, Nov. 13.

Edward Huter, superintendent of the Square Deal M. & Dev. Co., working in West Ten Mile, near Breckenridge, is running a 500-foot crosscut tunnel, which will tap several veins. In the spring a 3000-foot tunnel will be started from the base of the mountain.

Teller County.

The Iron King shaft on Ironclad hill, Cripple Creek, is to be sunk from the 85 to the 185-foot level and machinery is to be put in. The mine is being worked by leasers.——A 15 H. P. electric hoist has been put in by lessees Schiele & Co. in block 197 of the Stratton estate on Bull hill, Cripple Creek. Work is being done between the surface and the 400-foot level.——B. I. Shell & Co., lessees, have started work on the Hoosier mine on Tenderfoot hill, Cripple Creek.

Sinking has been resumed in the Home claim of the Cedar Hill Gold Mining Co. of Cripple Creek by N. Gardner and associates, lessees.——It is proposed by O. D. Fogleman, lessee of the T. Merritt claim of the Reno Co., on Womack hill, Cripple Creek, to continue the shaft to the 220-foot point.——The capacity of the cyanide mills at the Los Angeles mine on Bull hill, Cripple Creek, is to be doubled so that 500 tons of ore can be handled daily.——Morrison & Co., leasing the Silver Tip on Bull hill, are putting in machinery to handle ore that is being broken at a depth of 65 feet.

IDAHO.

Elmore County.

The mill at the Tahoma mine, near Atlanta, is running constantly. The machinery for twenty more stamps is all on the ground, but will not be installed at present. The cyanide plant will not be put in this year. There are twenty-nine men at work in the mine and mill.——There is no work being done at the Petit mine, near Atlanta.——Work on the Boise-Atlanta road is being pushed, but it will be impossible to complete the contracts this fall, as it was impossible for the contractors to secure enough laborers on the work.

Idaho County.

The Buster mine of Elk City has been sold by S. M. Smith to San Francisco people. Men have been put to work.

Shoshone County.

It is reported that good strikes have recently been made on the Ozark and the Klondike claims near Pierce City. The Ozark company is starting a 500-foot shaft, and is also putting in a 5-stamp mill. Ten men are working, and supplies are being taken in for the winter. On the Klondike the strike was made in the lower tunnel, the ledge having widened out to 4 feet.

A. D. Coplen has started work on the Ruth group at Mullan.

The Great Western Co., at Burke, has let a contract to extend its main tunnel 200 feet, which will bring the face of the tunnel within 100 feet of a point below the surface outcrop.——Negotiations are in progress for the sale of the Nabob mine, on Pine creek, near Wardner, to Spokane, Wash., parties. J. L. Safford has inspected the property. It is the intention of the purchasers to run a tunnel from the creek level that will tap the ore chute at a depth of 1500 feet. The ore is said to be clean galena, carrying very little zinc.——C. E. Poor of Los Angeles, Cal., is in charge of the work now being done by the Dominion Co. on its claims on Carbon creek, 1 mile from Carbon Center and 2 miles from Morrison's station, near Murray, and is driving a 700-foot crosscut tunnel to tap the ledge at a depth of 500 feet.——The Hecla Co. of Burke intends getting a new hoist. The present plant is intended to work only to the 900-foot level, and within a year its capacity will be taxed to the utmost. A hoist capable of working to a depth of 2500 or 3000 feet is to be bought. The Hecla plant uses electricity for power.——Work on the Reno & Idaho Co.'s claims at the junction of Military gulch with Canyon creek, 2 miles above Burke, is being done through a 300-foot crosscut tunnel.

R. N. Bell, State Mine Inspector, reports that the bonanza lead-silver mines of the Cœur d'Alenes are making another record year of production. The six principal producers of the district combined will pay dividends during 1905 of over $6,000,000.——At the Hercules a new concentrating plant with a capacity of 500 tons a day is being completed. The developments at No. 3 level indicate that when No. 4 level is completed rich ore may be struck.——At Burke the Hecla mine is being operated at a profit. It occurs in the only true contact fissure in the district, accompanying an intrusive dike. There have been several other properties throughout the district developed to the shipping stage during the year, and others that give evidence of developments in the future. Along the copper belt above Mullan the year's development has produced some results. The Snowstorm lease will ship over 60,000 tons of ore this year of a grade ranging between 4% and 5% copper and six to eight ounces silver. A trial run was recently made with a new leaching plant for the treatment of the ores of this mine and some important results obtained. The mechanical features of this plant, however, need adjustment.——The Monitor mine, 6 miles east of Mullan, has developed sulphide copper ore bodies carrying values in gold.

Washington County.

H. Houston has charge of Carroll & Wheaton's mine on Cuddy mountain, near Council. It is reported that a mill will be built in the spring.

MONTANA.

The October receipts at the United States Assay Office at Helena exceeded those of the preceding month by more than $30,000, according to the report of Assayer B. H. Tatem. Of this increase $11,000 is accounted for in the increased gold production of Lewis & Clarke county. The total receipts for October aggregated $248,583. Of this amount Montana contributed $207,981. The remainder was distributed among the Northwestern States as follows: Idaho, $2241; Washington, $9365; Nevada, $7296; British Columbia, $13,364; Oregon, $788; Alaska, $6410. Of the Montana counties Fergus was the leading producer, with $94,271; Lewis & Clarke second, with $31,131, and Madison third, with $37,206.

Fergus County.

A company has been formed to work the Anderson mines at Maiden.

Jefferson County.

It is proposed to sink a 400-foot shaft on the Minnesota mine near Wickes. T. Mullvahill is interested.——The shaft on the K. & H. mine, near Corbin, is being continued 100 feet deeper.

Silver Bow County.

(Special Correspondence).—The Butte district in October produced 28,517,520 pounds of copper, worth, on a 16-cent market, $4,562,803.20. The by-products of gold and silver amount to 2½ cents for each pound of copper, a total of $712,938, or a grand total value of the copper, gold and silver products of $5,275,735.20. There was an increase of 1,547,520 pounds over the September copper production. The ore tonnage, the yield per ton and the total yield for the month is shown in the following table:

	Tons of Ore.	Pounds Per Ton.	Total Pounds.
*Boston & Montana Co.	79,980	71	5,678,580
*Anaconda	148,800	52	7,737,600
*Butte & Boston	20,150	68	1,370,200
*Parrot	16,120	67	1,080,040
*Washoe	24,800	72	1,785,600
*Trenton	18,600	65	1,209 000
North Butte	19,220	145	2,790 000
United Copper	46,500	65	3,022,500
Clark mines	38,750	68	2,635,000
Miscellaneous	18,600	65	1,209,000
Totals	431,520		28,517,520

*Amalgamated.

The total output of the amalgamated companies was 18,861,020 pounds, and the output of the Washoe smelter, which treats the ores of the Anaconda, Parrot, Washoe, Butte & Boston, Trenton and North Butte companies, was 15,972,400 pounds.——Boston & Montana lost about 10,000 tons in ore production during the month because the Great Northern Railroad Co. could not supply sufficient cars to transport the ore from Butte to the smelter at Great Falls.——The North Butte is still mining only very high-grade ore, owing to the expense and trouble of hoisting it through a neighboring shaft while its own shaft is being rebuilt. When the hoist is completed the grade of ore mined will be reduced, but the tonnage will be nearly doubled.——The new Pittsburg & Montana Co. has joined the regular producers and made its first shipment of copper a few days ago.——There was a material increase in the tonnage of the Anaconda, North Butte and United Copper. The miscellaneous list received increased contributions from the mines comprised within the options of the new East Butte Mining Co.

Butte, Nov. 13.

NEVADA.

Storey County.

Considerable assessment work is being done near the Comstock this year. There is a big force at work at the Sutro tunnel doing construction work, under the management of Leon N. Hall, general manager of the Sutro tunnel for the Comstock Pumping Association. Assessment work is being done at the Brunswick lode. Gold rock, averaging $3 a ton, is being taken out of the Alpha mine in Gold Hill, which is now under a lease to J. Dietrich.

Lincoln County.

A 10-stamp mill is to be put in at Ibis, on the Santa Fe Railroad, near Searchlight. It will treat ore hauled from the Chiquita mine, in the southern end of the Searchlight district. A 500-foot shaft has been started from the lower tunnel. If water can be developed at the mine, they expect to move the mill from Ibis to the mine.——A new pump will be put in the Pompeii shaft at Searchlight to handle the increased flow of water. Sinking has been stopped at a depth of 315 feet. F. J. Spare is superintendent.

The Nevada-Utah M. Co. of Pioche will increase its force and retimber the old Phœnix shaft. As soon as the shafts are in working shape a modern pumping plant will be put in and the mine developed.

Nye County.

The Beatty Bullfrog Miner estimates that 400 men are employed in Bullfrog district. Among those working are the Providence, Lucy Jack, Red Oak, Piute Con., Crystal, Guthrie, Dores-Montgomery, National Bank, Montgomery-Shoshone, I. X. L., Mike Ryan, Starlight, Mayflower, Steinway, Eclipse, Denver, Tramps, Bullfrog Mining Co., Original Bullfrog, Gold Bar, Bullfrog Annex, Ohio Bullfrog, Bullfrog Central, Sunset Bullfrog, Great Eastern, Peerless, Golden Scepter, Diamond Queen, Gold Center Mining Co., Pick Up, Gibraltar Mines Co., Paradise and Bullfrog Western. The deepest hole in the district is the shaft of the Amargosa Mining Co., near Bullfrog. It was sunk 330 feet in the wash, on the desert in the hope of striking the ledge which shows near Ladd mountain. They found neither bedrock nor water.

Washoe County.

The Miners' Union of Olinghouse has taken the first step toward the enforcement of its law, that no Chinese be allowed in the camp, by driving two Chinese from Olinghouse canyon.

OREGON.

Baker County.

The dumps of the Golconda mine, near Bourne, have been leased to F. Ferguson, who will build flumes through which the rock will be sluiced. The rich specimens will thus be separated from the refuse and then hauled to the Sumpter smelter for treatment.

Josephine County.

At the Greenback mine at Greenback, near Grants Pass, forty stamps are dropping. The concentrates are cyanided. The main shaft is down 1400 feet. Electric power has recently been put in. W. H. Brevort of New York City is owner.——Several placer mines are being worked along upper Grave creek, 12 or 15 miles above Grants Pass. The Blalock mine will be operated all winter, and several others will start up as soon as sufficient water can be obtained.——Preparations have been completed for work on the hydraulic ground of the Columbia Mines Co., on the east fork of Grave creek, 1 mile from Placer. C. E. Foss is superintendent. Some hydraulicking has already been done in cleaning bedrock that was stripped last winter and in cutting down a bank of red clay to the gravel level.

Superintendent L. B. Wickersham has the additional ten stamps for the Granite Hill mill, near Grants Pass, in place, making a total of twenty stamps. The American Gold Fields management, owning the mine, announces that twenty more stamps will be placed by May of next year. The double-compartment shaft opens the Granite Hill vein to a depth of 450 feet, and levels have been established on each 100-foot level. —— The Condor Co is stringing its wires into the Granite Hill camp, and the change from steam to electricity will be made before the new year.

UTAH.

Salt Lake County.

The Fortuna mill, at Bingham, is to be started on low-grade ore from the mine. Concentrators are to be added.

The Kempton mining case, involving the ownership of ores valued at $16,500,000 in Bingham, has been reopened. The circuit court of appeals some time ago dissolved the injunction secured by E. A. Wall and associates, and the United States Mining Co. resumed the work of extracting ore from the property. This injunction has been reinstated by Judge Marshall and the extraction of ore has been discontinued. The litigation was started by the United States Company by bringing a suit against L. M. Lawson et al. and the decision was for the defense. The company then appealed to the circuit court. It was then that Wall entered the suit, the territory in question being about the same, the issues of Wall, the Ivanhoe Mining Co., and L. M. Lawson were joined. An injunction was obtained restraining the United States company from taking out any ore. When the matter was finally decided by the circuit court an appeal was taken to the supreme court of the United States. The court was not in session. The justice before whom the matter was brought declined to hear the case, and the dissolution of the injunction followed. A petition was then filed in the supreme court requiring the circuit court to send up all papers concerning the case. This was granted on the ground that the decisions of the Utah supreme court, the court of appeals and the supreme court of the United States were at variance with the decision of the circuit court. The question of priority of rights in locations and patents is involved. The Kempton ground is held by a location younger than the one held by the United States Mining Co., though patented before that company got out a patent. The supreme court has held that the first patent holds. The Wall interests feel that they have won a victory by having the case reopened.

Summit County.

The water in the Ontario mine at Park City has been tapped and the mine drained through the tunnel. Development work is to be resumed.

Piute County.

The Annie Laurie mill at Kimberley has been remodeled and its capacity increased to 300 tons per day. The lowest tunnel, in 4000 feet, has cut a good vein. The chute system of handling the ores has been changed to a skip system.

WASHINGTON.

Okanogan County.

P. S. Harris is working the California claims on Mount Ellemeham, near Loomis, for Drumheller & Voorhees of Spokane.

Stevens County.

T. F. Hertzell, general manager of the Enterprise mine, near Chewelah, says that on the Copper King mine a large body of ore has been opened up by tunnel at a depth of 300 feet. The Jay Gould property, 3 miles east of Chewelah, has rich silver-lead ore. The main shaft is 150 feet deep. On the Nellie S., 2 miles from Chewelah, the main shaft is 250 feet deep. The old Eagle mine is being pumped out. On the Enterprise property good results are coming from the 100-foot level.

SOUTH DAKOTA.

Pennington County.

The Blue Lead mine, near Sheridan, is being opened up by John Harnan, who is sinking a shaft to connect with a crosscut tunnel at a depth of 600 feet.——The Dakota-Calumet and the Custer Peak companies have done some work in the same district.

FOREIGN.

AFRICA.

Transvaal.

There were 425,000 ounces of fine gold output from the Transvaal mines during October, a total of 4,032,621 ounces fine gold for the first ten months of 1905.

AUSTRALIA.

Queensland.

According to the Queensland Mining Journal, the yield of gold in Queensland for September was 46,700 ounces fine, as against 52,005 ounces for September of last year, or a decrease of 5305 ounces. The falling off is spread over all the principal fields except Ravenswood, where the yield was 3817 ounces, or 849 ounces more than for the corresponding month last year. The principal decreases, however, were at Charters Towers. At Mount Morgan the falling off was 200 ounces, but the quantity of quartz operated on was larger, there having been a decrease in the value of stone treated of 1s. per ton. Charters Towers, Gympie and Croydon were also worse off in this respect than in September last year; but at Ravenswood, not only was there an improved yield, but the value of the stone treated increased from £4 15s. 11d. per ton in September of 1904 to £6 15s. 5d. per ton last month. The yield of gold for the nine months of 1905 that have elapsed was 436,286 ounces fine, as against 466,394 ounces for the corresponding month of last year, or a decrease of 30,008 ounces. The dividends for the month totaled £51,409.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Work has been resumed on the Big Four group, near Eholt. James Moran is in charge.——On account of the difficulty of packing in supplies to Franklin camp, the McKinley mine will not be operated all winter, but work will be resumed again in the spring.——The Napoleon mine, near Marcus, is being worked under Harry Johns for the British Columbia Copper Co.

The Dominion Copper Co. is shipping ore from the Brooklyn, Rawhide and Stemwinder mines. The new compressor for the Rawhide has been shipped by the manufacturers.——The Oro Denoro mine, in Summit, is to be worked under the direction of R. H. Anderson. The lower ore quarry is to be opened up and ore shipments will be made over the Great Northern.

Cassiar District.

The British America Dredging Co., operating on Spruce and Gold Run, Atlin, during the past summer built 9 miles of transmission line from the central hydro-electric power plant on Pine creek to Spruce creek where, at Blue canyon, the company built a dredge with a capacity of 3500 cubic yards of gravel daily. This dredge has a digging range of 40 feet. It was started on September 10 and run until the close down for the season.

Slocan District.

No work is being done on the Fisher Maiden group, near Silverton, and it is reported that the owners will not lease it. Many other nearby properties are being worked by leasers at a profit. The lessees at the Flint have made their first ore shipment; the Enterprise on Ten Mile creek is being worked; as is also the Wakefield on Four Mile, which is under lease to Wm. Hunter. The Noonday, 1½ mile southeast of Silverton, has started up again under lease to Mr. Crow of Slocan City.

Vancouver Island.

(Special Correspondence).—The Tyee Copper Co.'s smelter at Duncans Station ran sixteen days during October and smelted 2975 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $51,237.

Duncans Station, Nov. 11.

The Britannia Smelting Co.'s works at Crofton were built primarily to reduce ore from the Lenora mine at Mount Sicker, which is connected with the smelter by 8½ miles of railway, but now the Britannia mines on Howe sound on the mainland coast, 60 miles by water from the smelter, and also the mines of southeast Alaska are expected to be the chief sources. Elaborate arrangements have been made to receive the ore from vessels. The equipment includes a sampling mill, briquetting plant, roasting yard and smelter buildings. The 42x160 water-jacketted stack has a capacity of 350 tons, the Garretson furnace 200 tons, and the cupola for remelting matte, 65 tons. Hand-charging is used and the slag is granulated. The converter plant has four shells of the trough type. Thos. Kiddie is manager, H. C. Bellinger consulting engineer, and L. E. Gooding assayer and chemist.

The main shaft of the Tyee mine at Mount Sicker is nearly 1000 feet deep.

MEXICO.

Jalisco.

The Guadalajara smelter has been taken over by the Fundicion Metalurgica de Guadalajara, S. A. Diego Moreno, president of the Bank of Jalisco, is president and Jose S. Diaz, general manager. It is expected to begin smelting operations within two months. The Guadalajara plant now consists of a single lead furnace. The new company plans building a copper furnace. The small copper smelter at Etzatlan, which was recently taken over by the Etzatlan Copper Smelting Company, has been blown in.

Sonora.

R. K. Clancey, of the Oro Maximo mine, near Bacoachic, states that work on that property is progressing satisfactorily. They are working 120 men, and have sunk two shafts, one of two compartments, to a depth of 100 feet, as far as they could go without machinery. They are running a tunnel on one of the veins.

SIBERIA.

A recent consular report says that very little progress has been made in the Siberian mining industry, the most antiquated methods being in general use. The application of machinery or chemical processes is very rarely found. Mining machinery and appurtenances, properly introduced, will eventually meet with a big demand. Engines, pumps, boilers, cables and belts are the things most needed. Agents of concerns manufacturing these should visit Tomsk, Krasnojarsk and Irkutsk, the centers of this trade, and make enquiries as to necessities, customs and financial conditions of the market. Competition in all these products is sharp, the dealers naturally buying where the best terms can be secured. A large number of the dredges now in use were shipped from Great Britain. In Krasnojarsk agents of a British factory are competing with those of the Putiloff works in St. Petersburg. The chief local competitors are two Russian concerns, which, however, buy the principal parts from foreign countries. There is a demand for cables of medium weight. One firm running a large English commission house can handle cables of ¼, ½, ⅝ and ¾ inch in diameter. Sheet iron, used chiefly in eastern Siberia, is supplied by English concerns.

Personal.

W. A. PRICHARD is at Mexico City.

JAMES DOUGLAS is at Globe, Arizona.

H. H. MILLER, of New York, is now at Mexico City.

JOHN A. CHURCH passed through El Paso on November 7.

FRANK FOURNIER has returned to El Oro, Mexico, from Paris.

C. C. BURGER, of New York, is inspecting mines at Clifton, Ariz.

L. L. HUBBARD, of Houghton, Michigan, is visiting Tonopah, Nevada.

WM. M. BREWER has returned from California to Vancouver, B. C.

J. H. CURLE has been visiting Tonopah, Nev., and is now at New York.

A. L. GRANT has charge Grouse Mountain properties, near Grants Pass, Or.

CHAS. FIEHI has been appointed manager Virgilia G. M. Co. at Eldora, Colo.

THOS. CARLYON is now head mining captain at the Arcadian, Houghton, Mich.

W. M. THOMPSON is general manager Rosario y Anexas M. Co. at Elta, Oaxaca, Mex.

JAS. W. MALCOLMSON has returned to El Paso from a trip in western Chihuahua.

W. H. KINNON, Denver, Colo., is in Tucson, Arizona, where he will probably locate.

W. E. SHARPLES has resigned his position with the Power & Mining Machinery Co.

W. A. KIDNEY has been made general superintendent Heinze interests at Butte, Mont.

JOHN BOYLE has been appointed general manager Oro Plata mine, near Kingman, Ariz.

F. J. SEIBEL is superintendent Burlington mine, near Sutter Creek, Amador county, Cal.

GEO. MILLER has been appointed superintendent Sunnyside M. Co. at Twin Lakes, Colo.

C. T. PETERSON is manager Nighthawk M. Co. at Nighthawk, Okanogan county, Wash.

W. H. FROST succeeds E. W. Guthrie as president Western Gas Engine Co., Los Angeles, Cal.

D. G. DAVIES, superintendent Carnegie-Montana M. Co., Sheridan, Montana, is in Pittsburg, Pa.

C. J. BANDMANN of San Francisco has charge of mines of Magdalena M. Co., near Llano, Sonora, Mexico.

B. H. BENNETTS has been appointed superintendent American Smelting & Refining Co.'s smelter at Garfield, Utah.

N. H. EMMONS has been appointed mining engineer for the Old Dominion Copper M. & S. Co., at Globe, Ariz.

R. S. SHAINWALD, secretary The Paraffine Paint Co., San Francisco, Cal., was in Denver, Colo., last week on his way East.

W. C. HAMMATT has been reappointed assistant superintendent Iron Mountain mine of Mountain Copper Co., near Redding, Cal.

F. M. SIMPSON is in charge of a cyanide works at Zacuma, Ecuador, South America, for the South American Development Co.

R. P. KIRK has resigned as superintendent Big Bend Cinnabar M. Co., at Big Bend, Texas, to resume consulting work at El Paso.

GEO. W. MEYERS, representing Chrome Steel on the Pacific coast, who is at present in Australia, expects to return to San Francisco, Cal., by January 1st.

JAS. C. H. FERGUSON, Pacific coast representative Midvale Steel Co. at Philadelphia, has gone to El Paso to attend the session of the American Mining Congress.

G. E. SCHROEDER has been selected as successor to A. C. Beatty, who recently resigned as consulting engineer Stratton's Independence mine, at Cripple Creek, Colo.

N. D. PHELPS has been appointed sales manager mining, crushing and cement machinery department Power & Mining Machinery Co., to succeed T. H. Tracy, who has resigned.

H. W. TURNER, E. M., superintendent of mines for the Ladd Metals Co., of Portland, Or., left San Francisco, Cal., for Portland on the 15th inst. He contemplates an early trip to southeastern Alaska.

F. M. ESTES, JR., has been appointed chief engineer Camp Bird, Ltd., at Ouray, Colo., succeeding W. F. Harris, who has gone to Nicaragua to become general manager Leonesa M. Co., Matagalpa, Nicaragua.

C. M. BECKER, general manager Stratton's Independence mine at Cripple Creek, Colo., has returned from London, where he spent two months with the officers of the Venture Corporation, owners of the mine.

A. P. PECK has joined the Allis-Chalmers Co. and will hereafter be connected with the New York office of that company. He will travel throughout the New York district, giving attention particularly to the sale of power and electrical machinery.

THE following left Denver, Colo., Nov. 12 for the American Mining Congress at El Paso, Texas: E. M. De Lavergne, general manager Elkton Con. G. M. Co., F. C. Costello and Geo. L. Keener, Colorado Springs, Colo.; V. C. Alderson, president School of Mines, Golden, Colo.; J. G. May, E. L. White, Commissioner of Mines, and G. W. Schneider, assistant Commissioner of Mines, Denver, Colo.; Chas. Himrod, Boise, Idaho, and A. H. Roller, manager Shafter M. Co., Idaho Springs, Colo.

Books Received.

The United States Geological Survey has issued, as Water Supply and Irrigation Paper No. 140, "Field Measurements of the Rate of Movement of Underground Waters," by C. S. Slichter, and, as No. 152, "Review of Laws Forbidding Pollution of Inland Waters in the United States," by E. B. Goodell.

"The Production of Petroleum in 1904," by F. H. Oliphant, forms an extract from "Mineral Resources of the United States," as published by the U. S. Geological Survey. This is a comprehensive and detailed analysis of the world's petroleum production and contains considerable information regarding the productive fields and regarding the uses of oil.

The Mines Branch of the Department of the Interior of the Dominion Government at Ottawa, Canada, has issued two valuable monographs by Fritz Cirkel. The first deals with "Mica, its Occurrence, Exploitation and Uses," the second with "Asbestos, Its Occurrence, Exploitation and Uses." In the former the author presents an exhaustive discussion on the physical and chemical properties and geographical distribution of the micas, specifically in Quebec and Ontario, but devoting considerable space to foreign occurrences. He then describes the mining and preparation of mica for commercial purposes, comparing different methods. In the latter he discusses the location and geology of Canadian asbestos deposits, the mining and separation, foreign occurrences and the practical applications. Each is evidently the result of considerable research in the Canadian field and is valuable as an intelligent portrayal of present conditions there. Foreign deposits are described apparently from the works that have already been published and which since have been antiquated by recent developments. The chapters on geological occurrence and economical working are excellent.

"The Proceedings of the Chemical, Metallurgical and Mining Society of South Africa, May, 1902–June, 1903," Vol. III, published by the society at Johannesburg, Transvaal. In this volume there conveniently are assembled the papers read at the monthly meetings, with complete discussion on each. These are: "Notes on the Analysis of Cyanide Solutions," by A. F. Crosse; "Treatment of Slimes by Filter Presses," by C. Dixon; "Smelting and Refining Zinc-Gold Slimes," by E. H. Johnson and W. A. Caldecott; "Improvement in Extractor Boxes," by S. B. Hutt; "Improved Wash Bottle," by E. H. Weiskopf; "Residual Products of the Dynamite Factory and Their Value to the Gold Industry," by W. Cullen; "The Thermo-Hyperphoric Process," by A. T. Firth; "Notes on Valuing a Gold Mine," by T. L. Carter; "Lead Smelting of Zinc Gold Slimes," by P. S. Tavener; "Mine Sampling of the Main Reef Series," by D. J. Williams; "Use of Petroleum Oil Gas as Applied to Smelting, Laboratory and Drill Heating Furnaces," by David Laird; "Theory of Misfires," by E. H. Weiskopf; "Notes on Commercial Cyanide of Potash," by A. Whitby; "Miners' Phthisis," by W. Cullen; "Regeneration of Working Cyanide Solutions Where Zinc Precipitation Is Used," by A. F. Crosse; "Quartz Milling on the Rand," by Fraser Alexander; "Extraction of Gold from Cyanide House Slimes," by John Fleming; "Automatic Sampler," by C. H. Pead; "Refining of Lead Bullion," by F. L. Piddington; "Remarks on Banket Formation," by A. R. Sawyer.

Obituary.

H. I. HIGGINS, a well-known Colorado mining man and former manager American Smelting Co., died in Denver, Colo., on the 10th inst.

P. P. BUSH, an old and honored business man of Denver, Colo., died at his residence in that city on the 10th inst. His was a genial, kindly nature and he will long be held in cordial remembrance by those who knew him.

BEAUCHAMP H. SMITH, second vice-president of the S. Morgan Smith Co. of York, Penn., died in his home in Los Angeles on November 1st, at the age of 36 years. Mr. Smith went to Los Angeles about five years ago for the benefit of his health, since which time he has resided there, and hopes of a complete recovery were entertained.

Trade Treatises.

Bulletin No. 61 of the Crocker-Wheeler Co., Ampere, N. J., details the construction and use of large sizes of their Belt-Type D. C. machines.

"Water-Wheel Type Alternating Current Generators" are pictured and described in all details of construction in Bulletin 360 of the National Electric Co. of Milwaukee, Wis.

The new catalogue of Wm. Jessop & Sons, Ltd., 91 John St., New York City, gives many practical points regarding the use of their high-grade tool steel, of value to steel users.

A finely arranged array of testimonials and references, illustrated by portrayal of some of their telephones, is received from the Stromberg-Carlson Telephone Mfg. Co., Chicago, Ill.

The Ingersoll-Sergeant Drill Co., 11 Broadway, New York City, show the varied uses to which their stone channelers are put in catalogue No. 60. The details of construction of different types are illustrated and described, and their operation is portrayed under various conditions.

From the department of publicity of the Allis-Chalmers Co. are received: Catalogue No. 127, sampling plants and equipment; bulletin 1405, portable rock crushing plants; bulletin 1406, forged steel balls; and bulletin 1407, Bennett's pouring spoon, all of which are replete with practical and accurate data of special interest to all users of those devices, and prepared in a most attractive and interesting manner.

"Gold and Silver Milling," catalogue No. 5 of the Power & Mining Machinery Co. of Cudahy, Wis., presents pictures and descriptions of the various machines used in the treatment of gold and silver ores. It is of value to anyone intending mill construction. Accompanying bulletins give more detailed treatment to certain auxiliary apparatus. No. 25 describes the Niedermeyer jig, which treats unclassified ore and has a great stated capacity. Improved Huntington mills and crushing rolls are represented in Nos. 27 and 28.

Commercial Paragraphs.

A GOLD MEDAL has been awarded to the exhibit of the Department of Pharmacy of the University of California by the Lewis & Clark Exposition at Portland. This exhibit as prepared under the direction of Prof. F. T. Green was described in a recent issue of this journal.

AT a meeting of the directors of the Taylor Iron & Steel Co., held in New York City, Oct. 31, 1905, several changes were made among the executive officers of the company. L. H. Taylor resigned as president, and was succeeded by R. E. Jennings of Jersey City, N. J., who has been vice-president of the company since it was organized in 1891. P. Chrystie was elected vice-president to succeed Mr. Jennings. Knox Taylor was elected general manager. The officers at present are as follows: President, R. E. Jennings; vice-presidents, P. Chrystie and H. M. Howe; secretary and treasurer, T. F. Budlong; general manager, Knox Taylor.

THOSE in charge of smelting plants recognize the importance of giving personal attention to small details in the purchase of supplies. Regarding an item like Stephenson bar belt dressing which is made by the Stephenson Mfg. Co., of Albany, N. Y., E. A. Kellogg, treasurer of the company, reports that their volume of business is steadily increasing despite the fact that they have no personal representative in the field. They make their appeal for the patronage of belt users in asking permission to send a free sample of their product by mail to anyone interested. And they do this immediately upon receipt of a 2-cent stamp. They assert that "Stephenson" stands for quality, economy and efficiency, and that those who bought it 18 years ago still use it—and on the same old belts.

AT a meeting and banquet of the Technical Publicity Association held at the Aldine Club, New York, November 3, the following officers were elected: President, C. B. Morse, Ingersoll-Rand Drill Co.; 1st vice-president, H. M. Cleaver, Niles-Bement-Pond Co.; 2d vice-president, Frank H. Gale, General Electric Co.; secretary, Rodman Gilder, Crocker-Wheeler Co.; treasurer, H. M. Davis, Sprague Electric Co.; members of executive committee, Graham Smith, Westinghouse Companies and Chas. M. Manfred, Johns-Manville Co. Mr. H. M. Davis addressed the Association on "The Advertising Appropriation." An informal discussion followed, in which the members exchanged views on the disposition of advertising appropriations, the relative amount that should be spent in magazine and circular advertising, the relation between the advertising appropriation and the volume of business, etc.

THE De La Vergne Machine Co., of New York, which has recently completed its contract for 40,000 H. P. of Koerting two-cycle double-acting gas engines, of which 32,000 H. P. is employed for driving blowing engines and 8000 H. P. for driving direct current and polyphase alternating current generators, have recently been given a contract for three 500 H. P. Koerting gas engines to be direct connected to 325 K. W. 550-volt direct current Crocker-Wheeler generators for the Boston Elevated Co. These engines will be put in operation about January 1, 1906. The company has established a branch agency at Atlanta, Ga., to cover North Carolina, South Carolina, Alabama, Florida and Georgia. This agency will handle business connected with the three lines of machinery manufactured by the De La Vergne Machine Co., viz., refrigerators and ice making machinery, Hornsby-Akroyd oil engines and Koerting gas engines. Their representative will be Mr. W. M. Hargreaves; the office will be at 510 Candler Building.

Latest Market Reports.

SAN FRANCISCO, November 17, 1905.

METALS

SILVER. — Per oz., Troy: London, 29¼d (standard ounce, 925 fine); New York, bar silver, 63½c, refined (1000 fine); San Francisco, 63½c; Mexican dollars, 51c, San Francisco; 48¾c, New York.

The price of silver quoted to-day is still higher than last week—63¼ cents. The direct cause of this continued increase in price is not apparent.

COPPER.—New York: Standard, $16.35@; Lake, $16.50 @ 17.00; Electrolytic, $16.75; Casting, $16.25 @ 16.50. San Francisco: $16.75. Mill copper plates, $18.00; bars, 18@24c. London: £75 5s spot per ton.

Copper shows another movement upward this week, the price once more touching 17 cents. It is said that most of the large consumers have placed their orders, and that the price is unlikely to take another advance at once, and even may fall off a fraction. Production and consumption of the metal at the present time are remarkably even.

LEAD.—New York, $5.55; St. Louis, $5.15; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £15 6s 3d ℔ long ton.

SPELTER.—New York, $5.55; St. Louis, $6.00; London, £28 10s ℔ ton; San Francisco, ton lots, 7c: 100-lb lots, 7¾c.

TIN.—New York, pig, $33.15@33.40; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔ lb., 40c. London, £152 2s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots, 19.15c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17.35; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@ 25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11½c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12½c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50: Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2¼@2½c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¼@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

OILS.—Linseed, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency the following are worthy of special mention:

VEHICLE WHEEL BEARING.—No. 803,849. Nov. 7, 1905. H. C. Peterson, San Francisco, Cal. The object of this invention is to provide an anti-frictional bearing for wheels in which the parts of the bearing are attached to ends of the wheel hub without any interior box, and they are especially useful for converting old wheels. The invention consists in a ball-bearing for vehicle wheels, collars having annular channels in their inner ends, and concave interior ball-bearing cups, bands upon the wheel hub, to which said ball cups are fixed, an axle spindle extending through the hub, having a nut at its outer end and a collar on its inner end, ball-bearing cones fixed to the nut and to the collar, respectively, and dust-including disks inclosing the collar and bearings, said disks having lugs by which they are secured to the wheel hub.

CONVEYING APPARATUS.—No. 803,944. Nov. 7, 1905. T. Wallace and F. Nash, San Francisco, Cal. The particular object of this invention is to provide a simple, practical means for the expeditious loading of vessels with such goods as flour, grain, rice, and the like, which goods are usually put up in sacks or bags and, being soft, can be tumbled about more or less without injury. The device comprises an inclosed chute, having means at its upper end for suspending it, and provided with a series of inside oppositely disposed inclined arresters, said chute having a feed opening at the top and discharge openings at one side opposite the corresponding arresters, hinged closures for said discharge openings, and a deflector fitting one of said openings and arranged to be held in continuation with the corresponding arrester.

GOLD SAVING APPARATUS.—No. 803,868. Nov. 7, 1905. W. D. Baney, Tonopah, Nev. The chief object of this invention is to provide a convenient, simple, practical amalgamating machine and washer of large capacity for use particularly in localities where water is scarce. It consists in a gold saving apparatus, the combination of a tank, a horizontally disposed amalgam cylinder supported to rotate in said tank and having ingress and egress openings at opp site ends, a cylindrical agitator extending through the cylinder and supported to rotate independently thereof, a screw conveyor operating in the agitator and means for rotating the cylinder, the agitator and the conveyor. There are other details of construction arranged and combined to bring about the desired result.

QUICKSILVER TRAP. — No. 803,934. Nov. 7, 1905. P. Somerville, Bishop, Cal. The invention relates to a trap which is designed to separate quicksilver from slimes, tailings, and other material with which it may be associated, and to allow worthless material to pass off while the quicksilver is diverted and saved. The device comprises a pair of amalgamating and vertically disposed plates and an intermediate iron plate with insulating supports and gaskets to form joints at the bottom of the amalgamated plates, and a yoke having shoulders by which the lower edges of the plates are forced into close contact with the gaskets, pivots about which the yokes are turnable and screws bearing upon the pivots whereby the yokes may be adjusted to regulate the pressure upon the gaskets.

SUBMARINE BOAT.—No. 803,885. Nov. 7, 1905. H. O. Eiane, of the United States Navy. This invention relates to improvements in submarine vessels or those capable of traveling at will either beneath or on the surface of the water. The main objects are to provide a vessel or boat of this character which will be capable of a wide range of action, being quickly turned about in either direction and easily and quickly raised or lowered, which will necessitate a minimum intake of water for purposes of submergence, which will enable the replenishment of the air supply from the surface when submerged, and which will have a novel form of closure for the torpedo tubes.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING OCTOBER 31, 1905.

803,084.—ADVERTISING DEVICE.—M. S. Alexander, Los Angeles, Cal.
803,150.—WAVE MOTOR—W. P. Clinton, Point Richmond, Cal.
803,400.—CABINET—G. F. Conley, Joseph, Or.
803,402.—CONVEYOR—T. Cox, Portland, Or.
803,405.—VENDING MACHINE—Davis & Swetland, Portland, Or.
803,238.—CAR COUPLING—G. C. Harlin, Seattle, Wash.
803,484.—SINKING WELLS—Hickox & Killefer, Los Angeles, Cal.
803,485.—TABLE AND DESK—E. Higgins, Soldiers' Home, Cal.
803,287.—LEVEL—J. Hodgson. Thornton, Wash.
803,230.—SPACING DEVICE—F. F. Hough. Seattle, Wash.
803,231.—PIPE WRENCH—E. Huntley, Seattle, Wash.
803,167.—FRUIT PICKER—C. B. Hyson, Everett, Wash.
803,232.—CORRUGATING PIPE—Isaacs & Speed, Oakland, Cal.
803,114.—BOTTLE SEAL—G. Knutzen, Berkeley, Cal.
803,182.—LUBRICATOR—L. B. Manes, Elsinore, Cal.
803,535.—GARMENT SUPPORTER—Mensor, Greenblatt & Pelta, Seattle, Wash.
803,432.—SAW SET—J. C. Reckweg, Los Angeles, Cal.
803,367.—CUSHION TIRE—W. J. & C. G. Shaw, Los Angeles, Cal.
803,369.—MORTISING MACHINE—C. J. Stafford, Bakersfield, Cal.
803,376.—WEIGHING MACHINE—F. F. Wear, San Francisco.
803,382.—SWITCH TONGUE—J. C. Wilson, Nespelem, Wash.
803,384.—DRUM CORD BRACE—D. M. Wright, San Francisco.
37,600.—DESIGN—S. T. Stuver, Bellingham, Wash.
37,601.—DESIGN—S. T. Stuver, Bellingham, Wash.

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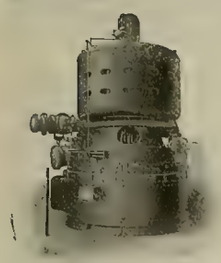

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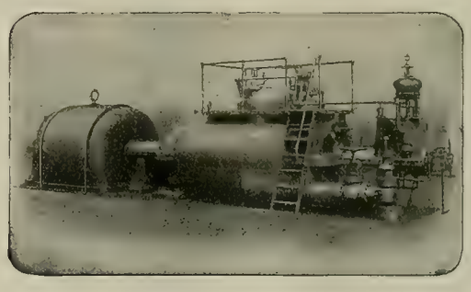

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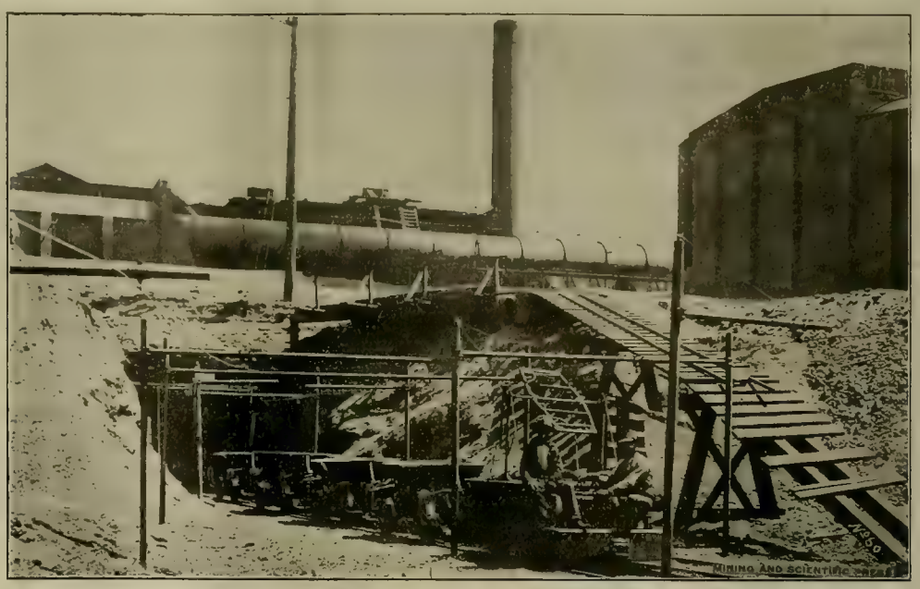
MINING AND SCIENTIFIC PRESS

Whole No. 2366.— VOLUME XCI. Number 22. SAN FRANCISCO, CAL., SATURDAY, NOVEMBER 25, 1905. THREE DOLLARS PER ANNUM Single Copies, Ten Cents.

Mine Capitalization.

In the incorporation of new mining companies it is often a question with those most interested what figure to set upon the property, or, in other words, for what amount to incorporate. A glance at the list of capitalizations of mining companies finds them to run from a few thousands of dollars into many millions. It is not always the large and rich, productive mine that has the largest capitalization. There are many mines which have never paid a dividend, and which, in all probability, never will, which have a capitalization of $5,000,000 to $10,000,000, and even more; while, on the other hand, some of the most profitable mines have a relatively small capitalization. Of this class the Calumet & Hecla mine at Houghton, Mich., affords the most striking example and represents an extreme case. The property is capitalized at $2,500,000 and has paid over $85,000,000 in dividends. The Homestake Co. was originally capitalized at $10,000,000, which was increased to $12,500,000 upon adding other property to its holdings, and then to $21,000,000, and later, as additional property was acquired, the capitalization was again increased until it has reached the sum of $21,840,000. The consolidated property has paid over $18,000,000 in dividends, and indications are it will pay many millions more. As there appears to be no direct ratio between capitalization and dividend-paying capacity, as demonstrated by developed and operating mines, it must then be considered a matter of expediency what capitalization to place upon an undeveloped mining property. In manufacturing, the capital is usually determined by the interested capital; but in mining this cannot be similarly employed with equal advantage, for the reason that a rich mine may be profitably worked with a plant costing but a small portion of its annual output, while a large and expensive equipment on a low-grade mine may produce only limited results. Generally it may be considered good business to place the capitalization at as low a figure as is commensurate with the dignity of the company and its probable capacity to pay dividends. To place the capital stock at too low a figure suggests to some the probability that the proposition has only fair or uncertain merit, and that it is in the category of small affairs, while an excessive capitalization may give it the appearance of being unsound and an unsafe investment. After all, the capital stock does not furnish a fair index of the value of the mine nor of its earning capacity. The average new mining corporation may capitalize at any reasonable figure, but the price at which the public is asked to subscribe for the stock is a matter requiring much more careful consideration. It should be shown by the promoters of the enterprise that the proposition is reasonably worth development; that it has the elements of success if these be properly handled, and that the amount of money asked for it is not in excess of its needs.



Electric Haulage at Cananea, Mex. (See Page 359.)

MINING at the Mount Morgan mine in Queensland, Australia, has seen many changes in methods since the discovery of the property. At first it was assumed that it was a superficial deposit — a sort of siliceous sinter deposited from hot springs. In accordance with this view the mine was worked superficially. Later it was found that the ore deposits were due to other causes and extended downward, and extensive underground workings were opened in the great deposit. Now, after twenty-five years of steady operation, it is found that it is more economical to work the deposit by benching in open cuts, employing steam shovels in handling the broken material. In this work the large timbered underground workings are laid bare, and much of the timber is recovered for use in the lowest workings of the mine in the sulphide zone. As this work of benching progresses downward it has been found that the waste overlying portions of the ore body is becoming troublesome and must be removed to prevent collapse into the open pits, which are constantly growing deeper as the work proceeds. This great open cut is now approaching in depth the deepest of the diamond pits at Kimberly in South Africa, as they were formerly worked. The waste from the surface will now be sent into the lowest levels for filling the stopes. What further change will take place in the working methods, the ore, and the metallurgy of this great mine, time alone can tell.

Smelter of the Cananea Copper Co., Cananea, Mex. (See Page 359.)

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SOME base metal mines are quite as satisfactory to own as gold or silver mines. The Bunker Hill & Sullivan lead-silver mine has gradually increased its output until it is now enabled to pay a monthly dividend of $180,000. Some of the larger copper mines of the United States are more profitable than most of the gold mines, while in Missouri large profits are derived from zinc and lead deposits lying close to the surface and in which only comparatively limited capital is invested.

IT is in the discussion of the papers of technical societies that the greatest value of these contributions lies. A critical analysis of statements contained in technical papers must lead to fuller knowledge of the subject discussed. By criticism of this kind, which need not be either sarcastic or cynical, but earnest and fair, the facts are brought forth. The discussion may not dispute a single statement of the original paper, but may possibly add much of value to it. On many important matters in the mining business there is diversity of opinion. There are always old questions to be revived and new ones to be considered. What important question, as an example, has more theory wasted on it that the genesis of ore deposits. There have always been contradictory opinions on this subject and there probably always will be. With all the light which recent research and voluminous literature has thrown on this matter the theorists still contend with each other, and few are fully satisfied, even with their own theory. If all of the statements made by those contributing technical papers to scientific and technical societies are to be accepted without analysis, the records of such societies would soon be found teeming with misstatements due to various kinds of errors. These the discussions have a tendency to correct, and to the facts are added new facts and additional information until, as a result, there issues a treatise which may be considered as embodying all that is known of the subject in question at the time.

The Equipment of Small Mills.

When large mining enterprises are contemplated, and there is abundant money available to equip the property on a large scale, there is usually little difficulty in arranging matters so that "ends meet." With the small concern, however, where available capital is limited, and the contemplated equipment, although not extensive, is nevertheless as important to the success of the enterprise as that of the large concern, and frequently more so, there is room for the exercise of care and good judgment. This is a matter requiring experience. Ordinarily, the first thing to be considered is power. In many places there is a variety of methods of obtaining power available—steam generated by wood, coal or oil; water power direct; electric power generated by water, or by steam, and transmitted to the plant. This may be either a private enterprise of the mine or it may be bought from a distributing company. There are also gas engines of the various makes, and using gasoline or distillate, etc. That means of securing power which is most convenient and least expensive is usually selected.

Having decided what kind of power to install, the question arises how much power shall be provided. The requirements of each power-consuming department must be carefully considered, and when the total amount needed has been figured, care being taken not to underestimate, it is well to add at least 25% for losses, and possible required extension of plant. This latter contingency is of such uncertain character that really little consideration can be safely given to it in the figuring. It is not good business to equip a new mine with heavy and expensive machinery far in excess of its requirements for probably several years. An experienced superintendent will not purchase and set up a hoisting plant capable of lifting 5 or 6 tons from a depth of 2000 feet in one minute for the purpose of sinking a shaft from the surface, nor will he order a mill of 500 tons or more daily capacity when he has not enough ore in sight to supply 10 stamps. If mistakes are made about large plants they can usually be discovered and corrected before serious damage results, but with the small mine, a mistake of this kind will frequently result in disaster, as funds are exhausted by extravagant and unnecessary equipment, and no results beneficial to the concern accomplished.

In some districts there are numerous small mines, no one of which will justify a milling plant, because of the limited amount of ore available, and yet the ore is sufficiently rich to pay a profit even if treated in a custom mill. In such districts as this the owner of the custom mill will usually make a much higher charge per ton than the cost of milling; the money which this difference between mill charge and actual cost of milling represents would build a mill in a short time. Obviously it would be good business, then, for the several mine owners to form an association for the purpose of building a mill in which the ores from the several mines represented could be treated at cost. This would be an advantage to every mine owner concerned, and incidentally to every mine in the camp, as custom rates could be charged those mines not represented in the association.

In the same way a power-distributing company might be organized to supply power to each of several companies interested in the enterprise, thereby effecting a great saving to all concerned, both in first cost and in future operating expense. There is a decided disposition among mine owners to stand alone on individual merit, independent of others, but co-operation has in this matter many advantages, as it has in other things, and where the several owners of a number of small mines associate themselves for the common good of all an advantage must accrue to each of those interested.

THE proposition of the Alaska convention held in Seattle, Wash., suggesting that Congress pass a law restricting the number of 20-acre placer claims any one person may locate to two on any creek or tributary in that Territory, is intended to put a stop to location by agent and to wholesale location by individuals in their own interest. Such a law would probably be unconstitutional, and it is unlikely that such will be enacted. The further suggestion that each locator pay a license of $250 cash, in lieu of $100 worth of assessment work, will probably fail of accomplishing the desired result, as only a few of the prospectors in the far North can afford to pay so large a sum in cash, while the performance of $100 in work requires mostly time and small cash outlay. These efforts, while well intended and seeking to meet requirements of existing situation, seem to have been, unfortunately, misdirected. What Alaska needs is a law requiring a stated amount of assessment work within specified and limited time—say, ninety days—and then the rigid enforcement of the law.

The Metal Market.

The producers of metals, both precious and base, must certainly feel great satisfaction at the present state of the market. Without exception, metals are in demand and consequently high priced. Gold, always in demand, is the standard of values, compared with which all other metals are considered as high or low. For several weeks past silver has been gradually going higher and higher. July 1st last, silver was quoted in the New York market at 58⅝ cents. By the middle of August it had risen to 59⅝ cents, and by September had advanced to 62¼ cents. Since that time the advance, though slow, has been continuous nevertheless, until the present price of 64⅝ cents has been reached. This is a peculiar, though gratifying, condition to the miners of silver, and in many instances means just that much more profit per ounce. Where there has been no profit, it means a reduction in the cost of production in ratio to the raise in price. Silver currency of the Philippines and other countries, where the ratio of 32 to 1 was assumed a safe relationship to establish, is now in demand for melting into bar silver, for the reason that the silver dollar of those countries is, at the present price of the metal, worth more as bullion than as coin, and the laborious and carefully considered efforts of the International Exchange Commission, which adopted this ratio of gold to silver, now fail. What the future has in store for silver will be awaited with interest, particularly by the producers of that metal.

Copper is now higher than in some years past, the latest quotations being $17.25 in New York. While it may be difficult to actually obtain this price in the open market for a quantity of copper, it is the figure which affords the basis for transactions in that metal.

Tin is also high, the price now having reached $33.60, with a firm market, which indicates that there is no immediate likelihood of production exceeding the demand, with consequent drop in market price.

Lead and zinc continue to bring good prices, lead being quoted at $5.25 to $5.70 and zinc at $6.10 to $6.20 in New York.

The steady and apparently increasing demand for all of these metals indicates the prosperous condition of the industries of the country, and there is at present no sign that there will be any material decline in the prices of any of the metals above quoted; in view of which miners may look forward to a continuation of the present prosperous conditions far into the coming year.

THE American Mining Congress concluded its session at El Paso, Texas, November 18, and some of the papers read during the meeting will be found continued elsewhere herein from last week. This week the California Miners' Association is in session at Nevada City, Cal., being the first time in its history, since its organization at Auburn, Placer county, that the Association has met outside of the city of San Francisco. A number of interesting and practical papers were also read at this meeting.

IN mine sampling, in a crosscut where the ore body occurs as a zone of impregnation in schistose rock, it is manifestly not proper to take samples parallel with the schistose structure of the rock, as the values are likely to occur in streaks or in lenses. The sampling should be taken under such conditions by making continuous channels along the roof and sides of the crosscut and not at disconnected intervals as is ordinarily done when sampling along the strike of the vein.

CONCENTRATES.

In large streams a fall of 3 inches per mile will give a velocity of current of about 3 miles per hour, where the stream is straight.

The output of carborundum for 1904 is officially stated to have been over 7,000,000 pounds, an increase of 2,300,000 pounds over the production of 1903.

Why a mine owner should build a stamp mill to treat gold ore when no values can be saved in an arrastra is a question "Concentrates" is unable to answer.

Where boiler water contains a small percentage of salt (sodium chloride), it is good practice not to carry over 90 pounds pressure per square inch on the boiler.

A number of experiments made on radium-bearing minerals lead to the knowledge that the radium content of minerals bears a direct relation to the amount of uranium present.

The statutory limit of length of a quartz lode location is 1500 feet. The side lines need not be parallel, but may have angles and elbows, but the line must not exceed the statutory limit.

Cement tanks were substituted for lead-lined wooden vats at Mount Morgan mine, Queensland, Australia, several years ago. The change has been found economical and otherwise satisfactory.

When black powder is fired by electricity the electric exploders used are of low power, there being no advantage in using high power caps, as the black powder is fired by the spark, and not by detonation.

Miners' wages in the Black Hills of South Dakota are $3.50 to $4 per shift of eight hours, helpers $3 to $3.50. This is in Lawrence county, but in some of the mines of the southern Hills the regular wages are $3 per day.

A boiler may be set in brick or stone. If the latter, stone must be selected which will not spawl nor crack. Some volcanic tuffs make excellent boiler foundations. Blocks of steatite are also used for this purpsse with satisfactory results where the rock is firm.

When patent has issued for railroad grant land to the railroad company it is useless to attempt to claim mineral on such lands. The discovery must be made prior to patent, and the fact that the land is more valuable for mineral than for other purposes demonstrated.

Tungsten and molybdenum, and minerals containing cerium and thorium (chiefly monazite), are in demand. The tungsten minerals are principally wolframite, scheelite and hubnerite. The principal molybdenum mineral is molydenite. Zirconium is also coming into use in electricity.

The cost of drilling with diamond drill varies according to the material drilled through, and to the depth of hole drilled, it being cheaper per foot to bore holes of limited length than long holes. It is also more expensive to bore down holes than those which are horizontal or inclined upward.

The practice of placing a detonating cap attached to a fuse in a stick of nitro-powder, and bending the fuse sharply backward, so that the fuse may be on the outside of the stick, is bad practice, for the reason that the abrupt bending of the fuse is liable to open it at that point and cause a misfire.

Twelve hundred inches of water under 14 feet head will supply the power required to run a 10-stamp mill, including rock breaker and 4-drill compressor, and if the water supply is permanent, much more than this. The power required to run the above mentioned machinery is about 85 H. P. when the entire outfit is in operation.

Mine timber is best which has narrow rings and a solid appearance on the cross-section. Timber exhibiting large rings, and soft, pulpy appearance on cross-section, will rot more quickly and has not the initial strength of the fine-grained wood. Young timber of the kind known as second growth is likely to be brittle and deficient in strength.

Where a vein crosses one end of a location and then swerves and crosses a side line, it is restricted in the extralateral right to that portion of the vein between the crossed end line and the point where the vein crosses the side line where the plane is projected downward in the direction of the dip, and parallel with the crossed end line.

Good ventilation may be secured in a tunnel by means of ventilating fans, blowers, exhaust fans, water blast, and draught by means of outside furnace. The method selected should be that which will operate satisfactorily at least expense at the point of installation. The fans or blowers may be driven by any kind of power most cheaply available.

When a man has been mining for years in a single camp, and has had little or no experience outside of that camp, his judgment on mining conditions and probabilities in that camp should be good and are entitled to much consideration, but he knows so little of other districts that his opinion as to them is of little value and is likely to be erroneous. One cannot always safely reason from analogy.

When it is required to refine granulated gold by fusing with niter and borax, if a graphite pot can not be obtained and a small clay crucible must be used, it will be found that, by adding clean quartz sand, the affinity of metallic oxides and the potassium of the niter for silica is satisfied, the charge will not attack the sides of the pot. Where this precaution is not taken, broken crucibles are not of uncommon occurrence.

It is claimed that producer gas has a calorific value of 140 British thermal units per cubic foot of gas. The gas is used as motive power in driving gas engines, and in generating steam under boilers. It is also employed in furnace work and in many other ways. It is represented as the cheapest form of energy from fuel. It is made in gas producers by passing a mixture of steam and air through a bed of incandescent fuel in a closed producer.

In some shafts a distance piece (a piece of plank 2 inches thick) is inserted between the guides and the end plates, or dividers, for the purpose of keeping the guides in perfect alignment in the event of slight movement of the main timber sets. This is likely to occur where the ground is soft, or there are fissures carrying gouge. When necessary the distance piece is removed and the guides adjusted by the insertion of pieces of the proper thickness.

Salt crystallized from natural salt lake or ocean waters contains the chlorides of both sodium and magnesium. When these two salts occur together the crystalline product of evaporation is dried, pulverized and subjected to a blast of air from fans, by means of which a large percentage of the magnesium chloride is blown aside, leaving the chloride of sodium nearly pure. Salt scraped up on the shores of salt lakes, dry lakes, etc., usually contains more or less dirt, according to the care taken in collecting the material.

The specific gravity of vein quartz is about 2.6. A cubic foot weighs about 162.5 pounds. Ordinarily 13 cubic feet of quartz are estimated as representing one ton of ore in place, though generally somewhat less, but the difference is allowed, probably as a factor for safety. The amount of rock in place to constitute a ton varies greatly with the character of the ore. Thus Homestake ore requires only 10 feet to constitute a ton. Heavily sulphuretted ore requires proportionally less than clean quartz.

The value of a bar of bullion of given dimensions can only be determined even approximately by knowledge of the fineness of the metal. As gold at the present market rate is worth about thirty-two times as much as silver, it is evident the presence of a comparatively small amount of silver will greatly reduce the value of a given weight of bullion. The average value of mill gold from gold quartz mines generally is about $17 per ounce, but it ranges several dollars above and below this figure in certain particular cases.

Unless the work of rock excavation in a shaft is carried a long way in advance of timbering, it is unsafe to fire the round of holes by electricity, as the shock and flying rocks will greatly damage the timbers. There should be at least 50 feet from the last set to the bottom of the shaft for reasonable safety in such cases. Generally speaking, it is more satisfactory to fire the holes by hand, the fuses being prepared of such length that the center cut holes will be discharged first, the others following in proper order from the center outward.

Maps of the greater portion of the mining regions of the Western United States have been published, or are in preparation, by the United States Geological Survey. For sketch maps showing what portions of the several States of which maps are desired address the Director of the United States Geological Survey, Washington, D. C. From these selections may be made of the maps covering the areas desired. The several States are divided by the Survey into quadrangles and the small maps indicate the progress of the survey in the several States.

Without doubt there is a vast amount of difference between the results obtained by different men in stoking a steam boiler. The man who adds too much coal lowers the temperature in the fire box unnecessarily, which should be avoided, and this is followed after a time by a hotter fire than is required, with a consequent increase in steam pressure and generally blowing off. A stoker who understands his business will secure a greater evaporation per unit of fuel consumed than another who is inexperienced or careless about the work.

The ores of Cripple Creek occur for most part in altered andesites, and are not the white quartz veins familiar to the miners of many other districts. In a large number of the mines the higher grade ore is friable and breaks into fine material, the coarse rock containing only relatively small values. The ore is washed and sorted on reaching the surface, this rude concentration raising the value of the ore considerably. More or less sorting is done underground in most of the mines, the large waste being used in building rock walls and in filling stopes.

Where a man is employed in the capacity of watchman on idle and unpatented mining claims, he may relocate said claims for his own benefit should they become subject to forfeiture for neglect to perform the assessment work. This watchman cannot be considered as holding a fiduciary relation to the owners, being merely an employe, in no position of trust involving the control of the finances of the owners. If the owners are in arrears for wages, suit may be brought in the usual manner, but if the claims are really worth anything it would be good business to wait until Jan. 1, 1906, and to then relocate the claims, bringing suit for wages later.

Assessment work may be commenced at the last moment at the end of the year, and if continued until $100 worth has been performed this work may be charged to the year 1906, the year 1905 having had no representation. This is on the theory that the locator's title is good, whether he does any assessment work or not, until another party enters his claim and relocates it for failure of the first party to perform the work required by law. The claim may be held for years without performing this work, but always at the risk of the original locator, for at any time he is liable to lose his claim by forfeiture for non-performance of the assessment work.

The best caps to use in shooting nitro powders are the high grade varieties—XXXXX and XXXXXX. It is never good practice, nor economy, to use lower than XXXX caps. The more powerful the concussion of the cap on the nitro powder, the more perfect the explosion, and consequently, also, the result of the blast. In the winter season nitro powder often becomes chilled, and, although it may not be frozen, is too cold to shoot well unless exploded by high power caps. These high grade detonators, although more dangerous than the lower grades, are always the best, either winter or summer, because of their superior force and the results accomplished in blasting.

A recent Belgium patent thus describes a method by means of which the gold supposed to be present in sea water may be recovered: A ton of sea water is treated with about 5 cubic centimetres of concentrated aqueous stannous chloride, when the gold is converted into purple of Cassius and precipitated, together with magnesium hydrate and the excess of tin, by the subsequent addition of about a pound of slaked lime. From this precipitate the gold is extracted with dilute potassium cyanide solution, and isolated by any of the methods commonly used in the cyanide process (precipitation with zinc). Sea water from the Mediterranean and the English channel yielded no gold by this process, whereas samples from the Atlantic furnished traces.

There is considerable difference of opinion as to the amount and kind of tamping to be used in the firing of nitro powders in drill holes, or as to the necessity of tamping at all. A series of tests might do much to throw light on this subject, provided these tests could be made where the conditions as to the character, hardness and resistance of the rock mass was uniform or approximately so for the series of tests. Some maintain that no tamping is necessary; others say a little is good, and others believe that water is a sufficient tamping, while others insist if a little tamping is good, more is better. As a result of these conflicting theories we have both extremes. The manufacturers of nitro powders generally advise the use of tamping. For safety it is well to put the first tamping in lightly, only using the wooden tamping stick when the tamping has covered the charge to a depth of several inches.

As to the receiver's certificate issued to the person making application for patent for a mining claim, "Lindley on Mines" says: "Strictly speaking, the certificate of purchase does not convey or purport to convey the legal title. As between the purchaser and the Government, it carries the complete equitable title. It is evidence that the recipient has complied with all the terms and conditions which entitle him to a patent to the tract therein described, and that he has acquired a vested interest therein. The public faith has been pledged to him, and any subsequent grant of the same land to another party is void, unless the entry is vacated or set aside. When the price is paid, the right to a patent immediately arises. If not issued at once, it is because the magnitude of the business of the land department causes delay; but such delay in the mere administration of affairs does not diminish the rights flowing from the purchase, or expose him to the assaults of third parties. A right to a patent once vested is treated by the Government as equivalent to a patent, so far as it may be necessary to cut off intervening claimants. After the issuance of the receiver's certificate annual labor is no longer required on a mining claim, as the applicant is then proven to be entitled to patent, the issue of which is merely delayed by the great magnitude of business to be handled in the land office."

Plant of the Cananea Con. Copper Co., Cananea, Sonora, Mexico.*

NUMBER II.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by O. P. FINDLEY.†

CONCENTRATOR.—The concentrating plant is on the side of a deep gulch, ½ mile southwest of the reduction works and on the line of the company's narrow-gauge railway. The plant proper consists of two main buildings, covering an area of 29,650 and 33,430 square feet, respectively. Concentrator No. 1 is of wood frame and corrugated iron sides, with fire-proof roofing. Concentrator No. 2 is of steel construction throughout.

The system is divided into four divisions, designated as Sections A, B, C and D. The accompanying diagram gives an accurate idea of the relative location of the main structures and various auxiliary buildings. At present an extension of 70 feet by 85 feet is being added to each of the four sections. When these are completed they will increase the total ground space to 75,000 square feet.

The original plant, completed in 1902, had a capacity of 600 tons daily. In 1904 it was found necessary to increase this to 1000 tons and add another unit capable of handling the same amount, so that at present the total capacity of the plant is 2000 tons per day.

The equipment of remodeled concentrator No. 1 is complete, comprising all the machinery usually installed and including 258 concentrators.

There is also being put in a large number of additional water clarifying tanks and spitzkasten for providing feed for the new equipment out of various slime waters now going to waste. Any power other than what is already provided will be furnished by motors.

The system of distributing and recovering the water will be noted from the diagram of the flow sheet. The general scheme is not wholly original, but has been ingenuously worked out by L. D. Ricketts, consulting engineer for the concentrators, and D. Cole, superintendent concentrator department of the C. C. C. Co. About 80% of the water leaving the mill in the tailings launders is recovered and used again.

The crushing of the ore is done in a building separate from the main plant.

The second class ore is run in on the narrow-gauge railroad in hopper bottom cars and dumped into the receiving bins. The bins consist of eight pockets, with an aggregate capacity of 2100 tons. The different classes of ore from the various mines of the company are distributed into separate bins in order that in the subsequent handling the ore may be mixed to the best advantage for concentrating purposes.

Underneath the bins runs a 30-inch conveying belt, which receives the ore from the chutes and conveys it to a grizzly with bars ¾-inch apart. The oversize from this grizzly passes to a 36-inch picking belt moving at the rate of 30 feet per minute, while the screenings descend upon a 16-inch conveyor and are transported to the concentrator bins. Sorters pick out the native copper and high-grade ore on the picking belt and load it into the tram cars, in which it is transported to the narrow-gauge railroad cars. The largest lumps of ore are broken by the sorters so that it can be handled by the automatic feeders of the crushers. The crushers are supplied by 12x24 plunger feeders, modified to handle material as coarse as 10-inch cubes without clogging.

After passing the crushers and rolls, the ore, which has been reduced to 1-inch cubes, passes to an 18-inch belt conveyor, which carries it up an incline of 18% to the concentrator bins, receiving en route the screenings from the grizzlies heretofore referred to. An automatic tripper working over the bins distributes the ore evenly over the entire surface. By means of an automatic device a uniform sample of the ore is secured as it is delivered.

Under the mill bins, conveniently situated, automatic feeders deposit the ore into launders, where it is mixed with running water and carried to the 18-inch bucket elevator No. 1, at the top of which it is divided into a double line of trommels. The course then taken, as outlined in the flow sheet, which was prepared by D. Cole, is as follows: The oversize from the ⅝-inch and ⅜-inch trommels passes to the coarse jigs and the undersize to ⅛-inch trommels. The oversize from ⅜-inch and 2½-inch trommels passes to middle jigs, and undersize to coarse hydraulic classifiers. The spigot feed of coarse classifiers goes to sand jigs and overflow of classifiers to discharge of No. 3 elevator, mixing with the crushed material from the Chilian mills. The tailings from the coarse jigs pass through 36-inch rolls to No. 2 18-inch bucket elevator; tailings from middle jigs pass through 27-inch rolls to No. 2 elevator, and tailings from the sand jigs through Chilian mills to No. 3 elevator. No. 2 elevator delivers material into ⅛-inch trommels, enabling the reground coarse and middle jig tailings to pass to the next finer jigs in the series, or, if sufficiently fine, directly through the hydraulic classifier system to the shaking tables and vanners. Auxiliary trommels with ⅜-inch holes handle the oversize from the ⅜-inch trommels, returning any spawls or pieces that may by chance have passed the coarser rolls at sizes larger than ⅜-inch. Since the jigs make no "waste" tails, this treatment insures that the limiting screens will be those of the Chilian mills, which are 20 mesh.

After being sized, either by hydraulic classification or screen, to 20 mesh, the now impoverished ore is passed to the fine sand and slimes treating department. Upon the tables handling the granular feeds, the sand middlings, tailings and muddy water middlings are separated into the table side launders. The concentrates go by shaking launder to the concentrates bins; the sand middlings to other tables at a lower level for retreatment; the muddy water middlings through centrifugal pump to pulp thickeners, thence to vanners, and the tailings to waste.

The pulp thickeners are round, wooden tanks 10 feet in diameter and 18 feet high. The slimes enter through a 12-inch wooden pipe placed in a vertical position in the middle of the tanks, and terminating within a short distance of the bottom. The tanks have hopper bottoms converging to the point from which the feed is taken out. The volume of feed taken out is much less than that coming in and a considerable overflow of clear water runs over the top of the tank in a thin sheet and is immediately recovered for use as dressing on the tables, or is sent to the settling tanks if the water has not been sufficiently clarified, as is the case when very slimy ore is treated.

No attempt is made to classify the thickened pulp, but a device is used which cuts the volume into many equal parts, both as to volume and quality, which compose the feed of the vanners, which latter produce clean concentrates and satisfactory tailings.

All tailings are gathered into one launder and conveyed to the settling tanks, where a large part of the water is made available for use in the mill again. An automatic sampler cuts through the stream of tailings at regular intervals and secures a uniform sample.

Horizontal water boxes are used as conduits wherever possible and the water is used over and over again as long as practicable. For instance, the water from the coarse jigs is largely recovered on the jig floor and used on the middle jigs, middle jig water upon the sand jigs, thence by local pump back to coarse jigs again. Muddy water from the tables goes to the pulp thickener as already indicated.

All concentrates made upon the jigs and tables pass automatically into bins located alongside the railroad spur. These bins are water tight and hopper bottomed and are fitted with water tight bin gates of a special design. The material from the bins is drawn by gravity into the railroad cars.

The water circulating plant consists of one Corliss cross compound condensing engine of 250 H. P., belted to a quill shaft having four quills with dental clutches. Each quill operates a 6-inch two-stage turbine pump at 1100 revolutions per minute, with a capacity of 1000 gallons per minute; thus the set has a capacity of 4000 gallons 150 feet high per minute. These pumps sometimes handle muddy water for considerable periods and the water is slightly acid, for which reason a 16-inch banded redwood column, discharging into the storage tanks above the plant, is used. These tanks are of redwood and have a combined capacity of 200,000 gallons. This pumping plant gives perfect satisfaction.

An additional pair of high pressure boilers are in course of erection. These will bring the boiler capacity up to 1500 H. P. at builder's rating.

There will also be installed another direct current electrical unit of 300 K.W., direct connected to a cross compound condensing Corliss engine. This, with the additions to the condensing system, including a large cooling tower, will complete the works.

When all projected work is finished, according to the present plans, the capacity of the plant will be approximately 3000 tons of second grade ore, producing from 700 to 900 tons of concentrates daily.

Some original devices that are in advance of the usual practice are found in these works and are proving very satisfactory, notably the following:

By placing small spitzkasten ahead of the hydraulic classifiers—compound classification is practiced—the feed to classifiers is drawn by spigot from the spitzkasten, and is thus very uniform in quantity, containing all of the sands suitable for hydraulic classification. The excess of water carrying the slime that is unfit for hydraulic classification passes over the spitzkasten and is laundered directly to the pulp thickeners that furnish the vanners with feed. Thus the slimes and occasional rushes of water are automatically by-passed around the classifiers, much to their benefit.

All classes of feed are unwatered before being fed to the regrinding machinery. This is accomplished by the use of specially constructed shovel wheels that are admirably adapted to the work. These wheels not only remove the feed from the water in a perfectly drained condition and act as feeders, but also separates the chips and all floating material that comes with the ore. About ten wheelbarrow loads of wood are removed from the ore in each division of the plant by this means daily. This system prevents the annoying choke-ups, etc., that come from wood chips, and since the wood is removed before it can pass through the regrinding machinery, there is no water-soaked wood pulp to plug spiggots and cause annoyance farther along in the process.

Concentrates made upon Wilfley tables and sand jigs are conveyed horizontally by shaking launders, some of which are 100 feet in length. They are made of wood, lined with rubber, and are operated by machines locally designed purposely to handle them. The vanner concentrates are removed by a special device that automatically transports them horizontally to their respective bins by the railroad track without attention or labor. Thus there is no shoveling or the use of cars, barrows, trolleys or tram tracks, with the attendant sloppy floors and extra labor found about the mills.

Each set of crushing rolls has an attachment that enables the operator to open them as much as 1½ inch instantly and without turning off the feed. This is a great advantage. The device was worked out here and applied to all machines used about the plant.

All machines that require frequent repairs have cranes or trolley tracks over them, so that repairs may be finished quickly, and the machines are so arranged that feed may be diverted and any machine cut out for repairs without interfering with milling operations or loss in feeding time.

A well equipped machine shop is situated so as to be served by the narrow gauge railroad and is connected to each section of the concentrating plant by an inclined tram track. Thus any machine on any floor of either mill can be taken to the shop for overhauling with very little trouble. Duplicate machines are kept in stock, and in the case of the smaller machines, such as centrifugal pumps, head-motion machines, shovel wheels, etc., the machines are replaced entire, the old one being sent to the shop and completely overhauled before going into use again.

SMELTER.—The process of treating the ore is by the matte and converter method. Most of the ore is smelted here, but a small portion is shipped to the American Smelting & Refining Co.'s works at El Paso, Texas. The company expects to be able within the next year to take care of its entire ore production and also do customs smelting.

The plant at present consists of eight furnaces, the dimensions of which are as follows: No. 1, 42x120 inches; No. 2, 48x120 inches; No. 3, 54x160 inches; No. 4, 54x160 inches; No. 5, 42x180 inches; No. 6, 42x210 inches; No. 7, 42x210 inches; No. 8, 56x180 inches. The latter furnace, installed about one year ago, is the largest in the Republic of Mexico and one of the largest in the world, being 56x180 inches at the tuyeres and carrying a charge of 14 feet in depth. It discharges into a forehearth 15 feet in diameter, which, as well as the crucible in the furnace proper, is lined with chrome brick. This furnace has a working blast pressure of 1¾ pound and can put through 6½ to 7½ tons of burden (or 450 to 525 gross tons) per square foot of hearth area per each twenty-four hours.

Over each furnace, except No. 8, there is a steel hood 20 feet square by 22 feet high, excepting that of furnace No. 1, which is 15 feet square by 16 feet 10 inches high.

The flue gases, after leaving the hoods mentioned above, pass through a steel flue 400 feet in length to a dust chamber 60x180x20 feet in the clear, constructed of brick and steel and designed to handle 600,000 cubic feet of free air per minute. Thence the gases pass through a brick flue 17x20x400 feet and a brick-lined steel chimney 20 feet in diameter and 200 feet high.

Serving each furnace is a steel forehearth, into which the matte and slag run in a continuous stream, the two fluids separating by reason of the difference in specific gravity. The matte from the settlers is drawn off into cast steel ladles of 67 cubic feet capacity. These ladles are handled by means of two electric overhead traveling cranes. These cranes have each one main and two auxiliary hoists, the main hoist of one having a capacity of forty tons and the other fifty tons. The auxiliary hoist of each crane has a capacity of five tons. Each crane is provided with five motors, as follows: One 50 H. P. main hoist, two 25 H. P. auxiliary hoists, one 25 H. P. bridge travel and one 7½ H. P. cross travel on the 50-ton and one 5 H. P. cross travel on the 40-ton crane. The crane runway is a continuous 30-inch plate girder carried on 8-inch Z-bar columns, spaced 16 feet and 21-foot centers, alternately. The distance between the centers of the runway girders is 50 feet, thus allowing a clear way for the main hoist of 40 feet.

The slag flows off into self-dumping cars drawn by electric locomotives, of which five are in use. Two of these are of the single-motor type, weighing four tons each, equipped with one 20 H. P. motor. The other three are of the two-motor type, weighing ten tons each and equipped with two 40 H. P. motors. These motors are fitted with a teetering trolley, which enables the motormen to reverse the direction of running with the least possible trouble through changing of trolley.

The slag cars are of the type built by the Colorado Iron Works, with a bowl holding about 33 cubic feet. A portion of these bowls are of cast steel, the others being ordinary cast iron bowls.

The slag is drawn from both ends of the smelter, the east dump being some 60 feet high. At the west end of the smelter the cars run through a tunnel and thence to a gulch, which has been filled to such an

*See illustrations on front page.
†Condensed.

extent that about twenty acres of ground have been made available for various industrial purposes.

The converter building is a steel frame structure 296 feet long and 65 feet wide, with 36½-foot walls, roofed with heavy corrugated iron.

The six stands for the converter shells are furnished with hydraulic operating mechanism, air-blast connections and valves for regulating the blast. There are twenty-two converter shells, 8 feet in diameter by 11½ feet long, fitted with 10-inch blast pipe and 14 1¼-inch tuyeres and constructed of standard steel shell plates of a thickness of 1 foot. The shells are rotated by means of hydraulic cylinders 24 inches in diameter, with a stroke of ram 7½ feet, describing an angle of 270°. The movement is controlled by a rotating slide valve of a special design. The rack is thrown in and out of gear by means of a screw and sliding crosshead operating a set of toggle links.

The converters are operated by water under a pressure of 200 pounds per square inch, provided by two accumulators each 30 inches in diameter, with 10-foot stroke of ram, equipped with steel frames, guides and weight holders.

The gases ascending from the mouth of the converters are received into collecting hoods and primary steel dust chambers, which move upon a steel track located immediately above the stands. The gases are then conveyed upward through a 48-inch uptake into secondary dust chambers, of which there are three, 8½x9x14½ feet, carried on the roof of the building. These latter are connected by an 8-foot flue carried on the roof to the west end of the converter building to a steel stack, 8 feet in diameter and 125 feet high.

The copper from the converters is poured into cast steel bullion molds, which, when full, form a bar weighing 400 pounds; but, as the metal ordinarily runs, the bars average about 300 pounds. Steel cars holding six molds each are run in under the converters to receive the metal. The bars are delivered to the bullion floor and are there trimmed of all rough edges. Assay samples are extracted by means of a small electric hand drill, and the bullion is then weighed and loaded into the standard gauge cars parked at the end of the building.

The slag skimmed off the converters during the process of blowing is poured into large molds on the floor, forming buttons of a thickness of from 8 inches to 1 foot. These buttons are allowed to cool, are then broken up and crushed and are then elevated to the feed floor and used as flux in the furnaces.

CARBON MONOXIDE is probably the prime cause of more than 80% of the deaths resulting from a coal-mine explosion, says Fuel. This gas is largely, if not entirely, generated by the partial oxidation of coal dust. If coal dust could be removed from coal mines as fast as it is produced, the danger from explosions would be very considerably reduced.

The Machine Miner.

Mining costs have been reduced in various ways, but largely by the introduction of the machine drill. This useful adjunct of modern mining has undergone an evolution, as almost everything else in mining has, until the various types of machine drills now on the market are all of superior workmanship, and all capable of doing excellent work in proper hands. This is self-evident, for the standard has long since been set, and the machine which cannot do satisfactory work is quickly rejected for one that will. The machine drill is used in every kind of mining—shaft sinking, tunneling, raising, stoping, and in outside quarry work. One of the accompanying engravings illustrates its use in driving a tunnel, where two machines are set up side by side, each on its own column bar. The other shows the employment of a machine drill in raising.

Some engineers maintain that shaft sinking with machines possesses no advantages over hand work, but there are as many — or more — who are of the contrary opinion. The record shaft sinking of the world has been done with machine drills.

Machine Miners Driving a Heading.

Machine Drill Operating in a Raise.

Gold at a Depth of 4224 Feet.

An important report was made by the manager of the New Chum Railway mine, Bendigo, recently, that good gold was showing in the stone in the crosscut east from the center country winze at 4224 feet, says the Australasian. The stone is 4 feet thick, and when broken disclosed splendid gold. The quartz is richly mineralized and well laminated, and fine gold is associated with the seams of slate and minerals. There are also a few large specks of gold in the quartz. In the top the formation is 4 feet wide, and in the bottom it has a width of 2 feet 6 inches. It is the east leg of the formation revealed in sinking the winze at a depth of 4165 feet. The bottom plat is at 3756 feet, but the shaft has a depth of 3896 feet. In order to work the reef to advantage, the company will have to sink 400 feet, and then crosscut at 4265 feet. The discovery is of considerable importance, as further evidencing the existence of gold at a great depth. In opening up the formation at a higher point gold was seen, but this development is the most important which has yet attended operations in the mine at over 4000 feet. The fact that this is the greatest depth at which gold has been obtained in the world lends to the development more than local interest.

Geology of Tonopah, Nevada.*

The most comprehensive description yet written of the Tonopah mining district is that by J. E. Spurr, entitled "Geology of the Tonopah Mining District, Nevada." It comprises a volume of 295 pages, handsomely illustrated, and with many geological sections, sketches, etc. It is issued by the United States Geological Survey as Professional Paper No. 42.

Much contained in this valuable contribution has already been published herein, but in the concluding pages the author makes some interesting comparisons with other similar mining districts elsewhere, from which the following is abstracted:

COMPARISON WITH SIMILAR ORE DEPOSITS ELSEWHERE.—It is often advisable to study an ore deposit or a mining district not by itself alone, but also in comparison with others. Similar districts often present information, through their likeness or dissimilarities, concerning the nature, origin, and future possibilities of the district under examination.

VEINS OF PACHUCA AND REAL DEL MONTE, IN MEXICO.—Among the nearest analogies to Tonopah yet described anywhere in the world are the contiguous mining districts of Pachuca and Real del Monte, described by Aguilera and Ordonez.

These celebrated districts are 62 miles north of the City of Mexico, on opposite slopes of the Pachuca mountains, which bound the great valley of Mexico. The mines support the city of Pachuca, which contains 35,000 people, most of whom are actually engaged in mining. The ore deposits were discovered in 1522, and have been worked almost continuously to the present day. Pachuca is the most important mining district in Mexico, and is estimated to have produced since its discovery 3,500,000 kilos of silver.

The geology is similar to that of numerous other mineral regions of Mexico. The whole Pachuca range is formed of Tertiary andesites, rhyolites, and basalts. The andesites are of Miocene age and have a varied appearance, due to alteration, the normal type being green and propylitic. The feldspar (labradorite) has often been transformed to sericite, calcite, chlorite, epidote, and clayey products; the pyroxene to chlorite,

*Abstract Prof. Paper No. 42, by J. E. SPURR.

viridite, and epidote. The rocks are silicified near the veins, so as often to resemble dacites or rhyolites, this alteration being due to the influence of hot solutions during the formation of the veins. Rhyolites cover the andesites, occurring as flows and dikes. The last eruptions were of basalt. The veins strike east and west. Secondary veins branch out from the smaller ones, and splitting and reuniting are common phenomena. The veins are more remarkable for constancy and extension than for thickness. They seldom exceed 20 feet in thickness, while they have a length of from 2½ to 10 miles.

The quartz croppings carry pyrite and oxides of manganese. They are always argentiferous, with an appreciable amount of gold. They may be divided into two zones, one overlying the other. The upper is composed of oxides (red ores) and the lower of sulphides (black ores). The upper contains, besides iron oxide (always auriferous), oxides of manganese and chlorides and bromides of silver; it has a maximum downward extent of nearly 1000 feet. The lower zone contains sulphides of lead, silver, etc. The lower limit of the upper zone corresponds to the ground-water level.

Calcite is found only in small quantities. Of the sulphides, pyrite, galena and argentite were in most cases deposited simultaneously with the quartz. The abundant manganese oxide in the upper zone is replaced in the sulphide zone by a lesser quantity of the silicate, rhodonite. Pyrite is frequent in the mineralized parts of the veins, and is also abundant in the country rock, but in the country rock it does not contain even traces of the precious metals. Native silver has been found at all depths; ruby silver has not been observed at Pachuca, but is found at Real del Monte.

Rich ores occur in certain parts of the veins called bonanzas, which are of irregular form, frequently nearly elliptical. The bonanzas of the different veins group themselves in a northeast-southwest zone nearly normal to the vein strike. Some are in the oxidized, some in the sulphide zone; the former are more numerous. In some cases bonanzas were encountered at the surface; in others they were found in depth, where the vein was barren at its outcrop. The size of the bonanzas varies; one of the largest was encountered at a depth of over 300 feet and was elliptical, the greatest axis being over 3000 and the smaller 1300 feet, with a thickness of 8 feet.

The veins become impoverished at great depths. At the bottom they change to barren galena and blende, too poor to repay working. However, certain developments lead to the belief that at still greater depth new bonanzas might be found. Most of the mines are only about 1300 feet or less deep; in only one has a little work been done as deep as 1800 feet.

This district is similar to Tonopah in the character and age of the wall rocks (Miocene andesites); in the nature of the alteration of the rock near the veins (silicification near the veins, propylitic alteration farther away); in the structural characters of the veins, which form a splitting and reuniting group); in the general character of ores (both oxide and sulphide), and of gangue, though adularia as a gangue material and selenides as ores have not been recognized at Pachuca; and in the occurrence of the rich ores in bonanzas, which seems to be due to the intersection of transverse fractures with the main vein zone.

THE COMSTOCK LODE.—Pachuca is about 2000 miles southeast of Tonopah, but a similar analogous deposit (the Comstock) lies 150 miles to the northwest.

The Comstock lode is a vein 4 miles long which has formed in Tertiary eruptive rocks, chiefly andesites, along a fault line having a maximum displacement of 3000 feet. At both ends it branches and so dies out.

It strikes east of south and dips easterly. It was discovered in 1859, and worked up till the present day, but most actively from 1861 to 1880. Up to June, 1902, it had yielded $369,566,112.61 worth of ore, of which about 42½% was gold and 57½% silver. The rocks of the district in the order of their succession are, according to Hague and Iddings, andesite, dacite, rhyolite, andesite and basalt. The andesites are coarse-grained in depth (diorites and diabases). Near the lode, and for some distance away, in a space about 5 by 2 miles, the country rock (chiefly andesitic) is extremely decomposed, the period of alteration having succeeded an andesitic eruption. The hornblende, augite and biotite have altered to chlorite, pyrite, epidote, etc., the feldspar to quartz and an undetermined white aggregate. This altered andesite is the famous "propylite." The basalt, which is the latest rock of the district, has not been altered in the same way as the andesites. The alteration of the rocks and the lode was due to solfataric action which accompanied the faulting.

The lode material is quartz, certain limited portions of which contained large quantities of silver and gold (bonanzas), while the rest is low grade. Calcite is much less than quartz in amount and is generally insignificant. Most of the bullion has been derived from a bluish quartz, like that at Tonopah, the color being mainly due to disseminated argentite, which is the principal ore mineral and is accompanied by gold, probably free. Bunches of stephanite, polybasite and ruby silver were also found. In the bonanzas, near the surface, chlorides and native silver occurred. Frequently the ore grew base, and carried large quantities of galena, zincblende, etc.

Pyrite occurs abundantly, both in the altered country rock and in the ore. The mineralizing solutions are thought to have derived their heat from volcanic rocks, and thus the general phenomena are classed as due to solfataric action, but the materials precipitated, including the ores, are thought to have been derived from the decomposed wall rock.

The workable bodies or bonanzas represent the smaller portion of the lode. The value of the ore in them ranges from $15 a ton to (very locally) several thousand dollars. They are encountered at varying depths, from the surface down to 3000 feet. The vein down to nearly 2000 feet contained sixteen workable ore bodies, while below this level the ore has proved mostly low grade. One large bonanza (that of the Con. California & Virginia) extends vertically from about 1250 feet to 1950 feet below the surface, and has a greatest diameter of about 1100 feet. It yielded about one-third the product of the lode. The ore minerals were chiefly stephanite, argentite and gold, the latter probably free.

The source of the heated waters which are encountered in the mines, and which are thought to have accomplished the rock alteration and ore deposition, is concluded from thermal surveys to be not less than 2 miles deep, and the heat and the active reagents, such as carbonic and sulphydric acids, are thought to have a volcanic origin, while the waters may have had an atmospheric source. The waters above 800 feet had a temperature of about 70° F., while from about 1000 feet down hot waters of above 100° F., rising under pressure, were repeatedly encountered.

The Comstock district is similar to Tonopah in respect to the character and age of the rocks in which the lode lies (Tertiary andesites), in their "propylitic" alteration, in the nature of the gangue and ore, and in the occurrence of the rich ores in regular "bonanzas." The chief distinction is that the Comstock consists of a single very strong lode, while at Tonopah there are a number, of less size.

SILVER CITY AND DE LAMAR DISTRICTS, IDAHO.—Another region having many striking peculiarities in common with Tonopah lies about 400 miles due north of Tonopah. The districts of Silver City and De Lamar (5 miles apart) are situated in the Owyhee range, in southwestern Idaho. The range has a granite core, almost covered by Miocene rhyolite and basaltic lavas. The ores were discovered in 1863. The total production to 1899 was 313,448 ounces gold and 10,540,000 ounces silver. The deposits are normal fissure veins, chiefly in rhyolite. In one type the principal ore minerals are small quantities of argentite and chalcopyrite, with a gangue of quartz and orthoclase (adularia). The proportion of gold to silver by weight averages 1 : 120. In the other type scarcely any sulphides are ordinarily visible, though occasionally pyrite, argentite and pyrargyrite occur. The gangue is quartz, pseudomorphic after calcite or barite. The relation of gold to silver by weight is about 1 : 10. At De Lamar there is a strong silicification of the country rock near the veins, with the formation of abundant pyrite and marcasite, and a little sericite. Farther away from the veins the country rock is softer and more pyritized. The veins strike northwest and dip southwest, both strike and dip varying considerably. The system comprises ten veins, 20 to 80 feet apart. The strike of these veins is such that parts of the group are like some of the radii of a circle, as is the case at Tonopah, and each vein may join and fork in the manner of linked veins, both horizontally and vertically. The width of the veins is from 1 to 6 feet, averaging 3 or 4 feet. The rich ore occurs in large, continuous bodies extending from the surface to a depth of 1000 feet, dipping gently (20°–30°) southeastward along the plane of the vein. They are generally about 200 feet long and ordinarily 1 to 6 feet thick.

In other veins the ore bodies do not extend so deep, and, while having often a generally definite course, are so irregular and discontinuous as to constitute irregular bonanzas rather than definite shoots. No considerable ore shoots have been yet found below 1000 feet, though the veins remain strong. Cerargyrite, pyrargyrite and argentite occur locally (the latter being common to nearly all the mines), as well as polybasite, proustite, native gold and silver.

Besides occurring in rhyolite, some of the veins are also in granite and basalt.

The rock alteration and the ore deposition are considered to have been accomplished by ascending hot waters, whose nature is indicated by the silicification of the rhyolite and the formation of adularia, chlorite and epidote. The period of formation is post-Miocene. The veins extend along the strike sometimes for a mile or so, but average less; they die out on both ends. The ore at present mined at De Lamar goes $14 in gold and $2 in silver. In 1872 the value of the ore mined was from $12 to $60 per ton in different mines.

The districts of Silver City and De Lamar just described are similar to Tonopah in that the ore occurs in Tertiary volcanics, and are probably in both cases post-Miocene in age; to a striking degree in the character of the ores and gangue materials; in the structural character of the veins, which form a group knit together by branches; in the general character of the alteration of the wall rock; and in the occurrence of the rich ores in irregular bonanzas.

(TO BE CONTINUED.)

Milling Ores at Tonopah.

The recent announcement that the Tonopah Mining Co. of Nevada are about to build an extensive milling plant near Tonopah is of interest. It is intended, so it is stated, to treat the ore by concentration and cyanidation. The capacity of the proposed plant will be several hundred tons of ore daily. In contrast with the extensive and expensive proposed installation, the accompanying illustration of the first mill in Tonopah district is of interest. The ore was delivered to the mill by teams. As the entire proposition was somewhat of an experiment, everything about the plant was more or less primitive, which is in strong contrast with the intended new mill, which will represent the latest in all that is considered essential to a modern milling plant of its kind.

First Mill on Tonopah.

A WRITER in the London Mining Journal, speaking of Cornish tin mines, says: "A point which I have not seen mentioned, but which has had a far-reaching effect, is the old system of the underground manager cutting down a contract when the men were making a little more than their wages. This has through a long period rendered the men indifferent, and the general rule is that they will not try and make more than the ordinary wages on contract, as any inducement to do so was withheld. When any mining engineer accustomed to the up-to-date appliances of well equipped mines visits Cornwall, a feeling of amazement comes over him when he sees the old, and in some cases very old, Cornish batteries at work; and if he should further have to work on one of these old mills, it is distressing to find the small efficiency obtainable from them. Yet, in many cases where they are used, it is exceedingly doubtful if, without a considerable outlay in further exploration of the mine, it would pay to replace them with an up-to-date Californian mill. The same remark applies to the dressing plant."

THOUSANDS of dollars have been added this summer to the thousands already made by the diggers of coal from the bottom of the north branch of the Susquehanna river, between Sunbury and Nanticoke, says Fuel. One man averaged $25 a day since early in May. Nearly 1000 tons were taken from an area hardly a mile long, between Sunbury and Espy, during the past four months. This river coal, which is carried down stream out of the Nanticoke and Nescopeck coal fields during high water, and deposited in bars in the eddies of the river, finds ready sale at the river bank.

The American Mining Congress.

At the session of the American Mining Congress held last week at El Paso, Texas, a number of addresses were delivered and important papers read the latter part of the week which were received too late for the issue of the 18th inst.

In addressing the American Mining Congress, its president, J. M. Richards, referred to the constantly increasing development of mining in Mexico and the equally constant inflow of American capital into that Republic, which he considered but the beginning of this international industrial progress. It was the expressed opinion of the speaker that the American Mining Congress could be made an instrument of great usefulness to the mining industry of the United States, and made a plea for sufficient financial aid to render the Congress permanent. He proposed that at its headquarters in Denver, Colo., there be started a collection of ores and minerals of commercial and educational value, and that each mining State be urged to make a display of samples of its mineral wealth in any amount it was considered the industry justified. He urged co-operation in mining, as a step by which much desirable to the industry might be accomplished. The speaker urged that continued efforts be directed toward securing the creation of a National Department of Mines and Mining. On this matter he spoke as follows:

This Congress, and especially with the assistance of a Mining Department, could be of great service to the mining industry in helping to bring about a greater simplicity, harmony and unity in the mining laws of the country, to meet the varying wants of the numerous branches of mining, and in a way to minimize litigation.

Litigation, by reason of defective laws and laws of doubtful wisdom, is one great source of waste, uncertainty and disappointment in mining. A great work along this line lies before this Congress.

A great field of usefulness, and especially with the co-operation of a department, is open to the Congress in the collection of mineral statistics. These statistics could be made of most practical utility. And no one more than the practical miner could be of service in suggesting how to complete such statistics so that they may be of real value, both accurate and comprehensive.

The subject of drainage districts, which often cross State lines, is one that is becoming of vital importance, and will prove of even greater importance as the years go by. On subjects of this character this Congress can be of great practical assistance.

The line of demarcation between agricultural and mineral interests had not yet been clearly defined. This question is constantly arising under varying conditions. Any law relating to such rights should be based on good and sound reasons, so that it may be clear and easily understood. This subject is bristling with interesting questions, which when wisely settled will prove of much practical benefit.

The question of water rights is one of extensive importance to mining. There is no uniform rule as yet adopted as to what constitutes an inch of water for mining purposes. This question is of most vital importance, and especially to such sections as Alaska. An act clearly defining a water right and a means of easily ascertaining the quantity of water acquired, would be of inestimable value to new mining sections, and especially to such districts as Alaska, where the great distances from courts and enormous expense of adjudicating such rights make an act of this character a real necessity.

The question of taxation of mining property is in a state of chaos. Every class of property should bear its just proportion of taxation. Just what is a just proportion, as applied to mining, is wholly unsettled. There should be some equitable system devised that will be as uniform as possible and yet not be a burden upon undeveloped and unremunerative properties.

The relation of employer and employe, while a somewhat delicate question, it would seem that an organization of this character might be of assistance in shedding light upon a subject so important to the advancement of the mining industry. There must be some basis which intelligence, guided by an unselfish purpose, could discover, which would aid in making these relations more harmonious in the mining industry than heretofore. There are vast numbers of American citizens engaged in mining coal, iron, zinc, lead, copper and the precious metals, and a great army of children being prepared for American citizenship, who are living under conditions not suited to the development of a very high order of citizenship. Can this Congress be of assistance to them and still do justice to the employer?

It is not the purpose of this Congress to consider technical questions nor the technical phases of questions relating to mining, but such questions of a general nature as are or may be understood by those not schooled in technical subjects. Nor is it the purpose of this Congress to consider political questions, as that term is generally understood; but it is important to the mining industry, and therefore to this Congress, to have those steps taken and those things done which will stably yet speedily advance the mineral development of Alaska. It is believed by many who purport to know, that Alaska will yet be one of the most stable influences in our industrial development.

The paper by R. Gilman Brown on "Examination of Mines" is particularly valuable and contains much information of value to engineers, students, miners and the public generally who are interested in mines. The paper is published in full:

EXAMINATION OF MINES.—I feel myself fortunate in enjoying this opportunity of elaborating before such a representative body some of the fundamentals of mine examination; the more so because they have not always been fundamentals, because it has been largely due to the dispassionate business sense of business men that fundamentals they now are, and because, more than anything else, to the observance of such fundamentals by the investor and engineer alike, is the view of mining as a business and not a speculation to be attributed.

But in these matters the business man is the main spring. Where there is a demand there will be a product to satisfy it, and the modern mining report is made to answer a simple business question: "What will be the profit?" Stated at length my subject is: "The Examination of Mines Preliminary to Purchase: To-day as Compared with Twenty-five Years Ago."

It is naturally "to-day" that has the most practical interest for us, but all advance is relative, and if any of you will take the pains to "dig" up some of the reports upon which mines were bought in the early '80's, and compare them with modern ones, the advance towards definiteness will be the most impressive point of difference. Then, more stress was laid upon generalities, more weight given to empirical conditions; ore reserves and net values were less considered; a telegram from the man in the field stating that the mine was worth it would be sufficient to make the capitalist pay out his thousands, by hundreds. Engineers, the best of them, cheerfully advised their clients to take all sorts of chances on persistency in depth on the various uncertainties attendant upon underground work.

I would here pay my tribute to the pioneer engineers; with a text-book assistance that was meager as compared with to-day, with little besides their individual experience and good sense, they were wonderfully successful in their prognostications. Their work is to be no more disparaged than should an engineer now venture to ignore the use of the extensive kit of tools, the accumulated experience of the past quarter of a century has provided for him.

It is not that people are now less ready "to take chances," but that it has gradually come to be the belief of engineer and capitalist alike that the chances should be recognized as taken; that if the buyer wishes to speculate for big returns, he should have the opportunity, so long as he is posted on what he is doing. Along with this belief has come the particular recognition of the general law, applicable not alone to mining, but those who would participate in a "dead sure thing" must be satisfied with a small per centum of returns; that those who wish to plunge stand to lose all or to gain fabulously, with the whole gamut of intervening possibilities.

So far as this paper is concerned, the last phase can be dismissed in a few words. It is to-day by no means an infrequent occurrence for business men to "take flyers" in undeveloped mining claims. Rich and poor, those who can afford to lose the money, and those who can not, seem equally addicted to this sort of thing, but I must emphasize, and all must agree, that this is not investment in mines; it is a venture, pure and simple, a speculation without reserve (and without reserves), and though the competent engineer with his wide knowledge of costs, of various regions and of what goes to make up a mine, can undoubtedly lessen the percentage of loss in such transactions, it is not to-day his most useful sphere. The most he can do in such a case is to tell his client whether he will have a run for his money, whether the possibilities are such as to constitute a good mining chance. The pity of it is that the lay capitalist does not recognize, as a rule, the essential difference between this game and the sober business of legitimate mining investment. This is particularly bad because the business man, turning for the first time to mines, is more likely to take up with some such "long shot" of this category than with the other. He pays small attention to the details of the matter—not a fraction of what he would if the same sum were to be put into a warehouse scheme, say, outside of his regular line—and if the time comes when he must either abandon his "investment" or put up more funds, whichever course he follows, he feels he has been bitten, and in the future views the word "mining" askance. This works another way as well, for he has come to look on mining as outside of business laws, and should he get into a mine that is really an investment, he is still apt to view it loosely as such, and not to inquire too closely into the business details of the management.

Doubly important, then, is it that the lines be sharply drawn between the two classes of mining, and that the layman in mining matters does not settle down to his layness as the end of the matter. The investigation of one class may take an engineer a week; of the other, months; in the case of the prospect, the report is largely a brief statement of possibilities, with the pros and cons clearly given; in the case of the mine, it is an exhaustive study, and exposition of facts and conditions, with carefully drawn conclusions. It is this latter that particularly concerns us.

The fundamentals of the modern mining report demand that the examination should have been conducted on certain lines; that certain matters should have been investigated; that certain tests should have been made; and when a report comes to hand not matching, point by point, with this formula, with some of these fundamentals slighted or missing, the investor will do well to refer it to independent engineering scrutiny, or, failing this, to send it back by the first mail.

These fundamentals are by no means esoteric; in their recital, they are not formidable, and to the uninitiated give small evidence of the weeks and months of laborious investigation they have cost the engineer.

They are: The assay plan showing the tonnage and assay value of the ore reserves; the table of costs; the summary of profits; the chances for the future; the question of title, and, if in the United States, the safety against litigation, arising from our deleterious law of the apex. It will not be without interest to see roughly how these are determined.

The assay plan is the multum in parvo of the report; to its production has gone more plodding work than to all the rest of the examination. It is an accurate, large-scale map showing ore bodies with their average values. Average values can only be truly determined by thorough and painstaking sampling, going over the workings yard by yard and laboriously breaking down rock that will represent the whole mass at each point. It is a tedious job at best, but cannot safely be slighted. It is frequently claimed that milling tests are better; that tests of the ore as it comes out from the drifts and raises of development work are better, that this, that or the other short cut to the result is better, as well as easier. All of us who have sweated in this sampling of mines will admit that there are many things easier, but the general consensus of those mining engineers who have been conspicuously successful in their prognostications is that there is no short cut that does not involve long and perilous leaps. From this it results that if the property is not in shape to be sampled, it is not in shape to be bought as a mine and it is only a prospect.

Strictly, I should close the paragraph right here, but I am so anxious to carry conviction on this point that I venture a word more. It is plausible to claim that from a tunnel driven on a vein of ore must come ore that will give a fair average of that vein; and this would be the case were the tunnel of uniform height from end to end, but it happens to be almost the rule that where the ore has been more valuable the tunnel has been run higher in accordance with the law of human conduct that puts the best foot forward, with the result that a certain proportion more of the better ore has been included in that coming from the tunnel. What becomes, then, of our average value?

Each of the assay values must be tabled with the width of ore it represents, and for each block in the mine averaged. Here no mere arithmetical average will do, summing the results and dividing by the number of them, for that would give the same weight to a 6-inch high-grade streak and the 6-foot low-grade. The true average must be gotten. For each sample width is multiplied by value, these products are added and divided by the sum of the widths. This is kindergarten teaching, so far as engineers are concerned, but hardly so, I fear, as regards the investor, to whom particularly I am speaking.

The determination of the tonnage represented by the ore blocked out is largely simply surveying work, but the engineer must use great caution in what he includes as ore reserves. Fortunately the old easy term of "ore in sight" is passing into disuse, thanks to the influence of a prominent mining society, and the modern engineer is expected to designate closely just what degree of certainty he has about the tonnage of each block. It is obvious that a tunnel driven 1000 feet in ore does not in rigid interpretation block out any ore, though an engineer is frequently justified in assuming certain distances above and below as "probable," or "reasonably to be expected;" but each such estimate is in its own category. The ore blocked out, as commonly understood, is ore with three or four sides showing in the workings. All of these data are collated on the assay plan; on the map showing the tunnels and workings to scale are plotted in proper position each sample with its width; the value for each block is given and the tons and average width, the one determined by multiplying the average width by the area of the block measured on the vein and dividing by the cubic feet going to make up a ton of ore in place; the other being the true average of the assays for that block. I venture to insist here, with an insistence that may to some savor of dogmatism, that an assay plan should be prepared in every case where a mine is being bought for its ore; nothing better than this shows whether the examination has been slighted, nothing is more readily comprehensible to the lay purchaser.

The costs of extraction in the case of an operating mine might seem to be a mere determination of results that a competent bookkeeper could prepare, and to a certain extent this is so. But more often than not the value of a particular mine hinges upon the introduction of improvements, increasing the capacity of the plant, and on economies to be gained in the present scale of operation. Light can be shed on these only by a proper segregation of the items of cost.

To a varying degree each mine is a lonely entity, with strong individual characteristics at times amounting to eccentricities. This is true even of mines in a single district, even in a district of the marked uniformity of the South African Rand, and thus it results that the engineer cannot safely say costs will be so and so because these have been attained elsewhere.

In the case of an operating mine he segregates the items over an extended period into reasonably narrow categories. A comparison of each of these with the work of other mines may give him a hint as to what items are normal and what not, but for definite figures he goes out through the works and mine, noting the duties of the men and their efficiency, both eyes open, his mind bent to a big interrogation point. In the light of this investigation he makes fresh calculations of what ought to be the costs on the present scale of working. Then he proceeds to a fresh segregation that will separate from the whole mass the fixed general expenditures, those that do not depend upon the yearly tonnage. As these will be practically the same in total, they will obviously be less per ton with a larger tonnage, so that, when the ore reserves are big enough, increasing the scope of operations affords a most profitable field for the investment of capital. The importance of this warrants reiteration in a different form; general fixed costs are constant in total, and inversely proportional to tonnage in per ton figures. Other costs are directly proportional to tonnage in total and constant in per ton figures.

This estimate tests most severely the ability and judgment of the engineer, and everything depends upon its correctness. It cannot be ignored, and yet, in the hands of the mere office man becomes academic and a snare. An error here is quite as serious as in the sampling, and, as examinations are nowadays conducted, it is easier to "salt" the cost sheets than the mine—and fully as effective.

The profits in the ore reserves of various kinds is a plain calculation from these premises, and, notwithstanding the serious drawback that the sampling can physically only represent the real values of the boundaries of the blocks of ore, has been found, except in unusual cases, to closely approximate the facts.

I have reserved until now speaking of the interval at

which samples are taken because the importance of this factor is now more clearly to be seen. The experience of the engineer and his preliminary inspection of the mine and assay books have told him what is likely to be the proper interval for his sampling. If the ore is high grade and spotted, he naturally takes a closer spacing, and 2-foot intervals are by no means unknown. Such close spacing is sometimes called for by even low-grade mines if the values are very irregular. The engineer recognizes that in a multitude of samples lies safety, and very frequently as the work progresses finds that the interval selected is too wide, and has to go back over his work and interpolate other samples. But he considers it an absolute essential that the distance apart shall be uniform for each individual block, it being obvious that if he has twenty high-grade samples from a 100-foot tunnel and ten low-grade ones from another 100-foot length, by even correct averaging, the result for the 200 feet will be too high. At times it happens that the high-grade ore would be more erratic in its sampling than the low, and that it would be a waste of time and expense to sample the low grade at as close an interval as the high. In these cases he is frequently justified in estimating each separately and then combining the two in the proportion of length that each represents. There is more than one way of doing this and it will hardly be interesting to explain fully such merely technical things.

It is rarely, however, that a mine is sold for merely the profits in the reserves; certain assumptions are made about continuance of ore, and it is the difficult task of the engineer to decide what assumptions are justified by the conditions. Indeed, it may be pertinently asked why any one should sell at all for only as much as he has already assured, and, on the other hand, why another should care to buy if he only expects to get back what he pays out. The answer to this question is outside the scope of this paper, but it can be briefly said that in the answer is involved the essential difference between the buyer and seller in any transaction, as well as certain peculiarities inherent in mining transactions alone. The vendor's knowledge of his mine is more sketchy than that of the buyer after his examination, and, while he is apt to be more hopeful of the prospects, this may be more than offset by imperfect realization of the possibilities of improvement. Aside from this, and in the case of the professional promoter, he is apt to figure on a price that will give him a good profit on his outlay and trouble. Logically and practically, then, it is the prospect that is bought, and we here come into close contact with the work of the engineers of the '80's and with that of the man who sets out to value a prospect.

A moment's consideration, however, shows that there are certain facts that here help out. The history of the mine affords certain clews to the future. The workings give vast advantages for the study of the particular geology. Moreover, almost a new science has been elaborated in recent years—that of economic geology. The servants of this have been enthusiastic and earnest and are opening out avenues of discovery that make our resources of twenty-five years ago appear, by comparison, sophomoric. This branch of geology is, however, only new so far as its general use is now common to the engineer. The painstaking studies of a generation of students go far to make it now possible; but what was being done in the '80's was the devoted work of a few; that of the present is being done by an army of investigators. By this the examining engineer now profits; indeed, he is very frequently assisted by a geological specialist in his investigations.

All the data of the assay plan are studied for the light to be thrown on the future as to change in dimensions of the ore bodies and of tenor in their contents, and to these questions of persistence they give prompt, if empirical, answers. The geological study of the vein, the existence of dikes, cross-veins, of changes in wall rock—all of these have a bearing on the future. Then there is the pertinent inquiry as to the extent the deposit owes its value to surface conditions, which are now recognized as often reaching to profound depths. It is practically impossible to do more here than state the prime factors in the case, which must all be combined into a trustworthy opinion. This is a severe test of judgment. No mine examination is to be lightly approached; but when the engineer reaches this summation of all his work, the responsibilities of his position have, in truth, come home to him. He is now to form his conclusions, the answer to the question with which he began, "What will be the profit?" He has certain definite facts arrived at by painstaking investigation; he has a number of facts of less definite demonstration, and he has a swarm of the small impressions that have buzzed around him during the examination. He must give due weight to each and combine the whole into a decision with logical sequence of conclusion to premise, so that no one can say "non sequitur." Just how this is done constitutes the personal factor, and who shall declare its course of operation? It is far removed from mere guesswork, it is the special faculty of the well-balanced mind; with no direct relation to personal predilection, we know it as but that imponderable quality of "judgment." But this talk about judgment must not blind us to the clear separation of fact from future. With all his innate habits of mind, the engineer strives to give his report the one, distinct from the other; and this is made clear no less in the use of his data than in the deduction of his conclusions. He virtually says: "These are the facts as nearly as can be determined, there are the uncertainties, the true weight of the uncertainties is thus and so, the chances are such and such. The problem is before you, make your decision; what will you do?" With this the scope of the engineer is reached, his work is done; he has investigated, and found the facts. He has studied, and evolved the probabilities; he has stated the one and the other with logical succinctness, and it is now up to the other man, as it always must be up to the man who provides the funds. When all is said and done, his decision is final.

I started out with the aim of showing what were the recognized fundamentals of the mining report of to-day, devised by experience to lessen the hazards of purchase; I have tried to show how guesswork has been eliminated, how certainty has been sought, whenever attainable; what the limits of definite information are, and what degree of reliance is placed on the purely personal factor of judgment. I have explained how the mining engineer, in his appraisement, makes the practice of separating the positive from the tentative factors; of presenting the one categorically, imperatively, as becomes the expression of ascertained physical facts, the other modestly, as things probable but concerning which the best judgment may be at fault.

If this serves to give the investor a better idea of what to look for in a mining report, I shall be pleased; if it aids him to place due value on the work of the engineer, I shall be gratified. If it leads some few to appreciate the essential qualities of mining as business without inordinate risk, I shall be more than satisfied.

The following paper, by James W. Malcomson, on the "Relations of Mining and Smelting Between Mexico and the United States," was an interesting contribution on this subject, which is of recognized international importance:

Twenty years ago practically all the gold and silver ores of Mexico were treated on the spot where they were mined by various local methods of treatment, amalgamation and leaching processes being very commonly employed.

Since 1885 a great change has taken place. Most of the ore now mined is transported by railroads to central smelting plants, and the precious metals contained reduced to bullion with the aid of lead or copper.

An enormous and prosperous smelting industry has thus developed to the mutual advantage of the mine operators and the railroads.

To-day the miner operating near the railroad finds himself able to turn his ore into cash immediately by shipping it to any of these smelters. He usually receives an amount which yields him as great or greater profits than he could obtain from local processes, and this, too, without any investment beyond the actual cost of mining the ore. The miner of refractory ores also finds himself almost as well off as the favored producer of free milling ores owning his own reduction plant, and it is only in those districts far removed from the railroads that the former cumbrous methods of local treatment are employed.

In order to form some idea of the importance of this change, it has been estimated that before 1885, 90% of all the silver and gold ore mined in Mexico was treated locally where it was produced, but to-day over 75% of all the ore mined is shipped over railroads to the smelters of the country.

Until 1890, lead ores were generally employed for this purpose, and Mexican gold and silver ores were shipped to Denver, Pueblo, Omaha, Kansas City and San Francisco, where lead smelters were in operation. Extensive smelting works in the city of El Paso were also erected at this period to handle ores from Mexico, which were actually crowding the ore markets of the United States

After the discovery and development of the lead mines of Sierra Madre and Nuevo Leon, in northern Mexico, the lead ore miners of Colorado in 1892, fearing that the introduction of Mexican lead ores into the United States would destroy their control of the lead ore market, succeeded in having a prohibitive duty imposed on this metal. The control of fluxing ores by the lead miners of Colorado at that time enabled them to dictate such terms to the smelters that smelting charges on lead ores were abolished entirely, but for a time the smelters were compelled to pay more for the lead contents of the ore than its market value to them. The result of the imposition of this duty was that the gold and silver miners of the United States were still left at the mercy of the lead ore miners, whose demands made it necessary for the smelters to obtain their margins from the miners of the siliceous ores, who were thus compelled to submit to higher treatment charges, while several millions of dollars of United States capital were invested in Mexico in the erection of custom smelters at Monterey, San Luis Potosi, Aguascalientes and other points.

During the past few years it has become evident, however, on account of the enormous increase in gold and silver production in Mexico, that the capacity of these lead smelters is insufficient, and that enough lead cannot be obtained to take care of the increasing production of gold and silver ores. One large smelter in the central part of the republic has already replaced its lead base with copper, although more than one-half of the copper employed is shipped south from the United States through El Paso, and on account of this unsatisfactory condition of the lead resources of Mexico it is inevitable that others of the principal smelting plants will soon be partly altered from a lead to a copper basis.

The greater part of the gold and silver produced in Mexico is found in siliceous ores, and the problem of the metallurgist is to get rid of this silica as slag, in the cheapest possible way, leaving the precious metals alloyed with the lead or copper used as a collector.

In a lead furnace the charge can not carry more than one-third of its weight as silica, and, owing to the relatively low temperature at which lead smelting is being carried on, the speed of operations is not great. In a copper furnace, owing to the higher temperatures employed, the charge may carry as high as one-half of its weight as silica, and twice the amount of charge can be smelted as in a lead furnace of similar dimensions. In other words, a copper furnace will smelt three times as much siliceous silver ore as a lead furnace of the same size in the same time.

Copper as a collector offers other points of superiority to lead. It can be enriched to a much greater extent with gold and silver. A copper furnace smelting gold and silver ores is often operated successfully with less than 1% copper in the charge, the volume of matter produced being made up by the use of iron sulphide ores, while a lead furnace can not be successfully operated with less than 7% lead.

There is, therefore, very little reason to doubt that the bulk of the silver and gold ore smelted in Mexico will be reduced in copper instead of lead furnaces in the near future, and the question arises: Where will this copper come from?

The silver and gold output of Mexico is large and increasing very rapidly. The silver production of 1904 was 71,880,000 ounces, or 18,000,000 ounces greater than that of the United States, Mexico being the greatest silver producing country in the world. The value of the gold produced during 1904 was $11,530,000, United States currency.

The greater part of this gold and silver is found in the central plateau of the Republic and along the lines of the main railroads, the principal districts being Pachuca, Guanajuato, El Oro, Zacatecas, Mapimi, Parral, Santa Eulalia, Catorce and Matehuala.

The production of copper in Mexico has increased from 900 tons in 1891 to 57,500 tons in 1904, largely owing to the opening up of the mines of Cananea. The bulk of this metal is mined in northern Sonora and Lower California and a considerable distance west of the gold and silver mining districts before mentioned. The adjacent territory of Arizona also supplies a large and steadily increasing output of copper, the output during 1904 being approximately 70,000 tons.

At the same time it is interesting to notice that the copper ores of Sonora and Arizona usually carry low values in gold and silver. At present they are smelted locally, the copper produced being shipped to New Jersey and other points on the Atlantic shore for refining.

There exists therefore to-day a temporary and abnormal condition of affairs which, when remedied, will have a profound influence on the development of mining and metallurgical enterprise, both in the United States and Mexico.

On the one hand, we have in Mexico a steadily increasing output of siliceous ores, rich in gold and silver, with a stationary or decreasing production of lead ores suitable for smelting purposes. The result is that gold and silver mining operations throughout central Mexico are handicapped by excessive treatment rates, and many gold and silver mines are now shut down which were formerly operated with profit.

On the other hand, there is in Arizona and southern Sonora a large and steadily increasing production of copper eminently adapted to the requirements of customs smelting, but which is not yet utilized for this purpose.

After the attention of the great copper producers of Sonora and Arizona is directed to the possibilities in smelting the gold and silver ores of Mexico, together with the copper ores of the West, there is no reason to doubt that very much greater profits will be made than is now the case.

Copper will be shipped to the refineries rich in gold and silver contents, instead of, as at present, without precious metal values of importance, and profits will be made by the combination that will benefit the miners and railroads quite as much as the smelters themselves.

When this copper smelting industry, now in its infancy, is developed along these lines, there can be little doubt that El Paso, lying as it does on the lines of communication between the copper mines of Arizona and Sonora and the gold and silver mines of Mexico, will become a copper smelting center of great importance, and a messenger of prosperity to the many gold and silver mines of northern Mexico.

A paper by F. A. Jones, on the "Mineral Resources of New Mexico," gave a comprehensive idea of the mineral possibilities of that Territory. The following is an abstract of this paper:

The mineral wealth of New Mexico first attracted attention at the time of the Spanish invasion in 1541, under Coronado. The natives exhibited ornaments and masses of silver, gold and ores, and also specimens of turquoise, which was used by them for ornamental purposes, and also as a medium of exchange. This gem stone was known to the ancient Indians (and also to the Aztecs) as "chalchihuitl." Turquoise was probably the first mineral mined in the United States. It is found in Los Cerrillos district, Burro mountains, Jarilla mountains and Old Hachita. The oldest known copper mines of New Mexico are those at Santa Rita, and these were the first copper deposits to be worked in America within historic time. The Santa Rita mines are the largest producers of copper in New Mexico, and are embraced in the copper belt of the southwest, that includes the deposits of Arizona and northern Mexico. The boundary line of this belt in New Mexico begins in the Mogollon mountains, and extends in a southeast direction through the Jarilla mountains. All that area lying to the southwest of this line belongs to the copper belt. The discovery of gold in New Mexico was made in gravels at the base of the Ortiz mountains, in Santa Fe county, in 1828. In 1839 new placers were found in the Tuerto mountains, south of the Ortiz mountains. The area, though not extensive, has produced approximately $2,500,000. Elizabethtown, in Colfax county, has made the greatest production of any district in New Mexico. Gold was discovered there in 1866, and the gravels have been constantly worked ever since. Rich silver mines have been found in New Mexico. Prominent among the silver camps are Lake Valley, Georgetown, Kingston, Hermosa, Chloride, Chloride Flats, Victoria, Mogollons and the Pyramid district.

The lead and zinc areas are principally confined to the west side of the Rio Grande, with the exception of the Organ mountain district. These ores are associated and found in the carboniferous limestones.

In the production of lead, the Magdalena and Cook's Peak districts take first rank; each of these districts produced several millions in lead carbonate and sulphide ores. At Granite Gap, in southwestern Grant county, are some promising lead-carbonate properties. A large quantity of lead is mined in the vicinity of Silver City.

The Magdalena district has come rapidly to the front as a zinc camp within the past two years. About $180,000 was credited the district in 1903. The output during the year 1904 reached nearly $1,000,000. Immense bodies of zinc-lead sulphide occur in the Magdalena mountains and at Cook's Peak.

Eastern Socorro county and western Lincoln county are the principal iron fields of the southwest. On the upper Gila are large alum deposits, not a pound of which has ever been marketed.

Sulphur abounds at "Sulphur" Hot Springs, near

White Oaks, near the Texas border and at Guadalupe.

Deposits of mica are found in the locality of Petaca, in Rio Arriba county. Other deposits are at Nambe, in Santa Fe county; at Talco, in Mora county, and in the San Andreas mountains, near Mocking Bird springs.

Pumice stone is to be had near the foot of Mt. Taylor, in Valencia county, and also east of the Rio Grande, in Socorro county.

Salt exists commercially in central New Mexico, but has not been utilized other than by ranchmen for their stock and local domestic purposes. The most interesting of these deposits is at the Zuni crater lake, in Western Socorro county. Here the process of salt making is continuous, due to the waters circulating through the underlying "red beds," whence they derive a strong brine as they flow into the shallow lake basin, depositing salt by evaporation. Other valuable salt deposits are found in the Estancia plain, in the eastern and northern parts of the plain of the "white sands," and in the region of the Pecos.

New Mexico has abundant gypsum, but only one plant exists in the Territory that manufactures cement plaster from this material, at Ancho, in Lincoln county. Many of these beds are several hundred feet in thickness. What is said to be the most extensive deposit of gypsum in the world is known as the plain of the "white sands," situated southwest of Alamogordo, in Otero county. This snowy waste of gypsum is about 35 miles in length north and south and about 18 miles across its broadest part.

Graphite abounds in the Raton mountains and in the Sandias east of Albuquerque. Guano is found in caves and extinct volcanic craters. Asphaltum exists on the Perea grant, in Guadalupe county, north of Santa Rosa. But little prospecting has been done for oil. Oil seepages are reported from different localities in the Territory, and there seems no good reason why paying wells will not be found sooner or later. The geological structure of probable fields in New Mexico is similar to that of Florence, Colo., and to the oil horizons in Wyoming.

In New Mexico coal is found in the Cretaceous rocks. In general, all of the coals of New Mexico are clean and make a good fuel. Some of these coals make a splendid coke, while others possess no coking qualities whatever. The areal extent of the New Mexican coal fields is not definitely known.

Among the interesting and valuable papers read was that of W. G. Swart, which follows, on the "Zinc Industry of the Rocky Mountain Region:"

For many years the zinc industry of the Rocky mountain region consisted almost wholly of efforts on the part of the miner to sort out, or mill out, and throw away enough zinc to bring his lead or copper ores below the penalty limit set by the smelters. Eight years ago this was changed through the purchase by European zinc smelters of some Leadville ores for their zinc contents. This was followed by a shortage of ore supply in the Joplin district, in Missouri, coincident with the enormous increase in demand for spelter, forcing the American zinc smelters to turn to the West for an adequate ore supply. The Rocky Mountain States have so far not been able to furnish ores of as high a grade as Missouri, nor will they ever do so, save in exceptional, scattered instances. This has greatly retarded the industry in those States.

Among the common metals, the metallurgy of zinc is the least advanced, and requires the cleanest ores unless iron furnaces be considered, which in the West is not necessary. A copper furnace can be successfully run on ores carrying 1% copper; a lead furnace on 7% lead; but a zinc furnace calls for at least 30% zinc, and 40% and 50% is much more apt to be profitable. Lead and copper furnaces are also built of great size, and charged like iron furnaces, automatically, in carload lots. The zinc retort still holds but a few hundred pounds, and must be charged by hand with a shovel. The consumption of fuel is also from eight to twenty times that of the lead or copper furnace. All these, and the further important factor that impure zinc ores produce low-grade metal or oxide, give the clean zinc ores a great advantage, and it is therefore not strange that the Joplin ores have always been standard, and have formed the basis of American spelter production, while the low-grade Western ores have remained untouched, or have been grudgingly shipped to the lead and copper smelters for their precious metal values, paying there the heavy zinc penalty. From the standpoint of the lead and copper smelters this penalty has ample justification. It is safe to say that the average smelter manager would be glad to eliminate zinc from his furnace as the miner would to escape the penalty. These two objects are at last accomplished, and Western zinc ores of almost any composition can be successfully dressed and profitably marketed.

This is largely the result of the increased demand for spelter mentioned above, and the consequent effort on the part of the zinc smelters to keep their output up by modifying and adapting their methods to these lower grade ores. This has taken time and money, and there have of course been disappointments and failures. Progress is shown by the fact that the first Western shipments carried a minimum of 45% zinc. Ores are now being regularly shipped assaying 30% to 35%.

Lead and iron are the impurities causing most trouble to the zinc smelter. Since these are the metals that are most desirable for the lead or copper smelter, and zinc the least so, one says naturally, "Separate them and sell each to its own smelter." It is along these lines that the future of the Rocky mountain industry lies. Most of the Western ores are complex sulphides, mixtures of galena, pyrite and blende, occurring in a variety of gangue rocks. In many instances hand sorting or simple concentration in jigs or on tables will give shipping products, but in the majority of cases some further or different treatment is necessary. This means that when, after trial, older and well-known processes fail to yield clean products, as they usually do, the newer methods must be utilized. Zince blende has too nearly the specific gravity of many of its associated minerals to be successfully removed by jigs or tables, and such work must be supplemented or replaced.

There are several methods now offered to the miner for the accomplishment of this purpose. All these methods are comparatively new and mistakes will be easy and costly, hence the miner should understand thoroughly that the work of selecting and installing a plant for handling zinc ores belongs strictly to the experienced engineer. This cannot be too forcibly stated. No two zinc ores are exactly alike, and since it is not possible to adapt the ore to the process, the process must be adapted to the ore. This is work for an expert and success depends on its recognition.

A number of chemical processes, based on leaching the ores both before and after roasting, have been tried. Such processes are attractive and are likely in the future to be entirely successful, but the fact remains that there is no such plant in commercial operation to-day in America, and work along these lines ought only to be attempted by strong companies having plenty of money for experiment.

In Australia successful commercial work has been done with what are known as "flotation processes," which depend for their operation on the selective lifting action of small bubbles of hydrogen gas on wet crushed ore. Experiments along these lines have also been conducted in America, but there is nothing commercial offered in this country as yet.

While these and other wet methods are full of promise for the future, the fact is before us that the only successful mills in operation in the Rocky mountain region are those using magnetism or static electricity. There are twelve such mills in the West at present, with a daily capacity of about 430 tons. Half this tonnage may be taken as zinc concentrates, which may be assumed to average 45% zinc. The indications are that in another year this will be doubled.

I have spent the past six years working exclusively on this zinc ore problem. I am free to admit my preference for wet work, but I cannot escape the fact that electricity is to-day making the Western output of zinc ore, and it is being done dry.

If put into the shape of high-grade concentrates, zinc ores are worth more per unit than lead ores, but low-grade lead ores can be marketed and smelted direct, while zinc ores cannot, hence the stipulation "high grade," and the broad assertion now made that in almost every case zinc ores must be dressed before shipment. Not only is this necessary to raise the grade of the zinc product, but to produce at the same time a by-product as valuable as possible, carrying the gold, silver, lead and copper, so that they may not be lost, but made a source of profit.

Any zinc ore can to-day be handled successfully, and many an old, abandoned mine be made to pay. There are exceptions, and the whole matter is so new that the statement made above will bear repeating—if failure is to be avoided, an expert must be consulted.

In Missouri, ores carrying 3% or 4% zinc, with no other values, are mined and milled at a profit. At present it will usually not pay to handle a Western ore carrying less than 10% zinc, provided there are no other recoverable values. One mine in Colorado is working a 7% zinc ore, but there is also recovered some $3 in gold, silver and lead.

Methods are daily improving. In three years ores carrying 5% zinc should be worked, in which the zinc will represent the sole profit, though not the sole value. Such ores are not being touched now, but we all know them to exist in large bodies, and as the knowledge of proper treatment spreads they will come into market.

The vital point in the whole matter is the recognition of the facts that, since zinc is penalized at the lead and copper furnaces, and lead, iron and copper are likewise treated at the zinc furnace, they must be separated and sold as cleaned products in the high market. Exceptions must be made here also, since the new zinc smelter at Pueblo buys mixed ores, and so do the Belgian furnaces; but it will be found that the prices offered are usually such as to make it profitable to the miner to separate his products before shipment. Even the furnaces just mentioned prefer the high-grade material, and will pay accordingly for it. It is a fortunate thing for the miner that his gold and silver values usually follow the lead, copper and iron, rather than the zinc, for the zinc smelters do not ordinarily recover these values, nor pay for them in low-grade ores.

Several things aside from new processes have contributed to the present activity and opportunity. The price of spelter has been uniformly high for some time, and bids fair to remain so as long as general financial conditions are good; many of the European mines have been obliged to curtail production on account of decreased ore reserve, causing the European smelters to look abroad for ore supply; the Western railroads have been generous in the matter of lower freight rates on these zinc ores, reaping their reward in the building up of a promising new business.

It has been suggested that the opening up of these large zinc deposits will lead to the establishment of zinc smelters in the West. This is possible, but there are certain considerations that must not be overlooked. Cheap labor, cheap transportation, and, above all, cheap fuel, are essential to zinc smelting. Unlike lead or copper smelting, it usually pays to haul zinc ores to the fuel rather than the fuel to the ores. If Western smelting can be made to pay, it will come in time, but it will not pay to wait for it, and meanwhile the miner should make the most of his opportunities, and recognize the fact that in his heretofore troublesome zinc ores he has to-day a most valuable asset.

As to the future, only a prophet dare speak. It is known that this Rocky Mountain region contains enormous zinc deposits. A prominent mining engineer has estimated 3,000,000 tons of zinc ore in Leadville alone, actually exposed; but it must not for a moment be supposed that all of this, or a tenth part of it, can be thrown on the market for years to come. Other extensive deposits are already opened in Utah, Idaho, Montana, South Dakota, New Mexico and Arizona, but they are apt to be even slower in coming into the market. One thing is sure, however: The zinc industry of the Rocky Mountain region is to-day on a firm basis, and is certain to expand and add increasing amounts to the world's tonnage as the years go by. This is certainly worthy the attention of every man interested in mining. Fortunes exist in these deposits, and a fortune in zinc counts just as many gold dollars as a fortune in lead or copper.

"The Mineral Resources of Alaska" was the title of a paper read by A. H. Brooks, who outlined the achievements and possibilities of our most northern Territory. Following is an abstract of his paper:

Last year the output of Alaska's gold mines was $9,300,000, while this year it bids fair to exceed $15,000,000. In 1880 the pioneers found the Juneau placers and soon after the auriferous lodes from which the alluvial gold was derived. These men soon found means to overcome the obstacles to inland travel, and discovered the alluvial gold of the Yukon about 1882.

The fifteen years that followed witnessed continuous progress in the exploitation of the auriferous lodes in the coastal zone, but the development of the Yukon placers, attended by so many difficulties, was of slow growth. Great changes were wrought in 1898, when the wave of excitement attending the Klondike discovery swept thousands of gold seekers into the Yukon region. This was followed by the Nome rush of 1900, which carried a vast horde of inexperienced men to the Seward peninsula. The Territory is continually attracting greater numbers of experienced mining men and larger amounts of capital. During the past decade it has been the placer fields which have received most attention. Meanwhile, the auriferous lode mining has been constantly on the increase, copper mines have reached a shipping stage, tin deposits are being actively prospected, and the coal fields are receiving much attention.

Of the total—$65,000,000—up to 1904, which, including this year, will be at least $80,000,000, about one-half has been taken from the mines of the Pacific coastal belt, and chiefly from lode deposits. The Seward peninsula has furnished about a third, and all of that in the past five years. The Yukon basin, though it has been a producer for twenty years, has only become of importance during the present year, since the discovery of the Fairbanks district. While exact figures are not yet available, it is probable that the Yukon region will yield nearly $7,000,000 in 1905, of which about $6,000,000 have been taken from the Fairbanks placers. During the first year of the Nome excitement the Nome placers produced less than half of the present output of Fairbanks. Yet Fairbanks is known only among mining men, while 20,000 people went to Nome the first year.

Tin has been found only in the extreme western part of Alaska, close to Bering strait, and but 60 miles from the Siberian coast. It occurs both in placers and in lodes, but the future of the tin mining industry can not yet be foretold. The lode deposits are similar to those of Cornwall, England, and the outlook is hopeful that they will become producers. Placer tin has been mined for several years and some shipments have been made, and the lodes are being carefully prospected.

At a number of localities on the Pacific seaboard there are large seepages, and at some, at least, the rock structure appears favorable for the formation of oil pools. The drilling that has been carried on has not met with much success, though some oil has been found.

The marble of southeastern Alaska is being developed, and the same region affords some mineral waters. At several localities gypsum deposits have been found. Of the other mineral resources of Alaska, granite, which is very abundant, should be mentioned. There are also extensive deposits of iron. Some cinnabar has been found in the Kuskokwim valley, but little is known of the character of the deposit.

Though up to the present time the gold and silver deposits have yielded practically all of the mineral wealth of Alaska, the copper mines are rapidly forging ahead. Copper is found in three districts. Two of these are on the coast and are now shipping ore, while a third lies inland. The southernmost field is in the Ketchikan district, on Prince of Wales Island, where half a dozen mines are in operation and two smelters have been built. The ores are chiefly sulphides, but also include some carbonates. Its accessibility and the abundance of timber make the Ketchikan district the ideal mining region of the Territory. Sulphide ores are also being mined in Prince William sound, where two mines are shipping ore and a dozen other localities where active prospecting is going on.

In the Copper and White river regions large masses of native copper occur in the glacial gravels, and these deposits furnished the natives with the only metal they had. After the Russians settled in Alaska, the copper deposits became of less value to the Indians, as they secured a better sub titute from the white men. During 1898 and 1899 search for the source of placer copper resulted in the finding of lode deposits on White river. The workable ore bodies are chiefly sulphides and occur in two belts, north and south of the Wrangell mountains. Their inaccessibility has made systematic prospecting difficult. There is no question but what Alaska is going to be an important source of copper.

At Cape Lisburne, in the extreme northwestern part of the Territory, an excellent quality of coal has been found by the United States Geological Survey in workable seams. It is of interest to note that this is the only known occurrence of Carboniferous coal west of the Rocky mountains. The region to the east has been but little explored, but the facts indicated a broad coal-bearing belt running parallel to the Polar sea. This field, locked in the ice for all but two months in the year, has no immediate commercial importance, but forms a part of the ultimate fuel resources of the world. A second bituminous coal field has been mapped which stretches along the lower Yukon, where some developments have been made, but there are no shipping mines. Lignitic coals are not uncommon in the Yukon basin, and these will eventually find a local market, but are undeveloped.

By far the most important coal fields are those near the Pacific seaboard. Best known is that of Controller bay, where there is a coal-bearing area of at least 150 square miles but 25 miles from tide water. Here numerous seams exceed 20 to 30 feet in thickness. This coal ranges from a high-grade bituminous to a semi-anthracite. A second field, carrying similar coals and probably in equal abundance, stretches along the Matanuska river north of Cook Inlet. This will probably receive early

development, as it is the immediate objective point of a railroad now under construction from tide water. Coal mining is being carried on at but few places and the total annual production does not now exceed a few thousand tons. As Alaska is annually paying $2,000,000 for fuel, it would appear to be an attractive field for the coal miner.

Whatever the future of copper and coal mining, the gold mines are every year adding millions of dollars to the wealth of the world. Two broad gold belts are recognizable. The one stretching parallel to the Pacific seaboard, through the Panhandle of the Territory and following the great bend of the coast line, is lost among the islands of southwestern Alaska. This zone includes practically all the auriferous quartz mines of the Territory and also some of the smaller placer districts. A second belt extends northwestward from the international boundary, near the Klondike, to the Seward peninsula. The interruptions in the belt indicate either that the field is unexplored or that the gold-bearing terranes are mantled by younger sediments. With the exception of the yield of one quartz mine on the Seward peninsula, all the gold from this belt, embracing about half the production of Alaska, has been taken from placers.

The coastal mineral zone, though it includes some important placer districts, is primarily a region of lode deposits. It has produced nearly half of the entire gold output of the Territory, and most of this has come from the Panhandle, or southeastern Alaska, as it has been called. In this field most of the gravels have been swept away during the recent extensive glaciation. Here a belt of metamorphic rocks, skirting the mainland from Dixon's entrance to Lynn canal, embraces the main lode system, which has many features in common with the mother lode belt of California. Workable auriferous veins have been found in a number of widely separated localities in this zone. Besides the mainland belt, other lode systems are found in the islands to the westward, but are less known.

The Yukon–Tanana gold belt, embracing the oldest producing classes of the interior, has been exploited for nearly a quarter of a century, but it is only this year that its output has run up into the millions. The placer gold finds its source in quartz veins and impregnated in a belt of metamorphic rocks. Some of these may yet be found to carry values, but no lode mining has yet been attempted.

The ever active prospector has found a new and what is said to be a very rich placer district lying to the south of Tanana. While much of this region has been run over in a hurried way, but little of it has been systematically prospected, and there is reason to believe that the limits of new discoveries have been reached. Moreover, under the present cost of transportation, only the richest deposits can be mined. It is fair to assume that this field will continue to be an important producer for many years to come.

Passing westward, what appears to be the same gold belt is found again in Seward peninsula. Up to the present year the Seward peninsula was the largest placer producer of Alaska, but its output this year bids fair to be exceeded by Yukon camps. This does not signify that the placers of the peninsula are on the decline, for they will not reach their maximum for many years. The cost of mining is much less than in the interior camps, and operations are on a much larger scale. At present much of the activity is being directed toward the installation of extensive plants, but comparatively few of which are in operation. The area of the gold-bearing gravels of the Seward peninsula is about equal to that of California.

One lode deposit has been developed in the peninsula, and this field may yet become a quartz mining region. When its gravels are swept away by the extensive mining operations which are now being carried on, the source of the placer gold will be revealed. Some of the deposits can be made to yield a profit, for even comparatively low-grade deposits will be mined, as the ditches now furnishing water for placer mining can be turned into power, and the railways for cheap transportation will have been built.

In Fairbanks district the broad valleys and low stream gradients present different problems to the miner than the coastal region. Cleary creek is one of the richest in the Fairbanks district. The pay streak being covered by an over-burden of 30 to 60 feet in thickness, drift mining is resorted to. The frozen condition of the gravels makes it impossible to tunnel throughout the year without the use of timber. It is said $6,000,000 worth of gold will be taken out this year.

The rapid evolution of mining methods in this northern field during the last five years is striking. For two years after the discovery of Nome, much of the gold was taken out with hand rockers, but this has been in part superseded by more economical methods.

The beach deposits of the Seward peninsula, though now nearly exhausted, have been the richest in the world. Near Bluff 400 yards of the beach averaged probably $150 to the cubic yard. Though there have been many improvements introduced in mining on Seward peninsula, shoveling in sluice-boxes is still practiced. Though there are in the Seward peninsula none of the tremendous bodies of gravel which have made the California placer fields famous, nor are there here the steep gradients and extensive water reservoirs which have made hydraulic mining in California the cheapest in the world, yet this method has its place in the Seward peninsula, and is constantly on the increase. The frozen ground has developed some new methods of mining, the most novel of which is the use of steam points. Dredging operations are constantly on the increase, and though they are not applicable to all parts of the placer districts of Alaska, they here find a legitimate place in economic mining.

The advancement of the mining industry in Alaska during the past decade, attested by the value of the annual mineral product, which has risen from less than $2,000,000 to over $15,000,000, has been great. The territory cannot reach its true position as a mining field until improvement in methods of transportation cheapens the cost of production. Besides the inland lying coal fields and copper district, there are scores, if not hundreds, of placers which must remain undeveloped until reached by railways and wagon roads. This fact has been recognized in Washington, and a move has been made toward highway construction, and means have been provided for explorations which must precede the choice of a railway location.

The Yukon basin is accessible by an all-water route from Bering sea, but this is closed by ice for nearly nine months in the year.

The means of river navigation have improved. The scow has been replaced by the steamer. The absence of a harbor and shoal water in northern Alaska makes the landing of freight expensive and this has been a severe tax on the mining interests.

Alaska's greatest need to-day is transportation facilities. It is necessary for a proper development of its mineral wealth that a railway should be constructed from some point on the coast to the Yukon region. A route for this railway can be chosen so as to include important coal and copper deposits, and it will open up a vast field which is now inaccessible. A railway to serve the mining interest must be constructed from some one of the good harbors, which are abundant on the Pacific, to the Yukon through American territory. The explorations and surveys of the Geological Survey have determined the general location of such a route. There are several classes which are feasible for railway construction, any one of which would reach the gold fields by a line not over 400 miles in length. A proper choice of location must be determined, not only on the topography, but also on the distribution of the mineral wealth, for on this will depend the tonnage of the road.

THE PROSPECTOR.

When going into the field the prospector should provide himself with a small steel pan for washing out samples to test for gold; a small steel mortar and pestle—a piece of drill steel "upset" at one end is best, as it cannot be broken, whereas the ordinary cast iron pestle is easily broken; and a pocket magnifying glass to examine samples. If the prospector has any knowledge of mineralogy, he should also have several bottles with ground glass stoppers for hydrochloric, sulphuric and nitric acids, and one for ammonia, and a good-sized bottle of pure water for washing, etc; two dozen test tubes, a blowpipe and alcohol lamp, several pieces of charcoal suitable for blowpipe use; litmus paper, red and blue; filter paper, glass funnel, and beakers for filtration, etc., and also a small scale for weighing materials. If the prospector is not familiar with the scale of hardness, he should have some small samples for test. The important ones are: 1, talc; 2, gypsum (selenite); 3, calcite; 4, fluorite; 5, apatite; 6, orthoclase (feldspar); 7, quartz; 8, topaz. The sapphire (No. 9) and the diamond (No. 10) may be dispensed with. Of course, he must also have the necessary working tools—picks, shovels, drills, hammers, etc. Most prospectors, however, go out with a very limited equipment, taking merely the mortar and pestle and pan, and some do not even provide these, but bring all samples collected back to town for determination and assay.

The interesting rock and ores from Lone mountain, Esmeralda county, Nev., are classified as follows: No. 1, an altered intrusive rock, carrying 10% or more of iron sulphide, which may contain gold and silver. The rocks should be assayed to determine these values. The dark-colored rocks in this package are similar to the light-colored ones, being simply oxidized, containing iron oxide instead of sulphide. The black, red and yellow colors are due to oxidation. Package No. 2 contains three pieces of crystalline, and partly crystallized vein quartz, showing iron sulphide (pyrite) and iron oxide (hematite), with a little green copper carbonate. This lot should also be assayed for precious metals. No. 3, consisting of four pieces of mineral, contains a white piece, principally carbonate of lime, with a little quartz, and a few yellowish-green garnets. The largest piece, consisting of a mass of crystals with pearly luster, is almost wholly garnet. A little copper carbonate can be seen. The smallest piece consists of a siliceous iron-stained rock containing some green copper carbonate. The dark-colored heavy piece is principally yellow copper sulphide (chalcopyrite), altering to bornite. It is a good grade of copper ore, and may also contain gold or silver, or both. It should be assayed for all three minerals. No. 4 contains a quantity of much-altered ore, principally iron oxide. It may be a part of the gossan of a copper-bearing vein. It also should be tested by assay. The white mineral in No. 4 is calcium carbonate.

The ores from Helena, Mont., are evidently from a zone of brecciation into which mineral waters have infiltrated, depositing iron sulphide, and probably also gold. The rock has since been oxidized and now shows iron oxides, while the brecciated structure of the material can be plainly seen. In a deposit of this character there may be walls on either side or on one side only, or the fissure may be in the central portion of the deposit, the mineralization having penetrated both walls. What the rock was originally it is impossible to say, owing to extreme metamorphism.

The rocks from Mineral hill, Pony, Mont., are: G, gneissoid granite; B is quartz-mica diorite.

Concentration and Separation of Zinc-Lead Ores.

Written for the MINING AND SCIENTIFIC PRESS by D H. LAWRANCE.

The county of Summit, Colo., long famous for its great gold production in the past, and for the fact that its collection of gold specimens is seldom equaled for rarity and beauty elsewhere in the world, is now becoming widely known as a center of importance for the production of lead-zinc ores.

For a long time past Breckenridge, the county seat of Summit county, has been a shipper of large quantities of high-grade zinc and lead ores to various smelting and chemical works, but only this year has it come to the fore in milling the ores of lower grade, so concentrating the metallic values and afterwards effecting a separation of the different metals as to make readily marketable products that are sought by the various metal works.

The first plant erected in Breckenridge district to make a good concentration and separation is the large mill of the old Union M. & M. Co., built during last winter and spring on the property of that company at the foot of Mineral hill, in French Gulch, one mile from town. The plant is so located as to handle all the ore trammed directly into it from the lowest level of the mine, and at the same time is conveniently situated for the hauling in of custom ore by the road. The building of the old Union mill was completed in July, 1905, and has been making trial runs and test crushings and concentrations ever since. It is the largest plant of its kind in Summit county, and one of the best arranged in the State. The dimensions of the building are 70x130 feet in length, and 73 feet in height at the apex, and in its erection over 200,000 feet of lumber has been used. The pulverizing machinery consists of one 9x15 jaw rock crusher, and two sets of 14x24 rolls. The concentrating and separation plant is a combination of eight jigs, eight No. 5 concentrating tables and two No. 5 slimers. Besides the above are the usual accessories in the shape of automatic feeders for the rolls and concentrators, elevators, classifiers, tanks, etc.

The power is supplied by a 100 H. P. tubular boiler, 16 feet long and 52 inches in diameter, and a 150 H. P. Corliss engine 14x36.

The sizing and classifying are done by a combination of revolving screens and hydraulic classifiers.

The flow of the ore is as follows: The ore trammed in from the mine or hauled from customers' properties is dumped directly into ore bins at the top end of the mill, and is all fed automatically to the crusher by means of a trough. From the crusher it is passed by an automatic feeder into the coarse rolls, whence it gravitates into the elevator boot and is lifted to the top of the building, to the main screen line. It first goes to an 8-mesh revolving screen, the oversize passing back to the fine-crushing rolls. The fine passing through the 8-mesh goes to a 10-mesh screen, the oversize from that being conveyed to two 4-compartment jigs called Nos. 1 and 2. The fines from the 10-mesh go to a 24-mesh screen, the oversize therefrom going to jigs 3 and 4 The product that passes through the 24-mesh is conveyed to a 30-mesh screen. That which passes through the 30-mesh is carried on to the hydraulic classifiers. The oversize goes to jig 5. The hydraulic classifiers make three sizes, the coarsest of which goes to jig 6 and the intermediate to four tables, and the finest to two tables. Jigs 1, 2, 3 and 4 take out the iron and lead in the different compartments, and the zinc and silica overflow to two more 4-compartment jigs on the lower floor, where the zinc is taken out and the rest of the material runs down the tail-sluice. Jigs 5 and 6 are 6-compartment machines, and separate the zinc and lead and iron direct in the one operation on the upper floor. The tailings from the four tables handling the intermediate product of the classifiers go on to two tables on the lower floor, and that from the two tables handling the fine classified product go on to two slimers, where another good zinc product is made.

The company is doing good work, and is shipping three different products: First, the lead concentrates carrying the high silver values and some gold; second, the iron concentrates carrying gold and silver values; third, the zinc concentrates carrying gold and silver values, all of which are finding a ready market.

The capacity of the plant is 120 tons per day, and the output will average 30 tons per day of concentrates.

The officers of the company at the operating end are: Albert E. Keables, general manager; David H. Lawrence, M. E., consulting engineer; George Smith, mine superintendent; Charles F. Gilbert, mill superintendent.

The company is an Eastern organization, the majority of the stock being held in Illinois and Wisconsin, the head office being in Oshkosh, Wis. The success of the old Union mine and mill will give a great stimulus to zinc-lead ore mining in Breckenridge and surrounding districts, and other mills will be the order of the day where low-grade ores are found in large bodies.

Reduction Plant and Process at the Oroya-Brownhill Mines.*

Written by Robert Allen.

The ores from the three mines are similar in character—schistose, and crush freely; also they are free from minerals harmful to the cyanide process. They contain from 50% to 65% of silica and insolubles, about 7% carbonate of lime, 3% to 5% carbonate of magnesia, about 5% of alumina, the balance being principally iron compounds. Tellurides of gold and silver are found throughout the ores, also coloradoite (a telluride of mercury). These, with considerable auriferous iron pyrites, form the great bulk of the concentrates, and contain the greater proportion of the gold contents of the ores. The amount of free gold is small, existing in a very fine state of division, disseminated through the mass as a rule.

As the result of a lot of experimental work upon the Kalgoorlie sulpho-telluride ores by Dr. Diehl, the present process was installed upon the Brownhill mine in 1901. Some modifications of methods have been adopted and extensions of plant made since then, the process of treatment being briefly as follows: The ore is coarse-crushed by breakers, milled in a battery through a coarse screen without amalgamation; the tailings separated into "sand" and "slime" products; the former is sized, its coarser sizing being coarse-ground in Wheeler pans; the whole of the "sands" are passed over tables, the eliminated concentrates being roasted, fine ground with mercury, agitated with cyanide and filter pressed, while the balance of the "sands" tailings is slimed in flint mills. This product is agitated with ordinary cyanide and bromo-cyanide and filter pressed; the gold solution is precipitated, as well as that from the concentrates, in ordinary zinc extractor boxes.

The great advantages of the process are that it is a wet crushing process, and consequently there are no dust troubles, and the treatment of the ore is completed within a couple of days.

Ore Breaking and Transport.—The Oroya ore is dumped from the brace on to 1½-inch spaced grizzlies, the coarse portion being broken by a No. 6 Blake breaker. The crushed ore is conveyed by an aerial tram to the bin of the Brownhill mine, a distance of about half a mile. The Brownhill ore is crushed by a similar breaker and drops into the same bin, which holds 600 tons. At the bottom of the bin are five belt-driven feeders delivering the ore on to a horizontal 18-inch belt conveyor, delivering to a second belt conveyor, which elevates the ore and delivers the full length of the battery bins, operating a traveling tripper, which distributes the ore evenly. The battery bins hold about 360 tons. The power used by the rock breaker is 15 H. P., by the aerial tram 7 H. P., and by the belt conveyor 4 H. P.

Milling.—The battery has fifty stamps, each of 1100 pounds. It is fed by suspended feeders from the battery bins. The ten mortars are of the ordinary Homestake pattern. End, side, and shoulder liners of malleable cast steel are used in the boxes. The boxes are 11½ inches wide at the surface of the dies, and 10 inches deep below the discharge. The dies and shoes are of forged steel, each of 9 inches diameter. The dies are worn down to about 2 inches thickness, compensation for loss of depth being made up by false dies. The depth of discharge is kept at about 2 inches by means of cleats. The steel consumption of the shoes and dies are respectively 4.36 and 4.56 ounces per ton crushed.

The stamps drop 108 times a minute a height of 7¾ inches, and with 10-mesh woven wire screens have a duty of 6.48 tons.

Plant water, kept to an alkalinity of .003% KOH by means of lime, and containing 0.04% KCN, is used in the battery, the amount used being eight gallons per stamp per minute. The power required by the battery is 160 H. P.

Classification of Battery Pulp.—The pulp from the battery is run direct from each box to a pair of conical spitzkasten in series, 14 inches by 16 inches and 24 inches by 28 inches, respectively, which eliminate two underflows of coarse sands and fine sands respectively, and a "slime" overflow—the last, amounting to 41% of the ore milled, can practically all pass a 150-mesh screen. The slime pulp passes directly to a pump sump. The coarse sands pass to five coarse-grinding pans, which are the 5-foot diameter improved Wheeler pans commonly in use on the field. The ground product from these pans passes on to a conical spitzkasten, 12 inches by 16 inches, which separates a coarse product and a finer product. The former is passed over five "coarse" tables, while the latter, with the fine pulp liberated by the battery spitzkasten, is sent to five "fine" tables. The ten tables separate out two concentrates products, while the tailings gravitate to the pump sump and are elevated, by means of four plunger pumps, 10 inches by 48 inches, a height of about 35 feet, to a nest of conical spitzkasten, consisting of eight rows of three each in series.

The sizes of the cones are 2 feet by 2 feet 9 inches, 2 feet 6 inches by 3 feet 6 inches, and 2 feet 6 inches by 3 feet 6 inches respectively, and the widths of the delivery launders of each set are 10 inches, 14 inches and 14 inches respectively.

The first two underflows, containing coarse sands, are sent to six flint mills for fine grinding; the third underflow, containing fine sands, is distributed over six tables, which eliminate a third concentrate product, the tailings being returned to the pump sump (A); the overflow containing slimes—i. e., material all passing a 150-mesh screen—is sent to the pulp condensers. These consist of five nests, three containing twelve inverted pyramidical spitzkasten, each 5 feet square and 5 feet deep, and two nests each containing twenty-four similar spitzkasten, where the slime pulp is thickened up in the underflows to a consistency of 1.41 specific gravity, which is sent to the agitator vats for treatment.

The slime from sump A is pumped by three-throw plunger pumps to three rows of four spitzkasten. The underflow from first row goes to flint mills, from second row to six tables, and the underflow from the third to the agitators, the overflow passing on to pulp condensers the same as above.

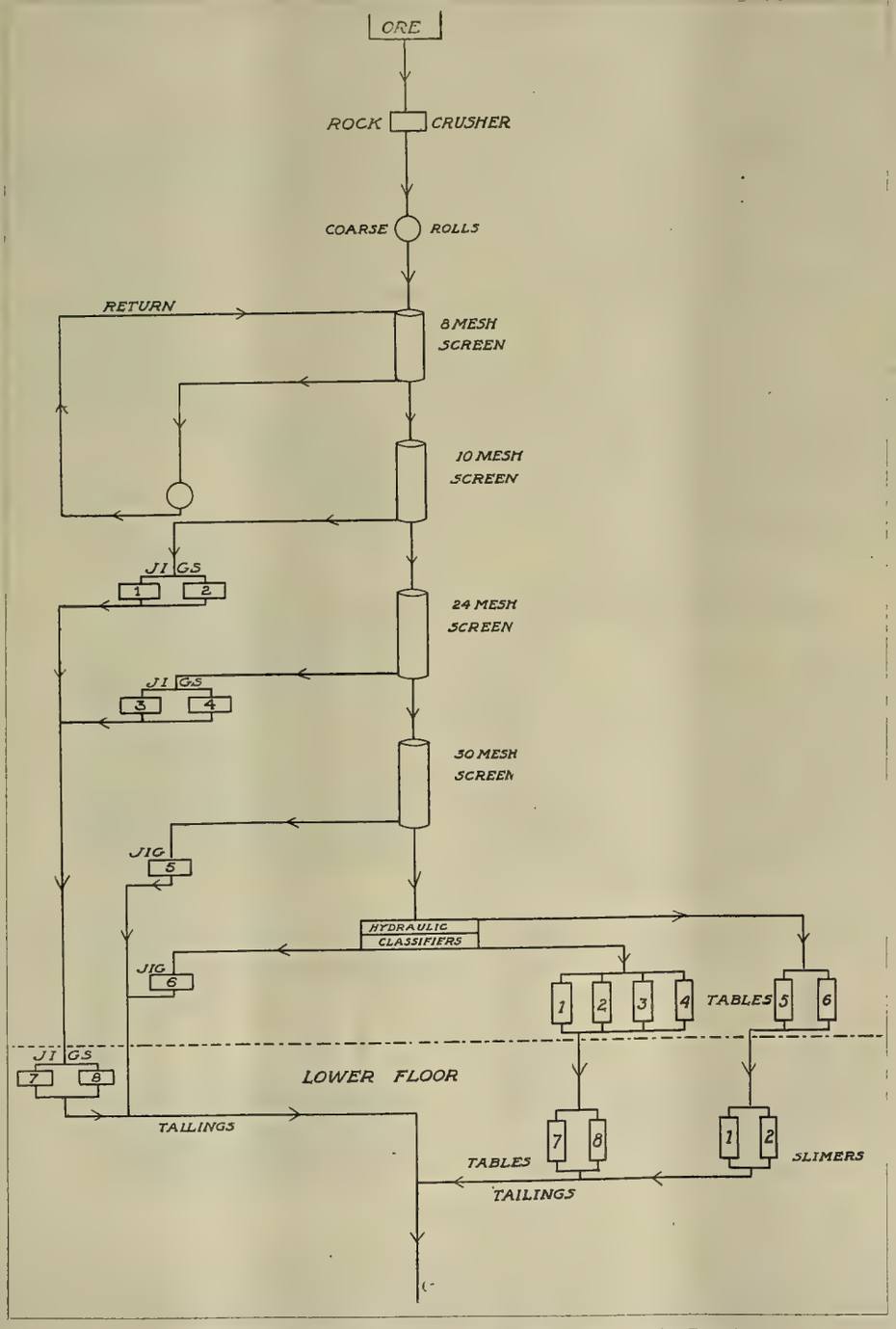
The overflow from pulp condensers—return water—is passed on to four intermediate settling tanks, where any suspended slime is settled, and thence on to a storage tank, from which it is sent by pump E to the battery overhead service tank. The flint mill products are sent back to the pump sump A.

Coarse Grinding Sands.—The grinding pans already referred to are used simply for grinding, with no mercury. They are run at fifty-one revolutions. A set of shoes and dies lasts three months; the shoes are worn down as far as possible, compensating rings, cast locally, being used to keep the grinding weight as uniform as possible.

Concentrates Treatment.—The concentrates already referred to contain the great bulk of the refractory elements in the ore. As far as possible these substances are eliminated with the concentrates to avoid consequent increased consumption of chemicals in the raw slime agitation vats. The concentrates, amounting to about 6% of the ore milled, and worth about eleven ounces per ton, are trucked from the various tables and sent to the feed floors of three roasting furnaces; salt in amount one-half pound to two pounds per ton, and sometimes acetate of lead, is used here. These furnaces roast ten tons of concentrates each per twenty-four hours, the duration of the roast being five hours. The furnaces have six rabbles each, two more than is usual. They require one-sixth ton of wood fuel per ton of concentrates, or 16⅔%, and absorbs 4½ H. P. One furnace man per shift attends to the stoking and feeding. About 600 tons are roasted per month, the sulphur contents being reduced from 35% to 0.2% (as sulphide). About 1.1% of the whole amount roasted is caught as fine dust in the furnace flues; it assays but a little higher than the roasted concentrates—about fourteen ounces per ton. Exhaustive tests have proved the loss from volatilization of gold to be inappreciable. The concentrates decrease in weight in roasting from 25% to 30%.

The roasted product is removed by a push conveyor with 22-inch flights to two pairs of grinding pans of the same type as above mentioned, worked in parallel. The first pair is used both for fine grinding and amalgamation, their overflows passing on to the second pair, which is used for fine grinding only.

*Abstract Jour. Cham. Mines, Kalgoorlie, W. A.



Flow Sheet of the Union Mill, Breckenridge, Colo. (See Opposite Page.)

Mercury is added three times daily to the first two pans, amalgamation recovering about 30% of the value of the concentrates. The greater part of the metallic iron slimes made by the battery and coarse grinding pans is caught with the concentrates, and prevented from entering the raw slime agitation vats.

The ground concentrate pulp is elevated by a 6-inch belt-driven plunger pump to a pair of conical spitzkasten, each 2 feet 6 inches by 2 feet 6 inches, which eliminate any coarse material for returning to the second pair of grinding pans. The overflow is distributed over a nest of nine inverted pyramidical spitzkasten, each spitzkaste being 4 feet 6 inches square by 4 feet 6 inches deep, the whole forming a settling surface 15 feet by 15 feet. The underflows united form a sludge of consistency 1.34 specific gravity. This is sent to three vats, in which it is agitated, with the addition of ordinary cyanide, for a period of about 100 hours, afterwards being filter pressed.

The overflow from these pulp condensing spitzkasten is sent to two settling vats, used alternately, the settled liquor being afterwards passed through the concentrates extractor boxes and returned to plant.

FIND-GRINDING SANDS.—The flints used in the flint mills are imported from the shores of the Baltic, and cost 7s 4d per cwt. in Kalgoorlie. Of the six mills on the Brownhill plant, five are 13 feet 7 inches long by 3 feet 8 inches in diameter, the sixth being 12 feet 11 inches by 4 feet 1 inch. Each is a long welded drum with cast steel ends, terminating in hollow trunnions through which the pulp passes. They are lined with chilled cast iron or cast steel plates 1 inch thick, locally made, each being bolted to the shell by two ⅞-inch bolts, with countersunk heads. The liners are worn down to from ¼-inch to ⅛-inch thickness, their thickness not affecting the efficiency of the mill. About 470 pounds weight of liners are worn down in each mill per month. The liners cost 30s per cwt., and a new set is put in by two men in seven hours. The mills are driven at thirty-two revolutions per minute, with spur gearing; each mill requires 21 H. P. to drive it. About 8 cwts. of flints are used up per mill every month. The mills are kept about half full of flints, a mill charge weighing about 2½ tons. Periodically the contents of the flint mills are removed, all flints passing a 1½-inch ring being rejected, the larger flints having been found superior for wet grinding.

On the Brownhill, of the material fed into the mills, about 17% will pass a 150-mesh, while the ground product contains 24%, so that about 7% of slimed material is eliminated by each passage through the mill. It is estimated that, under present conditions, 238 tons of ore pulp are passed through each mill per twenty-four hours, so that each actually fine-grinds about 27 tons per day, equivalent to 160 tons per day for the tube-mill plant.

RAW SLIME TREATMENT.—The raw sludge from the pulp-condensing plant is agitated with ordinary cyanide and bromo-cyanide in ten covered-in agitation vats (provided with the usual mechanical stirrers), from 20 feet to 25 feet in diameter and from 7 feet 6 inches to 8 feet deep. They hold from 90 to 110 tons of pulp, equivalent to from 41 tons to 50 tons of dry slime. Each agitator takes about four hours to fill. The solution, which forms about half of the bulk of the sludge, is plant water containing about .8 pound per ton, or .04% of cyanide; it is made up by the addition of more cyanide to 0.1% strength. The contents of each vat are first agitated for three hours, then bromo-cyanide in amount proportional to the value of pulp—about 1 pound to each ounce of gold—is added, and the agitation continued for another twelve hours, when solution is effected. Toward the end of the agitation—about two hours before its completion—lime in amount from 2 pounds to 5 pounds per ton is added. During the agitation about ¾-pound to 1 pound of ordinary cyanide per ton is consumed, while the whole of the bromo-cyanide is destroyed. After agitation the raw or roasted pulp is discharged into a sunken agitator, whence it is pumped to the filter presses under a pressure up to 70 pounds.

FILTER PRESSING.—The plant at present includes six modern presses of fifty frames, each 40 inches by 40 inches by 3 inches, with efflux taps to each plate, and external ports. There are four presses hydraulically closed, each holding 5.9 tons, and having a filtering area of 1111 square feet; also two with a patent angle lever closing arrangement, each holding 4.5 tons, with same area filtering surface. A press, with pressure up to 70 pounds, takes twenty minutes to fill, after which the cakes are washed with a weak solution of cyanide of about 0.02% strength under 70 pounds pressure for twenty minutes, when about 500 gallons are passed through the cakes. The cakes are next "dry blown" by compressed air under 30 pounds to 60 pounds pressure for ten minutes, the final effluent from the presses during this air-drying assaying from a trace to 6 grains per ton only. The press in then discharged, this operation taking twenty minutes more, the whole cycle taking about seventy minutes. The residual moisture of the cakes is about 14%, and it is interesting that filter press cakes from a dry process plant retain more moisture than those from a wet process plant. Formerly the presses were filled by montejus by means of compressed air, but that system has been abandoned in favor of the more economical practice now introduced in many filter press plants of filling by means of a three-throw belt-driven plunger pump 8 inches by 18 inches.

(TO BE CONTINUED.)

Filter Pressing Slimes.

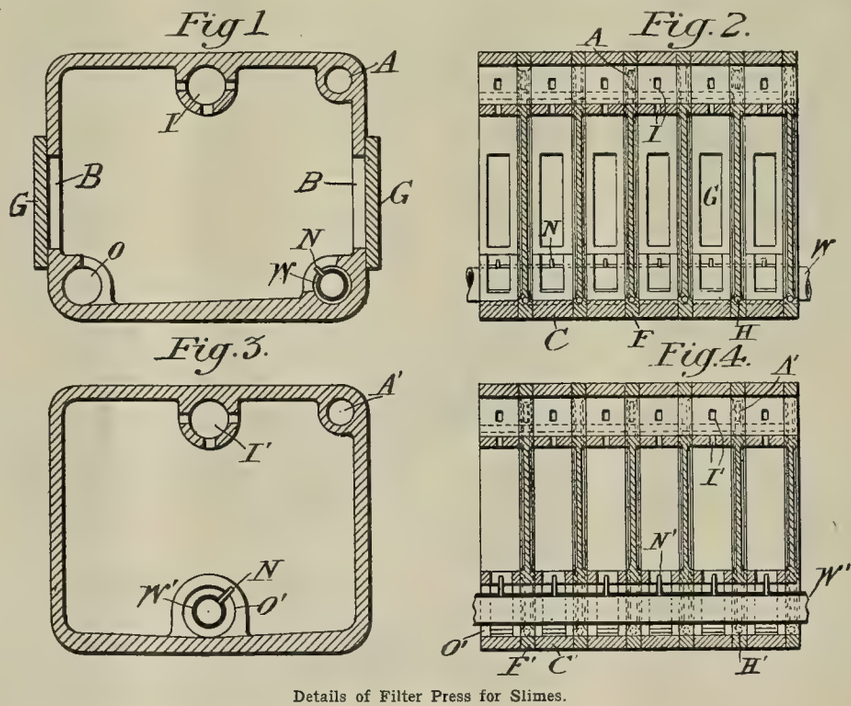
For four or more years the Homestake Co. at Lead, S. D., has been successfully treating its tailings, or rather a portion of them, by the cyanide process. The first plant with a capacity for treating 1200 tons daily was built in 1900–01, and took the pulp from three large mills crushing 2000 tons of ore daily. In the experiments made on this pulp it was found that better results were obtained if the slimes in the ores were separated from the sands. This separation was effected by means of hydraulic classification, for which a series of large cone-shaped settlers is used.

The thickened pulp is drawn from the bottom of these cones, the slimes overflowing at the top. The material drawn from the bottom of the cones is delivered to large leaching tanks where it is treated by percolation. The slimes, which contain values in gold, have for years been used in sluicing the sands from the large tanks, after first having been relieved of a portion of their water, the water being pumped back for reuse in the mills.

For a long time C. W. Merrill, who designed and built this great plant, with its several additions and improvements, has been experimenting to discover an economical method of treating the slimes at a profit. As a result of these labors he has been able to demonstrate that the slimes can be successfully and rapidly treated by filter pressing. This requires a filter press of peculiar construction and operating automatically and practically continuously. It is customary in the operation of filter presses to separate the several units of which the presses are made, known as the distance frames. Ordinarily it is the practice to do this by hand, and the process involves considerable labor and time, making the operation expensive. The time thus consumed also reduces the capacity of the press, and the wear on the filter clothes is quite an item in the expense account. As a natural result this limits the employment of the ordinary type of filter press to material of comparatively high grade.

Another feature of the usual filter press necessitates a high pressure in order to properly accomplish the filtration through the thick cake. Mr. Merrill has designed and built a filter press which does not require the distance frames to be taken apart in order to remove the semi-solid cake of slimes after the solution has been expressed from it. In this an inlet has been provided for each distance frame through which a liquid, vapor or gas is introduced under pressure, and the unfilterable material forced out of the container through an outlet in the frame.

The accompanying sketch illustrates the press and method of operating it.



Details of Filter Press for Slimes.

Fig. 1 is a longitudinal cross-section of a container, and Fig. 2 is a vertical cross-section, Fig. 1, of a series of containers put together in the manner usual in filter presses. Fig. 3 is a vertical longitudinal section of a modified form of container. Fig. 4 is a vertical longitudinal section of a series of such modified form of container put together. In Figs. 2 and 4 the views show the vertical cross-section when looked at from left to right.

In the construction shown in Figs. 1 and 2, C is the frame of the container, which may be in cross-section of any convenient shape. B B are openings in the sides. O is an opening or outlet at one side through which the solid, semi-solid, or unfilterable material, hereinafter for convenience called the "precipitate," is removed from the containers and which when a series of containers are put together in a filter press makes a continuous opening through the press, which is closed at the ends in any convenient manner and discharges into any suitable receptacle. A is a corresponding inlet for treating the precipitate in place with liquids, vapors, or gases, and which is preferably placed at either or both upper corners of the container and in like manner forms a continuous opening or openings when the containers are placed together in the filter press. I is an inlet through which the material to be filtered is introduced, which inlet is of the same general character and becomes continuous when the containers are put together in the filter press and is provided with the openings 1, 2 and 3, from which the material is introduced into the chamber. W is a supply pipe or channel through which the liquid, vapor, or gas is introduced under pressure for the purpose of removing the precipitate. This is provided with a nozzle, slit, or hole which enters into each container. F is the filter plate, which is introduced between the containers. G is a gate which is used to close the opening B B.

In the second construction, Figs. 3 and 4, the opening O′, which corresponds to O in the structure shown in Figs. 1 and 2, is placed within the container and contains in its interior the supply pipe W′, fixed or rotative, which corresponds to the pipe W and like it is provided with nozzles N′ N′, similar to the nozzles N N, which pass into each container, a series of these being employed, as in the previous construction. I′ represents the inlet through which the material to be filtered is introduced, which corresponds to the inlet I in Figs. 1 and 2.

A large plant is being constructed on McGovern hill, overlooking Deadwood, where the slimes from the two cyanide plants of the Homestake are to be conducted and treated by means of filter presses similar to those described, or some modification of them. This new plant will have a capacity of about 1600 tons per day.

ARGENTIFEROUS LEAD was first produced, according to Hahn, in 1866 or 1867, near Helena, Mont., and at Oreana, Nev. In 1869 the mines of Eureka, Nev., discovered in 1864, were opened, and the treatment of ore begun in the following year. Next came Utah, where smelters were erected in 1870, followed by Colorado, which came into prominence in 1878. Later, Idaho, New Mexico and Arizona were added to the list. Colorado has been since the largest producer, and it, together with Idaho, in the year 1900, produced about 50% of all the lead of the United States. The largest output of lead at present comes from the Cœur d'Alene district, Idaho.

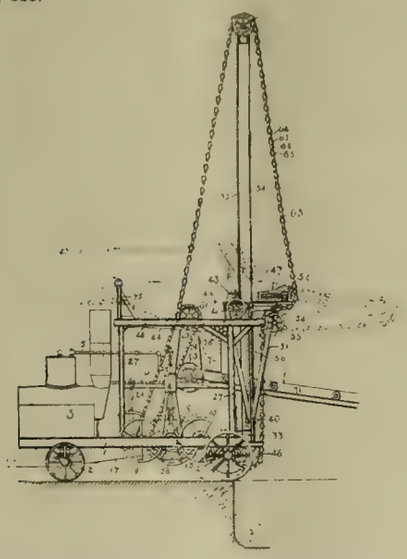
NOTHING has advanced the mining industry more effectively than the improvements in concentrating machinery, which have been made the past few years. The jigs, tables, and vanning machines, together with sizing and hydraulic classification, have accomplished much.

Mining and Metallurgical Patents.

PATENTS ISSUED NOVEMBER 7, 1905.

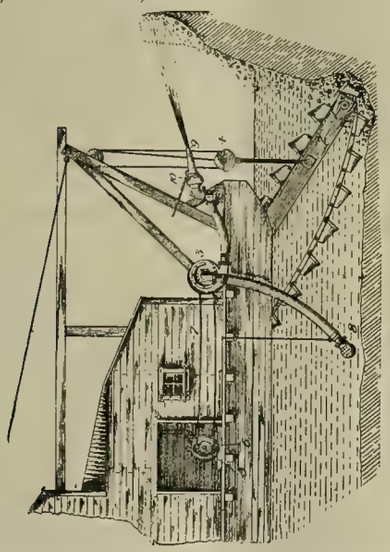
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS

EXCAVATING MACHINE.—No. 802,985; J. Helm, St. Louis, Mo.



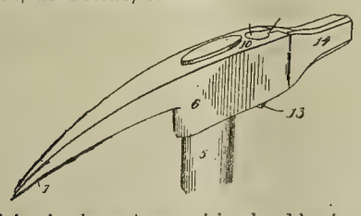
Excavating machine, comprising main frame, sprockets on main frame, guide frame pivotally mounted on main frame, yieldingly mounted sprockets on guide frame, shaft mounted on guide frame provided with sprockets and brake, conveyor frame reciprocatingly mounted on guide frame and conveyor passing over all of sprockets, sprockets on main frame engaging ascending side of conveyor, and sprockets on guide frame engaging descending side of conveyor, yieldingly mounted sprockets engaging conveyor at point behind point of engagement of sprockets on shaft provided with brake with conveyor.

DREDGING APPARATUS.—No. 803,587; R. G. Hanford, San Francisco, Cal.



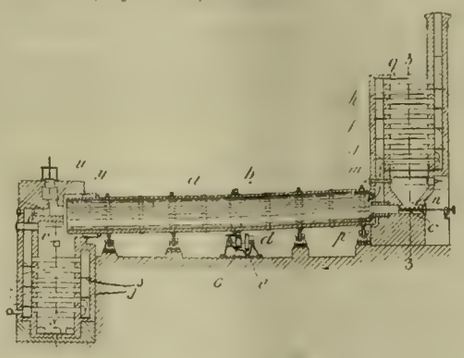
In combination with dredge hull, chain of buckets projecting below hull, pump, and hydraulic monitor mounted upon hull and connected to pump, and adjustable relatively to hull.

PROSPECTOR'S PICK AND AX.—No. 803,620; J. McMahon, Revelstoke, Canada.



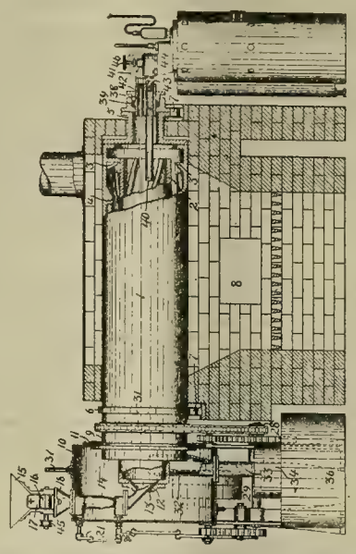
Mining implement comprising head having pick on one side, head formed with perforation between sides for handle, and recess parallel with perforation and terminating in ledge provided with perforation, insertible member having portion engaged in recess and seated upon ledge, and fastening member entered from under side of ledge and threaded into portion of insertible member seated on ledge, fastening member being disposed parallel with handle of implement.

FURNACE FOR BURNING CEMENT, ETC.—No. 803,530; G. Grondal, Djursholm, Sweden.



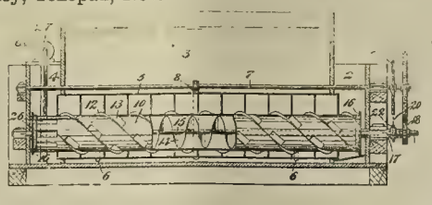
Furnace for burning cement or reducing or calcining ores comprising hollow rotating cylinder or drum slightly inclined to horizontal, vertical furnace located above upper end of cylinder, shaft located under lower end of cylinder, device for making gaseous mixture at lower end of cylinder and feeding device under vertical furnace conveying material therefrom to cylinder, construction of vertical furnace and shaft being such that air or gas may pass from lower part to upper part thereof in horizontal passages leading to and fro therethrough.

AMALGAMATOR.—No. 802,987; H. J. Horstmann, Fort Wayne, Ind.



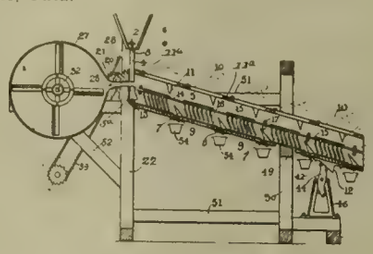
In apparatus of class described, revolving barrel having internal spirally disposed wings and being adapted to cause ore passing therethrough to become disseminated throughout interior; stationary vacuum hood surrounding discharge end of barrel and having closed relation therewith; chute having valves therein and communicating with barrel; funnel within hood and extending partially under discharge end of barrel; receiving tank adapted to contain water; discharge pipe extending external of hood and connected with funnel and communicating with tank; and retort having connection with barrel for charging interior thereof with vapor.

GOLD SAVING APPARATUS.—No. 803,868; W. D. Baney, Tonopah, Nev.



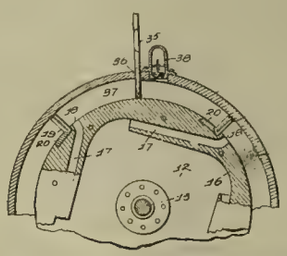
In gold saving apparatus, combination of tank, horizontally disposed amalgam cylinder supported to rotate in tank and having ingress and egress openings at opposite ends, rotary cylindrical agitator extending through cylinder supported in ends of tank and rotatable independently of cylinder, agitator having cylindrical sleeve projection at one end passing through end of tank, screw conveyor journaled concentrically with agitator and having shaft passing through sleeve, means exterior to tank to operate agitator and conveyor, and means for operating amalgam cylinder in unison with agitator and conveyor.

ORE CONCENTRATOR.—No. 803,830; J. J. Kennedy, Guthrie, Okla.



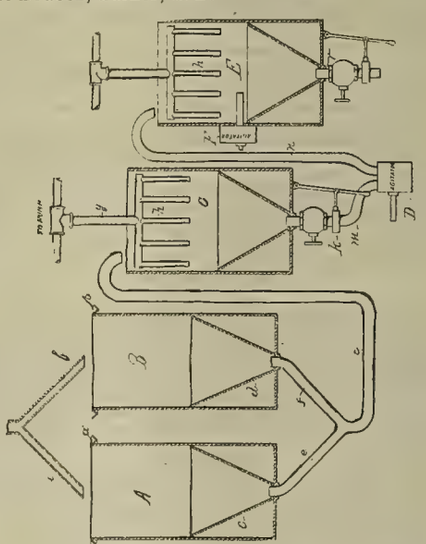
Ore concentrator, combination with sluice box, and mechanism for vibrating same, of doors arranged in top of sluice box and carrying air deflectors, riffles secured to bottom of sluice box, separable sections disposed in front of riffles and means for holding same combined with bottom of sluice box, reciprocatory agitators disposed between riffles, blast mechanism discharging in plane of deflectors, and means for supplying ore to sluice box below discharge from blast mechanism.

AIR COMPRESSOR.—No. 804,159; C. Neumann, St. Louis, Mo.



Device of class described comprising casing mounted upon base, shaft, revolving disk located upon shaft, and having air passages; pistons formed on revolving disk; shaft supported in A-frames located at each side of casing; flywheels and pulleys located upon shaft; crank disks located upon ends of shaft; connecting rods connecting crank disks of upper shaft with those of lower shaft; gear wheel located on upper shaft, short shaft located upon top of casing, operated by shaft, slotted cut-off disk carried by short shaft and arranged to allow pistons of revolving disk to pass therethrough during operation of machine; and means for discharging compressed air from machine.

PROCESS OF TREATING ORE SLIMES, ETC., CONTAINING GOLD, SILVER OR OTHER VALUES.—No. 804,186; L. J. Drabek, Turner, S. D.



Herein described continuous process of treating ore slimes to obtain values therefrom, consisting in charging slimes mixed with cyanide solution into tank, causing slimes to settle and accumulate in thickness in bottom of tank, discharging thickened portion by own weight and that of overlying solution into top of second tank containing barren solvent solution, filtering off value containing solution and allowing heavy slimes to settle and accumulate in bottom of tank, withdrawing thickened slimes, agitating and mixing them with water, discharging them into third tank containing water, filtering off liquid, causing thickened slimes resulting from filtering to accumulate in lower part of tank, thereby forcing liquid therefrom and discharging thickened slimes from time to time as necessary.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The Alaska convention at Seattle, November 20th, adopted a platform and a number of resolutions to be presented to the National Congress. The platform demands a territorial form of government, a delegate in Congress, and numerous changes in the mining laws pending the granting of self-government. The passage of a law is asked making it impossible to locate mining claims by power of attorney, designating twenty acres as a placer claim, limiting the number of locations by any one person to two on any creek or any of its tributaries, and submitting, in lieu of the $100 assessment on placer claims, a license fee of $250, to be placed as a fund for the building of roads and trails.

The Bartel Co. will put in a 10-stamp mill and concentrator at Tin City, on Behring sea, 138 miles northwest of Nome. About twenty men are now employed by the company. They are paid $5 per day and board.

ARIZONA.

Gila County.

Since January 1, 1905, the following corporations have been formed to operate mining claims in Globe mining district: Arizona Commercial Copper Co., capital $2,500,000, principal office Boston, Mass.; Consolidated Mines & Development Co., capital $500,000, a local enterprise; Keystone Copper Co., capital $1,000,000, principal office St. Louis, Mo., controlling interest owned by Globe people; Rye Copper Co., capital stock $1,000,000, par value of shares $1, a Globe enterprise; Miami Copper Co., capital $500,000, a Globe enterprise; Mount Stanley M. Co., capital stock $1,000,000, California and Arizona capital, mines southwest of Globe; Arizona & Eastern Consolidated M. Co., capital $1,500,000, Washington, D. C., and St. Paul, Minn., mines in Globe district; American Copper Co., capital stock $1,000,000, a Globe enterprise; the New Dominion Mines Co., capital $1,000,000, par value $1, a Globe enterprise.

Graham County.

P. F. Crowley is developing claims near Metcalf.

Mohave County.

A compressor and air drills are to be put in the San Francisco mine of the Yucca Cyanide M. & M. Co. at Cedar, which has shipped a carload of concentrates to the Selby smelter.——At the Standard gold mine, in Mohave Wash near Kingman, the shaft is being sunk to the 300-foot level under the direction of J. D. Jordan. ——The Arizona-Birmingham M. Co. is working on its lease on the Samoan mines at Chloride. A tunnel is being run to tap the Lucky Boy vein at a depth of 500 feet. L. Hoffman is in charge.

Pinal County.

A. Collins will start work on the Pickwick claims, near Mammoth.——It is reported that the Calumet & Hecla Co. has secured control of the Mammoth mine at Mammoth and that it will begin operations soon.

Yavapai County.

A 150 H. P. boiler and four new Wilfley tables have been put in at the Crown King mill at Crown King by Superintendent G. F. Shurtleff. The Zika tunnel is in 650 feet.

Yuma County.

L. S. Judd is manager of the Colonial Mining Co. at Cinnabar, 14 miles from Ehrenberg. A double compartment shaft has been sunk to a depth of 180 feet.

It is reported that a 60-stamp mill is to be put on the Little Jessie mine, near McCabe. A new hoist is to be put in and the shaft sunk to a depth of 1000 feet. J. S. Jones is interested.

The North and South Venture claims of the United Verde Copper Co., near Jerome, are to be prospected by a tunnel.——The Eureka Gold & Copper M. Co. is sinking a winze from their main tunnel near Jerome.

CALIFORNIA.

C. G. Yale, in a recent Government report, says that the gold-producing area of California includes thirty-four counties out of fifty-seven. In 1904, seven counties produced each over $1,000,000, and two produced over $2,000,000. The increase from quartz mining amounted to $1,400,494, and from dredging to $711,289. The production of silver in California, while never very great, showed an increase of 400,000 ounces for 1904 over that of 1903.

Calaveras County.

J. L. Henry of San Andreas has an option on the North Star mine, owned by O. Dolling, near Angels.——The air compressors of the Clary Gold M. Co., which is operating the South Bank mine, near Sheep Ranch, will be operated by a 40 H. P. motor.

El Dorado County.

It is reported that they have struck rich rock in the Crane's Gulch mine, near Georgetown.——It is reported that rich gravel is being taken from the Alcimento and Alveoro mines, near Smith's Flat. Chas. Henson is superintendent.——Work has been started at the Gold Bend gravel mine, near Smith's Flat.——The Oro Fino mine, near Shingle Springs, is being reopened.

The Lone Star gravel mine, near Smith's Flat, is to be reopened with Wm. Rupley as superintendent. A new incline is to be sunk 400 feet to strike the channel under the lava hill.

Mono County.

The owners of the Liberty and the Pittsburg mines, in the Masonic Mountain district, near Bodie, have agreed to unite in building a 50-stamp mill. The mill built at Sweetwater several years ago, which is now not in use, will be purchased if the parties can agree upon terms.

San Bernardino County.

The Arizona-Mexican M. & S. Co. are slowly building their plant at Needles. The dust chambers have been completed and the base of the stack has been placed. The mixing floors are ready for the handling of ores and fluxes. The sampler building is nearing completion.

Shasta County.

Geo. Graves has charge of work on the Summit and Copper Crest copper mines near Kennett.

The second furnace of the Mammoth C. Co.'s smelter at Kennett was blown in November 22. The third and last furnace will be ready to blow in by December 1, marking the completion of the smelter to its full capacity of 750 tons per day.

Sierra County.

(Special Correspondence).—Recent rains will enable the following drift mines to commence more active operations: West Point, Golden Scepter, Hilo, Mugginville, South Fork, Mabel Mertz, Balsam Flat and Mobile Flat. ——The Twin Eagle mine, at Gold Point, is reported sold to C. F. Humphrey of San Francisco.——Fitting & Corbiere have completed their examination of the Alice and Pappoose mines, near Downieville.——The drift at the 50-foot level of the Elnore shaft of the Sovereign claims, near Downieville, is being extended.——At the Antlers quartz mine, 2½ miles east of Downieville, supplies have been laid in for the winter. J. W. Wallace has charge of the mine.

Downieville, Nov. 20.

The Herkimer tunnel, near Table Rock, has been driven 150 feet toward the channel. H. Fowler has charge of the work.——W. O. Frost is preparing for work on the Mineral Mountain placer claim in Hungry Mouth, 1 mile from Downieville.——The Marguerite shaft, near Sierra City, is being unwatered and work will be resumed from the 400-foot level by E. Westall.

H. L. Johnston has sold a four-fifth interest in the Tightner mine at Alleghany for $250,000. Senator Jones, Sam Jones, A. C. Hamilton and others of Nevada are in the company. W. S. Haskins has charge of the work.

Siskiyou County.

It is reported that a cyanide plant will be added to the stamp mill of the Jillson mine, near Hornbrook, by the Hazel G. M. Co.

The Wolverine mine, 4 miles from Hornbrook, is being opened up under the direction of L. B. Collins.—— It is reported that the Thos. Needham property, 15 miles northwest of Hornbrook, is to be opened up by A. R. Foss.——The Sterling mine, near Hornbrook, is said to have been sold to a Seattle company. S. J. Fore is superintendent. A 10-stamp mill is on the ground. ——A 10-stamp mill and cyanide plant are being put in at the Eliza mine, 12 miles from Yreka, by C. A. Patterson. A 600-foot tunnel has opened up ground below the old workings.——The Porto Bar Dredging Co. has a bucket dredger at Callahan, in charge of R. M. Wade.

Trinity County.

The McCampbell Gravel M. Co., under the management of G. W. Pelletreau, has completed a 2-mile ditch and flume to the mine near Hayfork.——G. Van Gorden, superintendent of the Drinkwater M. Co., near Hayfork, intends to prospect the property for dredging.

Tuolumne County.

The long deferred rains of the past week will cause a large number of properties to resume operations. Many of the larger mills have been closed for some time because of lack of water.——A new cable 2200 feet long has been put in at the Dutch mine at Quartz.——A new steam hoist has been put in at the App mine at Quartz.

COLORADO.

Boulder County.

A mill is being put up at the Corona mine at Summerville, in Four-mile canyon, near Salina. Other nearby properties being developed are the Quo Vadis, Elkhorn, Valley Forge, Crown lode and Gold lode mines.——Machinery is being put in at the St. Joe mine, near Gold Hill.——Good ore has recently been struck at the Keystone mine, at Gold Hill.——Near Wall Street, the Mile High mine and the Good Morning tunnel are being worked.——A mill is being put in at the Myrtle mine, near Ward.——Manager C. L. Mitchell has closed down the Struggler concentrating mill, near Ward, for the winter, and will make cyanide tests on the Struggler ore at the Myrtle mill.——Manager Wilson intends putting in a hoist on the King claims, near Gold Hill.

The Gold Medal mill in Four Mile Creek canyon, at Langdell, near Boulder, was destroyed by fire November 16. The origin of the fire is not known. The mill was new and equipped with the latest machinery. The engine and other machinery were ruined. It is believed the rolls may be used. The roasters were not put in. The total loss is about $5500, with insurance of $3000. The mill belonged to W. C. Knox of Boulder and G. W. Mabie.

Clear Creek County.

The Kittie Ousley mine, owned and operated by the Manhattan Union Mining Co., in East Argentine, near Georgetown, is being developed. At present thirty men are employed under the management of E. Wing. The drift from the shaft is in 250 feet. Stoping has been started. An ore house has been constructed capable of holding 150 tons of mineral.

B. J. O'Connell is getting good results from his lease on the Frostburg lode of the Mendota property, near Silver Plume. Drifting and stoping are carried on and the output is concentrated at the Mendota mill. The shaft is down 160 feet.

The Pay Rock claims on Republican mountain, near Silver Plume, are to be opened up by E. F. Kendall.

The Baby Eddie M. Co. has been formed with W. M. Stieren of Pittsburg, Pa., as president, to work claims in South gulch, near Freeland. The company proposes to run a crosscut tunnel. The work is under the direction of David Ellis, superintendent of the Brighton mine.

A. A. Ireland of Golden has secured from A. Johnson and O. Nelson a lease and bond on the Denver group in East Argentine, near Georgetown. He proposes starting work in the spring and a 50-ton concentrator is to be built for the treatment of the concentrating ore.

Gilpin County.

The Derby M. & M. Co. has been formed to work claims southeast of Sawmill gulch, near Apex, and are sinking the Venture shaft, which is down 60 feet. A steam hoist may be put in. J. R. Moler of Denver is president and manager of the company, and J. Field is superintendent. The Kimber mill at Apex may be started to handle ores from the Venture shaft.——The Sleepy Hollow property, in the Gregory district, near Black Hawk, is to be worked by the Black Hawk Leasing & Mining Co., formed by P. Feldhauser, J. F. Hopkins and P. McCourt of Denver, Colo.——Sinking has been commenced at the Carr mine on Bobtail hill, in the Gregory district, by the Carr Mines Co. The main shaft is down 850 feet and is to be sunk 200 feet deeper. Superintendent W. H. Hook will make connections with the Chicago-Carr lower workings for improved ventilation in both properties.——The 34-foot crosscut from the main shaft of the Running Lode to the vein has been completed, and opened up a crevice of smelting ore. The shaft is 1125 feet deep. Thomas Dunstone of Central City is superintendent.——W. M. Bloomer of Denver has let a contract for 250 feet of work in the Little Gem tunnel, up Moon gulch, near Rollinsville.——The new shaft building on the Southworth property in Moon gulch has been completed. The property has been leased and bonded to W. H. Knowles and associates of Denver, and the new company which is to be organized will be known as the Mineral Hill M. & M. Co. Manager Knowles has purchased a 25 H. P. hoister and a 40 H. P. boiler. The shaft on the Southworth is to be made a skip, and the work on the tearing out and fixing of the upper part of the shaft is now under way. The main shaft is down 200 feet, and as soon as the shaft work is attended to and the property is unwatered, the lessees will commence sinking.

It is reported that operations will be resumed on the Geiger mine, on Michigan hill near Apex, by E. E. Steffner of Central City.——The Apex G. M. & M. Co.'s Rochester shaft is down 125 feet.

The Iron shaft, adjoining the Pewabic mine, in Russell district, near Central City, is to be unwatered. As soon as the shaft and levels of the Iron are free of water, the Richardson, which is a part of the Pewabic group, will be worked through the Iron shaft. The Iron shaft connects with the Richardson at the 300-foot level. The North Pewabic is being worked through the main shaft of the Pewabic. The ore is sent to the New York mill in the Black Hawk, which is being operated by the Pewabic Con. Gold Mines Co. The mill has resumed operations after a short close-down while the shaft was being sunk on the Pewabic.

Gunnison County.

The Mono mill at Ohio City is to be started on ore from various dumps by J. S. Gardner. —— J. A. Holmberg, D. K. Anders and O. M. Aronson have purchased the Statesman properties, near Pitkin, and expect to commence development.——A 14-foot vein of ore running high in zinc has been opened in the drift run from the incline shaft on the Napoleon, near Pitkin. The property is being operated by the Lanyon Zinc Co. —— The Carter tunnel being driven from Ohio creek is in 1500 feet. A new compressor and drills have been put in.—— The cable and machinery for the aerial tramway for the Raymond Con. M. Co. at Ohio City has been delivered. The tram will be 2000 feet long and will carry ore to the mill from the Raymond shaft, which will be sunk on the vein to the tunnel, a depth of 1200 feet.

Hinsdale County.

The Silver Fleece shaft, near Lake City, is being unwatered by F. A. Ralph.

Lake County.

The Silver Nugget shaft on Breece hill, Leadville, recently cut a vein of high-grade gold ore 120 feet from the surface. The Silver Nugget is being operated by R. W. Spensley for New York parties.——Sullivan & Burkhardt have commenced shipments from the Governor mine on Mosquito range, near Leadville. They are using a pack train to pack down the high-grade ore.——J. W. Newell, manager of Bohn mine of Leadville, has resumed sinking.

Harrison, McCreary & Spears are working on the Copper King group, Red mountain, near Twin Lakes.——W. T. Buchanan is developing the Tom Paine group on Mt. Elbert.——The tunnel of the University group, on Red mountain, is in 350 feet, and the vein has been recovered after passing through a 50-foot fault and a large dike.

Preparations are being made by the smelter trust to enlarge its plant in Leadville. The smelter now handles 20,000 tons of ore a month and when the new machinery and apparatus is installed the capacity of the plant will be increased half as much again.

The shaft on the Belle of Granite, near Leadville, will be sunk another lift of 200 feet, making the total depth 675 feet.——At the Cloud City and Home Extension, in Leadville, the connecting drift is being pushed.

Mesa County.

The Grand Junction smelter has been blown in. The plant will employ sixty men, working three eight-hour shifts. General Manager Lavery stated that the blowing in was successful.

San Juan County.

The King mine, on Sultan mountain, south of Silverton, and operated by the Royal M. Co., has been closed down by order from General Manager Pyke.

At Animas Forks the Gold Prince Co. is putting up a 500-ton mill. ——The Mogul M. Co., at Gladstone, has its new 200-ton mill under roof.——The Old Hundred M. Co., 5 miles north of Silverton, will have its new 200-ton concentrator in working order by Jan. 1.——At its property in Cunningham gulch, near Silverton, the Green Mountain Co. is putting the finishing touches on its new 200-ton mill.

The management of the Sunnyside mine, near Eureka,

9 miles north of Silverton, are enlarging their mill by putting in magnetic separators to save zinc values which have been allowed to go down the river with the tailings from the plant, or have been shipped to the smelters with the concentrates. The product of the Sunnyside contains from 12% to 15% zinc, which, when shipped with the concentrates from the mill in the past, has lowered the value of the latter in the smelter from $3 to $4 per ton. The magnetic separators will make a 45% to 55% zinc product.

San Miguel County.

The Caribou-Montezuma mine of the Yellow Mountain M. Co., near Telluride, is to continue work during the winter under the superintendence of O. Erickson.

At the Black Bear mine, in Ingram basin, near Telluride, the drift has been run 200 feet from the bottom of the 150-foot shaft from the tunnel level. Work will be continued during the winter. The company expects to build their mill in the spring on leased ground. A tramway will be built from mine to mill, and hoisting machinery and air drills put in. L. Kaanta of Telluride is president.

Summit County.

(Special Correspondence).—The Beaver Creek M. Co., operating the Lucky mine in French gulch, is shipping high-grade lead ore from its main shaft workings. The lower grade ore from the same workings is being milled at the company's own mill. The same company is operating the Carbonate mine on Mt. Baldy and are shipping lead carbonate ore. The lead value is 40% and it carries 1½ ounce of gold per ton. F. A. Yauger is general manager and George E. Moon is superintendent of both properties. —— The old Union Co.'s mill at Mineral hill is turning out concentrates.——The Abundance M. & M. Co.'s directors recently approved of the tunnel development work started by the management. —— The owners of the Little Sallie Barber property on Nigger hill have struck a 3-foot vein of oxidized iron ore carrying gold and silver values.——The Novelty group on the same hill is being worked by J. G. Detwiler and the Summit County Mining Exchange. The main shaft has been sunk 100 feet vertically and the crosscuts are now being driven in both directions to cut the ore shoots.—— B. Fry is operating a lease on the Gold Dust property and has struck an 18-inch vein. —— The Washington-Joliet M. & M. Co. have their mill in shape with the addition of tables and slimers, and expect to resume operations at once ——The test run of the Carrie mill on Wise mountain proved so satisfactory that six 60-ton cyanide leaching vats are being added to the plant to enable the mill to run continuously. —— On the northeast slope of Mt. Gayot, near Georgia Pass, a tunnel is being driven into the mountain to cut a rich ledge at depth of 800 feet. The tunnel is now in 120 feet.

Breckenridge, Nov. 20.

The Morning Star lease, near Breckenridge, operated by Condon & Shrock, has made a working connection, from the tunnel through a stope, with the old workings of the Enterline shaft.——The Mekka G. M. Co. is continuing its 2100-foot drainage sluice near Breckenridge.

Teller County.

A strike has been made in the Mahoney shaft of the Empire State on Bull hill, Cripple Creek, by C. M. Crowder at a depth of 200 feet. —— The Little Giant M. & M. Co. has started their new cyanide mill, southwest of Cripple Creek. The mill has a capacity of 180 tons. —— The control of the Hull City placer at Independence has been sold to J. T. Miliken of St. Louis, Mo., president of the Golden Cycle M. Co. W. P. Dunham is general manager.

A 100-ton cyanide plant is proposed for the Golden Wedge property, on Raven hill, near Cripple Creek. J. Winchester is interested.——Galena has been found at a depth of 200 feet in the Gold Dollar mine, on Beacon hill, Cripple Creek.——Work has been started on the first unit of a cyanide mill on the south end of the Red Rock claim of the Colorado City & Manitou P. & M. Co. ——A. Morrison is sinking from the 40 to the 100-foot level of the Silver Tip mine, on Bull hill, near Cripple Creek.

A form of agreement to be entered into by the Cripple Creek Drainage & Tunnel Co. and owners of mining ground in the Cripple Creek district, providing a 2% assessment on mill and smelter returns, to raise funds with which to build the $800,000 deep drainage tunnel, has been approved by many of the mine owners. The agreement recites that the portal of the tunnel shall be located at an elevation of 7660 feet above sea level, in or near the bed of Cripple Creek, and the general course of the tunnel shall be: From its portal to a point in the vicinity of what is now known as the main shaft of the El Paso mine; thence to a point in the vicinity of what is now known as shaft No. 1 of the Vindicator mine. Provisions in the agreement are: 1. That on or about July 1, 1906, a sufficient amount of its capital stock will be subscribed and contracted to be paid for so as to realize at least $800,000 as required for the prosecution of work on said tunnel. 2. That within 60 days after $800,000 of its stock is subscribed it will commence the construction of said tunnel and will thereafter, with all reasonable diligence, prosecute such work of construction to completion. 3. To use all reasonable diligence in maintaining said tunnel in such condition that all water from said mining premises flowing into said tunnel, either by seepage or artificial means, may be drained through the same without any charge of any character upon the owner of said mining premises, except as hereinafter specified; provided, that such owner shall not suffer any third person who has not contracted for like service with the tunnel company to use any artificial means provided by the owner for the drainage of property other than said mining premises. The owner agrees that, beginning on the 1st day of July, 1907, the owner will pay to the tunnel company 2% of the value of all ores produced thereafter from that portion of the mining premises lying above the plane of the floor of that portion of said tunnel which runs through or nearest to said mining premises; said value to be the gross mill or smelter returns upon such ores, less transportation and treatment charges only.

IDAHO.

In 1904 Idaho derived $349,246 more from its gold mines than in 1903. The principal increase comes from siliceous ores in the Silver City district, Owyhee county, Buffalo Hump and Thunder Mountain districts, in Idaho county, and from various districts in Lemhi county. The silver product increased by 267,412 ounces, derived from the lead ores of the Cœur d'Alene and the Wood River districts and from the siliceous ores of the Owyhee fissure veins.

Bannock County.

The Fort Hill M., M. and S. Co. is working mines 6 miles from Pocatello. Ore was struck after driving the tunnel 3200 feet. W. M. Nesbit of Salt Lake City, Utah, has had charge of the property.

Blaine County.

The new Dollarhide mill, near Ketchum, has been started.

Custer County.

It is reported that the Mackinaw Copper Co. intend to put in a hoist in the spring at their mines in Copper Basin, 25 miles east of Hailey and 20 miles west of Mackay. E. Daft of Hailey is manager.

Idaho County.

The mill of the Jumbo mine at Buffalo Hump has been closed down on account of shortage of water, but the chlorination plant and active development work will continue all winter, says Frank Brown, the manager.

Shoshone County.

W. L. Gallagher has bonded the Columbus claims, owned by the American Lead-Silver Supply Co., operating on East Eagle creek, near Murray section.

MONTANA.

The United States Geological Survey reports that of Montana's gold production, amounting to $4,267,062 in 1904, more that $1,000,000 was derived from the cyaniding ores of Fergus county. The Butte copper mines contribute $971,046, a slight decrease from the figures of 1903. Madison and Lewis and Clark counties follow next, and only smaller amounts are contributed by the other counties. The most important placers are in Madison county, and 20,566 ounces, or about the same amount as from Idaho, were derived from the placers. By far the largest part of the silver, or 10,530,682 ounces, is produced by Silver Bow county.

Beaverhead County.

The company which recently bought the Polaris mine at Bannock is putting in new machinery to develop the property. A railroad shipping station is to be made on the Oregon Short Line 3 miles north of Redrock and the roads near the mine are being prepared for traction engines. John Cusick is assistant manager.——Work has been discontinued for the winter at the Ajax mill in the Big Hole basin, near Dillon. A tramway is to be put in to connect the mine and mill. A. J. Noyes is manager.

Fowell County.

The Kineo M. Co. is developing claims on the west side of Nigger hill, 6 miles from Elliston. A tunnel has been run 400 feet, with 230 more to drive before cutting the vein 86 feet below the shaft. A concentrating plant is to be put in early in the spring. Work will continue all winter.——The Sadie group, controlled by D. M. Platner of Elliston, joins the Kineo mines.——The Champion, near Elliston, has been allowed to fill with water. ——The only placer mine in this district, Nigger hill, is being opened for a fall and winter run by Wilson & Mack.——The Monarch mine, near Elliston, will be operated this winter by C. L. Friederichs of Helena.

Silver Bow County.

W. B. Orem, deputy State mining inspector, in his annual report to Governor Toole, states that during 1905 all of the large mining properties in the Butte camp have been operating continuously. There has been little litigation, the advanced price of copper stimulating both production and development. The mines of the large companies have yielded more than $31,000,000 of mineral and have disbursed more than $12,000,000 in wages to the miners, the average number employed daily at these properties being nearly 8000 miners and 2000 surface men. The Boston & Montana properties are hardly more than developed, the Mountain View mine being the first of its mines to put in skips for hoisting. The skips have a capacity of six tons and are attached either above or below the cages. Skip chutes are cut at the different stations and hold from fifty to seventy-five mine cars of ore, and furnish storage for the ore from the levels and stopes, thus avoiding any delay in tramming. Men, horses and compressed air engines are employed in tramming the ore to the skip chutes. The mouth of the skip chutes is in the shaft and the loading of ore into the skips is done by the station tender. The properties of the Amalgamated hoist 10,000 tons of ore daily, which is shipped to Anaconda and Great Falls for treatment. The Montana Ore Purchasing Co. hoists daily 1400 tons, which is treated at Butte and Basin. The Clark mines hoist 1350 tons daily, which is treated at the Butte reduction works. The North Butte M. Co. hoists 700 tons, which is treated at the Washoe works at Anaconda. The smaller properties are producing about 750 tons of ore per day. The depth of most of the large mines runs from 1200 to 2400 feet, the latter being the greatest depth at present. In the matter of fire protection the mines in Butte are well equipped for handling fires, both on surface and underground. There are maintained at each of the large properties hose carts, fire pumps and other necessary apparatus, and at the mines of the Amalgamated the employes are regularly drilled in order that they may be familiar with the equipment in case of fire. At the Anaconda, Washoe, Parrot, Colorado and Butte & Boston properties the fire apparatus is under the supervision of G. L. Lapp, who assumes direct command at all fires. At the Boston & Montana properties John Barclay is in charge. A regular fire alarm code is in use at all of the mines. The report shows that during the year ending November 1 there were thirty fatal accidents in the Butte mines, resulting in the deaths of forty-one men. There were also thirty-one non-fatal accidents, in which thirty-two were injured.

MISSOURI.

Jasper County.

The Bumblebee M. Co., operating on the Shewmaker land, southeast of Joplin, has completed its new mill and now has it in steady operation.——L. Stevison of Webb City has purchased the Little Hope M. Co.'s prospect on the Rex M. Co.'s land east of Joplin.—— G. W. Taylor and J. Carmean are building a mill on the prospect they recently opened up near Carterville.—— The United Zinc Co. of Boston, which owns mining land at Aurora, Joplin, Badger and Diamond, is preparing to go after the deep run of ore known to exist at about the 300-foot level at Aurora.

NEVADA.

Esmeralda County.

Buena Vista, the largest town of the Oneota mining district, is on the Carson & Colorado railroad, 65 miles west of Goldfield and 45 miles south of Sodaville. Gold Hill, the next largest town of the district, is 4 miles by trail and 8 miles by wagon road from Buena Vista. The mines are an equal distance from Gold Hill and Buena Vista. The main property of the camps are the Browny, the Tip Top, the Buena Vista, the Ticker, the Queen, the Summit and the Lilly. The Queen mine is reported sold to a company headed by Geo. Pardee of California. The Browny has four sets of leasers working; the showing of T. L. Jones and Riggs & Kanters is the best. The Tip Top, owned by the White Mountain M. Co., has been getting bids on ore haulage. The road to the mines from Buena Vista is being built.

Lincoln County.

Development work is being done in Antelope canyon mines, near Caliente, and on gold-silver properties in the Chief district, 8 miles northwest of Caliente.——J. A. Elston of Colorado Springs, president of the Josephine Gold M. Co., with properties 7 miles northwest of Caliente, and W. M. Shemwell, the manager of the company, have been at the mines. Within three months a mill will be built near the mines.

It is reported that G. F. Colton intends to sink a 1000-foot vertical shaft on the Duplex mine, near Searchlight.——It is expected that stamps will be dropping in the new 10-stamp mill at the Cyrus Noble, near Searchlight, by February 1, when sinking will be resumed.

NEW MEXICO.

In New Mexico the gold production for 1904 was $381,930, an increase of $112,307 over 1903, which is derived largely from the Rosedale district in Socorro county, and the Hillsboro district in Sierra county. Small decreases are reported from other counties. The placers yielded $149,424. A small increase, mostly from Socorro county, is noted in the unimportant silver production.

Grant County.

A new shaft house is planned for the Ivanhoe, at Hanover, by the Hermosa Copper Co. In it will be placed an engine and a hoist which will enable the company to sink 2000 feet.——The Copper Queen shaft, at Hanover, which several months ago was filled with water, has been unwatered and development work will be begun upon the property.

Otero County.

The Monument mine, at Chloride, has resumed shipment of silver ore to the smelter at El Paso. Work has been started on a long tunnel under the old workings. The work is to be done with power drills.

OREGON.

A recent report of the United States Geological Survey states that during 1904 Oregon showed a stationary gold production of $1,412,186, of which one-third is derived from the southern part of the State and the remainder from the Blue mountains in the northern part of the State. Baker county led in production, with $738,973, of which $51,855 was derived from placers. The silver output of Oregon is unimportant and principally derived from Baker and Grant counties.

Baker County.

The 10-stamp mill at the Taber Fraction mine, near Bourne, is said to have been started under the superintendence of A. Case. An additional ten stamps and a cyanide plant are to be put in. The Taber is being worked through tunnel 2 of the Eureka claim. G. Oswald is mine superintendent.

The North Pole, Columbia, Golconda and E. & E. mines, near Bourne, are all running full blast.——At Cable Cove the mill on the Imperial is approaching completion. Manager T. C. Gray of the Valley Queen group, near Cable Cove, reports No. 4 drift is in 110 feet. A rich strike of galena ore has been made in this drift.

Grant County.

The Badger mine, near Susanville, has been temporarily closed.——It is reported that N. Berkeley's report on the Buffalo-Monitor mines, near Granite, has caused the management to decide to put in a mill in the spring. The crosscut on the upper level is to be continued under the direction of W. Berkeley during the winter.

At the St. Anthony, near Alamo, work is to be continued during the winter on tunnel 2, which is in 1100 feet.

Jackson County.

The Mountain Lion mine, on Miller creek, near Applegate, is being worked and the 5-stamp mill will be started when water becomes available. In addition to the mill the mine is well equipped for operation. Bailey Bros., C. E. Harmon and L. L. Jewell of Grants Pass are the owners.

The Shorty-Hope M. & M. Co. announces that the

mill on this mine, near Ashland, will soon resume operation.

Josephine County.

R. E. Gilbert, superintendent of the Euchre Creek M. & M. Co., is developing the Half Moon and Black Bear placer mines on Lower Rogue river, below Grants Pass. A ditch flume 3 miles long supplies 2500 inches to the giants under a head of from 175 to 200 feet.

Lane County.

The directors of the Le Roy M. Co. have decided to resume work on their mine near Bohemia.

Yamhill County.

The owners of the Muir mine, near Grand Ronde, are making arrangements to put in a mill which is to have a capacity of thirty tons a day.

SOUTH DAKOTA.

In 1904 South Dakota produced within a small territory in the Black Hills gold to the value of $7,363,977, an increase of more than $500,000 over the output of 1903. This industry is based on the minnig on a large scale of low-grade amalgamating ores of the Homestake type and of siliceous ores of higher grades which are reduced by cyaniding or smelting.

Lawrence County.

The Homestake South Extension M. Co. is working the Skelley claims, near Deadwood. The president is Frederick Schroeder, and manager, A. H. Oleson of Deadwood. A double-compartment shaft is being sunk. A hoist has been ordered.——It is reported that the sinking is to be resumed on the Wauconda shaft, on Elk creek, near Roubaix, by Manager Goldman. It is down 135 feet.

The report of Superintendent T. J. Grier of the Homestake M. Co., at Deadwood, for the year ending June 1, 1905, states that the ore at the 1250-foot level has been reached and is being crosscut. A level is being opened up at the 1400-foot level of the Ellison shaft. The B. & M. shaft is down 1250 feet, the Golden Prospect 900 feet, the Old Brig and the Golden Gate 800 feet and the Golden Star 1100 feet. The expenses were 70.4% of the gross earnings. Of the expenses, 66.8% is charged to mining, 25.3% to milling and cyaniding and 7.9% to general expenses, including repair shops. Bullion receipts totaled $5,302,338, an average of $3.734 per ton.

	Amount.	Per Ton.
Mining expenses and charges	$2,492,257	$1 782
Milling expenses and charges	600,685	0 430
Cyanide expenses and charges	345,349	0 247
General and miscellaneous	295,396	0 211
	$3,733,687	$2 670

TEXAS.

Following are the results of the drilling contest at the American Mining Congress at El Paso: Chamberlain & Make, Dos Cabezas, Mex., first prize, $1000, donated by W. C. Greene of Cananea, 40 inches; Page Bros., Bisbee, Ariz., second prize, $600, 39 1/8 inches; Bradshaw & McIver, Bisbee, Ariz., third prize, $350, 39 5/16 inches. Later a claim for tie was made and Page Bros. drilled 40 5/16 inches, defeating Chamberlain & Make, who drilled 39 1/8. Their record of 42 1/4 is still unequalled.

UTAH.

Grand County.

W. Hayes and son of Mancos, Colo., and Long Bros. of Telluride have leased the Thomson stamp mill near Basin, and have it in operation on Double Standard ore from Montreal mountain. The capacity is to be increased from five stamps.——The Interstate M. Co., operating in Gold basin, 5 miles south of Basin, have started their cyanide mill. They have a tram 1800 feet long from the mine to the mill. J. H. Clark is superintendent.

Juab County.

It is reported that a new hoist is to be put in at the Bonanza mine, in the West Tintic district, near Eureka, by Depew & Jones. The shaft is down 152 feet.——At the New Utah mine in West Tintic the hoist is in operation and sinking is being pushed in the incline shaft.——Wm. Ball, J. F. Hayes and D. Depue have closed their lease on the Eureka Hill dump and will develop their lease on the 100-foot level of that property.——Two shifts are now at work on the North Mammoth property, near Eureka, under the superintendence of Wm. Mathews.——At the Raymond mine, north of Eureka, Superintendent J. C. Sullivan will push development from the 1500-foot level.——The Dragon Iron mine at Silver City is shipping 150 tons daily.——Operations have been started on the Old Brooklyn property at Silver City under the direction of Superintendent James Packard.——The Swansea mine at Silver City is producing a carload of ore per day. Several of the old producers at Silver City will be started up shortly.

It is reported that the Ridge & Valley mine, north of Eureka, is being worked through the Gemini tunnel.

The shaft of the South Eureka mine, near Robinson, is to be sunk to the 1000-foot level from the 500-foot.

Summit County.

A compressor and power drills are to be put in the Mount Masonic mine, near Park City, by Manager A. H. Spooner.

Piute County.

The Kimberley M. Co. has been organized to work the Deer Park, Surprise, Holland and other claims near Kimberley. W. F. Snyder is president. The Holland tunnel has already been driven 2600 feet to open up the claims and will be continued to open up the Surprise vein at a depth of 1350 feet.

Salt Lake County.

The Butterworth mine at Bingham is being worked under the direction of A. P. Hanson through the Queen tunnel.——A sampling mill is being built for the Boston Con. Co. at Bingham. The new mill is across the gulch from the Ohio ore bins. It is proposed to have the mill running before the beginning of the year. The plant will test the copper-bearing porphyry which is being opened up.

Tooele County.

C. W. Coe & Sons of Salt Lake City have resumed work on their mine in the Granite mountains, near Dugway.——The Midas mill, in the Deep Creek district, northwest of Deseret, has been shut down for the winter. The May incline is being connected with the old workings of the Midas.

Utah County.

The Commercial M. & M. Co. has been formed to work the Silver Glance property in the American Fork canyon, under a bond and lease.

WASHINGTON.

According to the report on the mineral resources of the United States for 1904, Washington produced less gold than in 1903, the decrease amounting to $193,422, with a total production of $314,463. This is explained by the idleness of several large mines in Ferry, Chelan, and Okanogan counties. In Ferry county the decrease seems due largely to the difficulty of treating the ores, which do not yield readily to amalgamation or cyaniding, while their siliceous character makes them undesirable for the smelters. That the State did not show a still greater loss is due to the Mount Baker district, which increased its yield from $36,388 in 1903 to $115,000 in 1904. The output of silver in Washington is small and is derived mainly from the lead ores of Stevens county, but in part from the siliceous ores of Whatcom and Ferry counties.

Chehalis County.

Engineers employed by the Geological Survey are investigating the black sand deposits of Ocean Beach about Willapa Harbor. Dr. Day says that the sand beds run to a depth of 70 feet. Samples have been taken from the surface sands and from the bottom of the beds. A plant may be established at Damons Point, near Hoquiam, for the manufacture of tool steel direct from the black sand.

King County.

(Special Correspondence).—The Portland M. Co., J. F. Merrill manager, operating on Miller river, 6 miles from Berlin, have finished their raise connecting No. 1 and 2 tunnels and are now ready to begin shipping. The ore is sacked, hauled on wagons to Berlin and shipped to the Everett smelter. The cost of hauling from the mine to the railroad amounts to $5 per ton.——The Apex gold mines, Abner Giffin manager, on Money creek, have made another shipment of high grade ore to the Ladysmith, B. C., smelters.——Kimball Creek M. Co. beve suspended operations for the winter and Manager Irvine has returned East. The Kimball Creek Co. have expended over $150,000 in this district during the last five years.

Berlin, Nov. 20.

Okanogan County.

The Mt. Chapaca M. Co. of Loomis has men clearing away and getting in shape to drive a 3000-foot tunnel with which to crosscut the main vein.——The Grand View Co. of Loomis has put in a 160 H. P. impulse wheel under 260-foot working head. This is being used to drive a 120 K. W. 400-volt belted generator. The voltage is transforming to 10,000 volts and the current carried 7 miles to the company's 20-stamp mill, which is almost completed. An aerial tram 1½ mile in length is being constructed from the mine to the mill.——The Palmer Mountain Tunnel & Power Co. is putting in the first unit of 750 H. P. on its water right on Toates Coulee creek, near Loomis. The power will be transmitted 2 miles to the mines of the company and used to run the power drills and other machinery, and will furnish power for a 300-ton reduction plant, yet to be built. A crosscut tunnel, 4000 feet in length, has been driven, crosscutting twenty-eight veins.——The Prize M. Co. of Loomis is running its mill and shipping concentrates to the smelters. C. Gehrhard has charge.——The Copper World Extension Co. has put in a 5-drill compressor and is sinking a double compartment shaft, which is down 200 feet. It is the intention to drive this shaft 500 feet, then crosscut the vein.——The Triune M. Co. is driving a crosscut tunnel to cut the veins that appear on the surface.

Stevens County.

The Daisy mine, 20 miles south of Kettle Falls, has resumed operations. The company will do development work during the winter and in the spring will put in a concentrator.——The Acme mine, 6 miles south of Kettle Falls, has been bonded to Eastern parties and active operations will commence soon. This property has a tunnel 1500 feet long.

WYOMING.

Carbon County.

A three-compartment shaft is to be sunk from the 600 to the 1000-foot level at the Doane-Rambler mine at Encampment.

FOREIGN.

AFRICA.

Transvaal.

The Simmer & Jack Proprietary mines were one of the first to employ Chinese labor on an extensive scale, and the results obtained go to prove to what extent the introduction of Chinese labor has been attended with success. The report for the past year shows the tonnage crushed to be 475,000 tons, equivalent to 5.39 tons per stamp per diem. The value of the yield was 32s and the costs 23s 3d per ton. At present the costs are about 20s per ton. The Chinese costs per ton milled are now practically down to the lowest Kaffir costs at this mine, despite the numerous expenses attending Chinese labor, while the tonnage developed is ahead of that milled during the year.

AUSTRALIA.

New South Wales

The Mining Journal reports that the example of the Broken Hill South Co. in selling their heap of mine residues has been followed by the Broken Hill Block 14 Co. The purchasers have now acquired from the three companies 1,500,000 tons of tailings, apart from the future output. At Block 14 a portion of the money received is to be expended in thoroughly exploiting the mine's lower levels. The main hauling shaft has been sunk 600 feet, but beyond cutting a chamber plat nothing has been done at this depth. The sulphide workings at the 500-foot level are confined to the southern section. The management has decided to prospect with the diamond drill. The De Bavay Sulphide Process Co., Ltd., is making arrangements for putting up their zinc apparatus plant. At the Central the lead mill is treating 2000 tons weekly. The new granulation process plant has been giving good results.

Victoria.

At the Victoria Quartz mine a vein 2 feet 10 inches wide has been found at the bottom of a winze, which is down 4105 feet. There is every facility for exploiting the reef, the mine being so ventilated by a series of winzes that the air in the 3824-foot crosscut is cool, and even in the bottom of the center country winze, which is down 281 feet, the atmosphere is not heated.

CANADA.

BRITISH COLUMBIA.

Nelson District.

A strike of 4 feet of milling galena ore besides a small streak of higher grade ore has been made on the 1000-foot level of the Ymir mine, near Ymir. The ore was found in the west drift of the crosscut, which has not been worked for two years. C. M. Hand is manager.——George Bell, of the Kootenay Belle, near Ymir, has rented the Yellowstone stamp mill for one month and will run 1000 tons of ore through the mill. He has built a road from the Kootenay Belle to the mill.

Slocan District.

The Rosebery mill has shut down, due to the inconvenience of handling the ore from the Monitor and cold weather.——The Goodenough Mines, Ltd., near Sandon, were the first shippers of zinc ore to C. Ferneau at the zinc reduction works at Frank. —— It is reported that the Payne mine, near Sandon, has been leased to W. Smith. The Payne Co. ceased operations a year ago, at which time the upper portion of the mine was leased to W. Smith and the lower portion of the mine and the concentration plant to B. P. Little. The mill has been running and there is enough ore in sight to keep it running until the end of the year, at which time Little's lease will expire.

MEXICO.

Chihuahua.

According to the El Paso Herald, there are eleven districts in the State of Chihuahua, as follows: Iturbide, Bravos, Galeana, Rayon, Guerrero, Camargo, Arteaga, Andres del Rio, Hidalgo del Parral, Jimenez and Mina. Each of these districts has a mining agent, who is a Federal officer, in the capital of the district, except that of Iturbide, which is divided into two mining districts—Iturbide and Abasola—with a mining agent in the city of Chihuahua for the former and another in the town of Cusihuiriachic for the latter district. In the offices of these agents all denouncements are made.

The district of Iturbide is south of Bravos, in the central part of the State, and extends to the Rio Grande on the east. Chihuahua is the capital. Santa Eulalia is 15 miles southeast of Chihuahua, in a low range of limestone hills which rise 1500 feet above the surrounding plains. The ores, which are usually carbonates, are found in the limestone, generally along or near fault planes or dikes in the lime. All the larger bodies are replacements of the limestone. Some of the mines have been worked to the depth of 1700 feet, are dry and still produce "sand carbonates" at that depth. Water has to be pumped from the river below Chihuahua 12 miles for the steam hoist. Two narrow-gauge railroads have been built from Chihuahua to Santa Eulalia to haul the ores from the mines. At Terrazas station, 25 miles north of Chihuahua, there are a number of silver-lead properties which produced 3500 tons of lead carbonates during 1903 and 1904. There are several copper properties near, among which are the Rio Tinto, on which there is a copper smelter and on which operations have been resumed. At Victorino, 10 miles west of Terrazas, silver and lead mines have been opened up. Oil, quicksilver, nitrate of soda and salt are being developed.

The Abasola district is a part of the political division of Iturbide, and lies southeast. Cusihuiriachic is the most important and the oldest camp. The Santa Marina has been worked to a depth of 1056 feet, and shows good ores at the bottom of the deepest workings. This mine is equipped with a large hoisting and pumping plant and 25-stamp mill. This camp is 12 miles from San Antonio station, on the Chihuahua & Pacific Railroad. The Burns mines are about 15 miles southeast of Cusihuiriachic. The Rema mine, of which Governor Creel is the principal owner, is 5 miles west of the Burns mines. It is developed to a depth of 416 feet. The ores are treated at the mill of the Burns mine at Buenos Aires. Milpillas is 15 miles south of Cusihuiriachic. There are several large, strong veins of silver-lead ore at this place, and one or two showing good values in copper. At Gavalana, 60 miles south of San Isabel, a station on the Chihuahua & Pacific Railroad, there are several silver properties, one of which has a small mill in operation and is a regular producer. Six miles east of Gavalano there are several silver-lead properties, one of which has over 1000 feet of development work on it. The ore is high in lead and carries good values in silver. A Pittsburg, Pa., company has equipped a 40-stamp concentration mill, which it proposes running as a custom plant. The Magistral copper mines of Governor Creel are 15 miles south of San Isabel station.

The district of Bravos occupies the northeastern portion of the State. There are silver and lead in many places. Near Ojo Caliente on the Mexican Central railroad, a number of gold, silver, lead and copper veins have been located. Small quantities of native silver have been found in some of them. Near Ahumada, some silver ore has been shipped. Near Ojo Caliente some rich bismuth ore has been found. Gold and copper have been reported at Tasesiqua, Lagunas Colo-

radas, Pilares and other points, and silver, lead and graphite at Pilares. There is coal west of Pilares.

The district of Galeana is in the northwest corner of the State bordering on Sonora on the west and New Mexico on the north. At San Pedro the Candelaria M. Co. has been working silver mines for twenty years. Within the last year a pumping plant costing $100,000 has been put in and a new concentrating plant is being put in to replace that at Juarez. There are mines being worked at Ascencion, north of Casas Grandes. There are two American companies working silver mines in the San Joaquin mountains, 30 miles south of Nueva Casas Grandes. In the extreme western part of the State and west of the Guerrero district, is Rayon, which includes Ocampo, Pinos Altos, Concheno, Otates Socorro, Sahuayacan, Yoquivo, Maguarichic, Uruachic, Candemania, and others of less importance. In this district and that of Guerrero, the Greene Gold-Silver Co. is operating. At Ocampo there are seven mills having a combined capacity of 250 tons daily. The process employed in all the mills is amalgamation, but at the Waterson Gold M. Co. the cyanide process has been put in to treat the tailings. The mills are not all operated regularly, owing to the great difficulty of obtaining wood for fuel. All the wood used has to be carried in on pack animals and costs $6 to $7 gold per cord, delivered at the mills. There is an abundance of timber in the mountains for all purposes, and an aerial tram would easily get it down the mountains at a moderate cost. Greene has recently bought for the Greene Gold-Silver Co. the Belvanera, Belen, Refugio, and other mines and controls the greater part of the camp. He has engineers planning a tunnel 8600 feet long to tap veins at the depth of 2000 feet below the present working. The deepest workings in the camp are on the Santa Juliana mine of the Belvanera group. The three mills on the Greene properties are idle preparatory to overhauling and remodeling. Pinos Altos is north of Ocampo. The old 60-stamp mill is being overhauled, twenty stamps are in commission and concentration is to be the process, probably supplemented by cyanide for the tailings. Concheno is northeast of Pinos Altos. An American company operating a 150-ton mill and cyanide plant here and the Greene Gold-Silver Co. is developing a group of claims and shipping in a 300-ton mill which will also be a custom plant which should be in operation early in next year. This same company is building a wagon road from Temosachic, the present west terminus of the Chihuahua & Pacific railroad, to Concheno. At Sahuayacan, 30 miles west of Ocampo, a Pittsburg company is operating a 20-stamp mill on high grade gold-silver ore, and at Portrerito, 2 miles from Sahuayacan, a 10-stamp mill is in operation. At Socorro, 20 miles west of Ocampo, an American company has a 10-stamp mill. The veins are small, but rich in gold and silver and are free milling. Yoquivo is 20 miles from Ocampo. Mines are also being worked at Otates, and at Maguarichic, 40 miles south of Ocampo.

On the north of the district of Rayon and south of Galeana and extending west to the Sonora line is the Guerrero district. W. C. Greene is exploiting the western part of the district. The Dolores gold-silver mine is 60 miles west of Temosachic. The mine is being equipped with a 15-stamp mill and cyanide plant. Copper prospects are being developed at Guaynopita and gold properties near Yepachic. There are silver properties at Namiquipa. Five kilometers from the San Isidro station, on the Temosachic branch of the Chihuahua & Pacific Railroad, with a narrow gauge railroad running to it, is the Calera zinc mine owned by an American company. This is the largest zinc mine in Mexico.

The district of Arseaga lies to the west of Andres del Rio. The most important points in the district are Guazapares, Palmarejo and Rialito. At Palamarejo an English company has been operating for fifteen years. The company has built and equipped 12 miles of narrow gauge railroad from the mines to the mill, which is at Chinipas, and 10 miles of stone aqueduct to take water from Chinipas river to run a 50-stamp mill and cyanide plant. An American company is operating a mine and 15-stamp mill at Aguas Callentes, on the river 5 miles north of Chinipas.

The district of Andres del Rio is east of the district of Arteaga. Batopilas and Urique are the principal camps. At the Barranca del Cobre a New York company is operating a copper mine and a 20-stamp concentrating mill. Other camps of less importance are Cerro Cohui, Cieneguita, etc.

The district of Camargo is in the east central part of the State and south of Iturbide. The Encinillas Mines, Ltd., has a 100-ton smelter at Santa Rosalia. It is understood that they will increase the capacity to 600 tons daily. Naica, 15 miles west of Conchos station, is producing 4000 tons of silver-lead ore. A narrow gauge railroad has been built from Conchos station to the camp. There is quicksilver near Encinillas, 65 miles northeast of Santa Rosalia, and at Sancillo, north.

The district of Jimenez is in the southeast corner of the State. Five miles south of Baca station the Cigarrero mine is shipping 3000 tons per month. The Mexican company which owns it has decided to build a railroad from Baca station to the bins at the foot of the mountain, where the ore is brought by gravity tram from the mine. Near Jimenez some copper mines are being worked with good results. The Las Adargas mine, 25 miles from Jimenez, is being operated by the Cia Metalurgica de Torreon, and it is from this mine that a large part of the lead fluxing ores at its smelter at Torreon have been obtained. J. F. Johnston, a prominent mining man of Parral, has a concession for building a smelter at Jimenez, and he has a number of properties in Cerro Almoloya, Rio Florido and other sections which he proposes to develop to furnish the fluxing ores.—— The Parral district is producing nearly 30,000 tons per month of low-grade silver and siliceous ores. A concession has been granted reduction plants aggregating 1000 tons per day, with immunity from taxes. This enterprise includes an electric power plant on the Rio Verde, in Durango, 65 miles distant, which is to furnish power for the mines. Work has been commenced by D. M. Evans on a new smelter. There are several parallel veins in Parral and all of them are strong and well defined. Concentration and lixiviation are the processes employed, and at Santa Barbara, where the ores carry a large percentage of zinc, magnetic separators have been put in.

The district of Mina is bounded on the south by the State of Durango and on the southwest by the State of Sinaloa and is south of the districts of Andres del Rio and Hidalgo del Parral.

Guadalupe y Calvo is one of the oldest camps in the State and has a record of production of $60,000,000. The famous mine of the camp is the Rosario silver mine, in Guadalupe y Calvo. Morelos is in the western part of the Mina district and 40 miles south of Batopilas.

Sonora.

(Special Correspondence).—The Arizpe M. Co., 15 miles southeast of Cananea, is making shipments to the smelter at El Paso and, according to Secretary G. D. Cash, the ore they have been shipping is netting the company about $1500 per carload of ore. J. P. Hallihan of El Paso is president.

Cananea, Nov. 20.

Zacatecas.

High grade ore has been uncovered in the lower workings of the San Rafael el Grande mine, near Zacatecas, which is being unwatered by the United States & Mexican Trust Co. A. E. Stilwell of Kansas City is president. Unwatering has been in progress for several months under the direction of J. W. Malcolmson.

Books Received.

The Department of Geology of the University of California has issued bulletins on "Sketch of the Geology of Mineral King, California," by A. Knopf and P. Thelen, and "The Differential Thermal Conductivities of Certain Schists," by P. Thelen.

The fact that a book has passed through four editions first causes the reviewer to ask why. On examining "Select Methods in Quantitative Analysis," by B. W. Cheever and F. C. Smith, the reason is readily found—not in the contents, for they differ little from similar texts, but in the authors' method of presenting the subject. The beginner is first introduced to a series of analytic methods designed to give him experience in diverse chemical manipulations. Simultaneously he is taught the necessity for careful selection of methods. A workman must know his tools before he can hope to use them. The first part of the book consists of laboratory notes for a beginner's course. Methods here presented are designed to supply the student with experience in the details of chemical manipulation. The author begins with the subject of specific gravity, continuing with gravimetric determinations, volumetric analysis and gravimetric separations. The author gives detailed instructions of manipulative methods, but says little regarding the calculation of results. In the second part the author presents a number of selected methods for inorganic quantitative analysis. These are standard methods covering the usual work of the commercial analyst. The text is excellent for students, as it embodies methods likely to be met in actual practice and shows the goal toward which they are working. It is published by Geo. Wahr, Ann Arbor, Mich., and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $2.

Verily we are the heirs of our forefathers. This apparently alien thought is suggested upon looking over "Machine Design," by A. W. Smith and G. H. Marx. For in it the authors show the processes of machine evolution. The first machine was built according to the best judgment of its designer; but that judgment was fallible, and some part yielded under the stresses sustained; it was replaced by a new part made stronger; it yielded again, and again was enlarged, or perhaps made of some more suitable material; it then sustained the applied stresses satisfactorily. Some other part yielded too much under stress, although it was entirely safe from actual rupture; this part was then stiffened and the process continued till the whole machine became properly proportioned for the resisting of stress. Coincident with the development of the science of mechanics has been the progress in the design of machines. The text deals primarily with the application of motion, force, work and energy. These are first analyzed, and then the student is instructed in the design of material shapes qualified to resist and direct them. The authors consider such design with regard to adaptation, strength and stiffness, economy and appearance. It is stated that adaptation requires all complexity to be reduced to its lowest terms, strength and stiffness require the machine parts subjected to the action of forces to sustain these forces; economy requires due consideration of the amount of metal and labor. "A machine to be beautiful must be purposeful." In successive chapters are treated sliding surfaces, axles, journals, roller and ball bearings, clutches, bolts, fly wheels, gears, springs and machine supports. In each case is given a brief definition, an analysis of stresses to be met, and the best method of design to meet such stresses. The clear, concise style of the authors is supplemented by a number of excellent drawings of various machine parts. The book is written primarily for students in mechanical engineering, and requires a thorough grounding in analytical mechanics to be of use. A series of practical illustrations make clear the theoretical contentions. This volume will undoubtedly find an immediate place in the designing room, for it gives reasons, not rules. It is published by John Wiley & Sons, New York City, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $3.

Obituary.

J. J. TOLER, a well known mining man in central Idaho, died recently at Grangeville, Idaho, from pneumonia.

Personal.

H. KLINGENDER is at Goldfield, Nev.

FRED W. BRADLEY is in New York.

CHARLES BUTTERS is at Guanacevi, Durango, Mexico.

FRANK H. PROBERT of Los Angeles, Cal., is at Globe, Ariz.

C. W. LININGER is now at Parral, Chihuahua, Mexico.

THOS. H. LEGGETT in on his way to Guanajuato, Mexico.

J. H. CURLE sailed from New York for London on Nov. 15.

J. H. PRIAR is superintendent Pueblo M. Co. at Warren, Idaho.

J. B. EMPSON is in Guanajuato, Mexico, from Deadwood, S. D.

J. V. N. DORR has returned to Deadwood, S. D., from Denver, Colo.

P. BERTSCHEY has charge Eleventh Hour mill at Spearfish, S. D.

ROBERT LANKA has opened engineering offices in Searchlight, Nev.

T. V. CONNOR is superintendent Wild Horse mine, at Cripple Creek, Colo.

F. L. BOSQUI has returned to San Francisco, Cal., from Goldfield, Nev.

E. C. ENGLEHARDT has returned from Elizabethtown, N. M., to Denver, Colo.

R. J. GRANT of Denver, Colo., is examining mines in western Chihuahua, Mexico.

W. H. ESTABROOK is manager Yreka Creek Gold Dredging Co. of Yreka, Cal.

EDMUND SHAW has been made manager Mainstay M. Co.'s mill at Keystone, S. D.

FRANK MEE is superintendent Blue Jay mine, near Hornbrook, Siskiyou county, Cal.

HENRY SCHNITZEL has been made manager Golden Reward mines, near Deadwood, S. D.

EDMUND J. SKINNER has returned from San Francisco to the Leonesa mine, Nicaragua, S. A.

C. O. ELLINWOOD of Salt Lake City, Utah, has been in San Francisco, Cal., on mining business.

J. R. WOODBRIDGE has been made manager Tonopah sampling plant Western Ore Purchasing Co.

W. P. PRESSINGER, New York manager Chicago Pneumatic Tool Co., is in San Francisco, Cal.

W. R. THURSTON represents the El Paso branch of the Mine & Smelter Supply Co., Douglas, Ariz.

W. G. SWART, manager Blake-Morscher electrical separator of Denver, Colo., is in El Paso, Texas.

J. B. TOMLINSON of Prescott and Cananea is making examination of mining property in southwestern Arizona.

J. T. KESCEL has resigned as foreman Kearns-Keith mill to take charge Daly-Judge mill at Park City, Utah.

E. N. SKINNER has returned to Denver, Colo., from Nicaragua, where he has been examining mining properties.

W. A. DESBROUGH, representing Fulton Iron Works Co., San Francisco, Cal., attended the Mining Congress at El Paso, Texas.

H. F. BROWN of San Francisco, Cal., is at the Doane-Rambler mine of the Battle Lake Tunnel Site M. Co. at Encampment, Wyo.

H. H. NICHOLSON has returned to the United States from an extended trip through southern Mexico, in the interests of Eastern clients.

F. G. STEVENS, formerly superintendent Le Roi No. 2, Rossland, B. C., is now at the Santo Domingo mine, Etzatlan, Jalisco, Mexico.

T. A. RICKARD has returned to San Francisco, Cal., from Nevada City, Cal., where he attended the California Miners' Association meeting.

C. E. LANE, vice-president American Engineering & Reduction Co., Cleveland, Ohio, was a visitor at the Mining Congress at El Paso, Texas.

W. B. LEWIS, of the board of trustees of the Colorado State School of Mines, expects to have established a chair of coal mining in that institution.

ADAM INNIS of Columbus, Ohio, secretary Copper World Extension M. Co., operating near Loomis, Wash., spent several days at the property recently.

W. B. LEWIS, manager South Canon Coal Co. of Denver, Colo., has been appointed a member of the board of trustees of the School of Mines at Golden, Colo.

CASSIUS E. GILLETTE, Major Engineer Corps, U. S. A., former member of the California Debris Commission, has been appointed chief engineer Philadelphia bureau of filtration, at an annual salary of $17,000.

GOVERNOR PARDEE of California has appointed the following trustees of the State Mining Bureau: Curtis H. Lindley, vice T. B. Bishop, resigned; F. W. Bradley, vice J. E. Doolittle, deceased; E. A. Stent, vice Frank Monaghan, term expired; Louis Janin, vice Fred H. Harvey. This leaves Harold T. Power as the only remaining member of the old board.

Commercial Paragraphs.

IT is understood that Mexico is about to repeal its present duty on steel importations.

THE Chicago Portland Cement Co. has ordered of the Allis-Chalmers Co. of Milwaukee, two new rotary kilns, each to be 136 feet long, for its plant near La Salle, Ill., and extensions for four of the 60-foot kilns now in the plant, which will make these kilns each 136 feet long when they are reconstructed.

THE Best Manufacturing Co., of San Leandro, Cal., report that they received the highest award and gold medals from the Lewis & Clark Exposition at Portland, Oregon, for traction engines and logging and lumber trucks. They state that their sales of these machines the past season was unprecedented in the history of their business, and even at this early date are receiving orders for these machines and expect to double their output for 1906.

THREE centrifugal pumps, each having a capacity of 10,000,000 gallons daily, for the Massapegna pumping station, Brooklyn, N. Y., have been contracted for with the Allis-Chalmers Co., Milwaukee. The pumps will be driven by vertical cross compound engines. The Newport water works, Newport, R. I., has awarded contracts for a vertical, triple expansion, crank and flywheel pumping engine to the Allis-Chalmers Co., Milwaukee. The engine will have a daily capacity of 6,000,000 U. S. gallons against a head of 190 feet.

THE Fulton Iron Works of San Francisco, Cal., report the following recent orders: Air compressor and accessory equipment for the Kennedy M. Co., California; additional milling machinery, Challenge feeders, etc., for the Sierra Buttes mines, California; 4x6 double cylinder, single drum hoisting engine and 10x8 Blake crusher for German Roth & Co., Mexico; two 15 H. P. electric hoists and necessary equipment for the Llanos de Oro M. Co., Mexico; mining machinery, ore buckets, etc., for the Butters-Salvador mines, Mexico; milling equipment, crushers, rolls, concentrators, etc., for the Coso Reduction Co., California; 4x20-foot trunnion type tube mill for the California Ore Reduction Co., California; 10-stamp mill, latest type (1000-pound stamps), and complete equipment for the Don Pedro gold mine, California; one 36-inch lead furnace and accessory equipment for the Copthall Stores Co., Rhodesia, South Africa; and 6x7 single drum, double cylinder hoisting engine, 60 H. P. horizontal tubular boiler, two steam-driven air compressors and four 2½-inch Wood drills for the Querobabi Mines Co., Mexico.

Trade Treatises.

Catalogue No. 18 of the Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill., shows a large line of rock drills and compressors for all classes of work.

A handsomely illustrated booklet from the Westinghouse Machine Co. of East Pittsburg, Pa., minutely describes their Standard engine, its construction, economy and field.

Latest Market Reports.

SAN FRANCISCO, November 24, 1905.

METALS.

SILVER.—Per oz., Troy: London, 29 1/16d (standard ounce, 925 fine); New York, bar silver, 64⅝c, refined (1000 fine); San Francisco, 64⅜c; Mexican dollars, 53c, San Francisco; 49½c, New York.

Within the week silver has advanced 1⅛ cent, being on the 21st even higher than this. It would not be surprising to now see silver reach and possibly go beyond 65 cents.

COPPER.—New York: Standard, $16.87½; Lake, $16.87½@17.25; Electrolytic, $17.00; Casting, $16.50 @ 16.87½. San Francisco: $16.75. Mill copper plates, $18.00; bars, 18@24c. London: £75 12s 6d spot per ton.

Copper this week is quoted at a slightly higher price than last week and producers are reported well sold ahead, which gives a firm tone to the market.

Following are the figures of German consumption of foreign copper for the months January to September, as compared with the same period of time for 1904 and 1903:

	1905.	1904.	1903.
Imports, tons	82,445	83,845	63,527
Exports, tons	9 101	6,379	7,797
Consumption, tons	73,344	77,466	55,730

Out of the above, 69,177 tons were imported from the United States.

LEAD.—New York, $5.55; St. Louis, $5.15; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £15 8s 9d ℔ long ton.

SPELTER.—New York, $6.10; St. Louis, $6.20; London, £28 10s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $33.42@33.60; San Francisco, ton lots, 34c; 500 lbs., 35c; 200 lbs., 36c; less, 37½c; bar tin, ℔, 40c. London, £153 7s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots 19.15c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17.35; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11½c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

OILS.—Linseed, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 57c; Lucol oil, boiled, bbl., 48c: cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING NOVEMBER 7, 1905.

804,182.—ELECTRIC SIGNAL—Andriano & Herbstritt, San Francisco.
803,868.—GOLD SAVING APPARATUS—W. D. Baney, Tonopah, Nev.
803,974.—HOLDING ATTACHMENT—C. Benedict, Fruitvale, Cal.
803,978.—KNIFE—E. Bienseth, Seattle, Wash.
804,095.—LIFEBOAT—F. W. Brown, Tacoma, Wash.
803,668.—CLAMP—W. H. Clendenon, Healdsburg, Cal.
803,672.—IRONING BOARD—L. M. Darrow, Berkeley, Cal.
804,185.—TOOL COUPLING—E. A. Davison, Stockton, Cal.
803,564.—AIR BRAKE—J. Dillander, San Francisco.
803,885.—SUBMARINE BOAT—H. O. Eiane, U. S. Navy.
804,113.—LOCK—G. K. Glenn, Pasadena, Cal.
803,688.—SHOE DISPLAY DEVICE—Gruss & Alexander, San Francisco.
803,736.—BOTTLE WARMER—B. L. Gwynne, Sumpter, Or.
803,587.—DREDGER—R. G. Hanford, San Francisco.
804,124.—BRAKE—W. Heffiin, Michigan Bar, Cal.
804,125.—TIRE SHRINKER—Horner & Buck, Seattle, Wash.
803 903.—ORE CRUSHER—G. Johnston, San Francisco.
804,136.—AIR BRAKE—R. W. Kelly, Los Angeles, Cal.
804,144.—WIRE STRETCHER—M. K. Lewis, Lompoc, Cal.
803,767.—TRACING DEVICE—P. F. Limacher, Los Angeles, Cal.
803,769.—MOP—E. O. Loeber, Los Angeles, Cal.
803,699.—CHAIR—D. T. Matthew, Tacoma, Wash.
803,705.—BINDER FOR LEAVES—R. D. Miller, Spokane, Wash.
803,849.—WHEEL BEARING—H. C. Peterson, San Francisco.
803 934.—QUICKSILVER TRAP—P. Somerville, Bishop, Cal.
803,724.—COOKER—F. F. Stetson, Los Angeles, Cal.
803,638.—SAFE—H. C. Stockwell, Los Angeles, Cal.
803,796.—FRUIT CLIPPER—C. F. Streight, Riverside, Cal.
803,736.—STOCK RELEASER—B. Teal, Walla Walla, Wash.
803,642.—UNDERREAMER—W. J. Traver, Fullerton, Cal.
803,943.—BRAKE—M. F. Volkmann, Santa Monica, Cal.
803,944.—CONVEYING APPARATUS—Wallace & Nash, San Francisco.

FOR THE WEEK ENDING NOVEMBER 14, 1905.

804,371.—WHEEL—H. Behan, Seattle, Wash.
804,297.—RAILWAY CROSSING—W. J. Bell, Los Angeles, Cal.
804,298.—RAILWAY CROSSING—W. J. Bell, Los Angeles, Cal.
804,701.—PNEUMATIC TIRE—O. M. Bigger, Holt, Cal.
804,518.—DRIER—G. Boschke, San Francisco.
804,211.—DENTAL SWITCHBOARD—M. N. Callender, San Francisco.
804,378.—SPRAYING DEVICE—J. F. Cass, Seattle, Wash.
804,306.—PAPER DELIVERY—C. P. Fonda, San Francisco.
804,307.—PAPER DELIVERY—C. P. Fonda, San Francisco.
804,529.—STOCK SUPPORTER—Minna B. Foster, Sausalito, Cal.
804,397.—CINCH—E. A. Grushus, Ft. Bidwell, Cal.
804,398.—SAWING STONE—J. A. Hall, Sacramento, Cal.
804,8 2.—SAWING STONE—J. A. Hall, Sacramento, Cal
804,315.—FURNACE—J. E. Hayden, Pasadena, Cal.
804,534.—SAW FILING MACHINE—C. M. Henderson, Berkeley, Cal
804,538.—COUCH—J. Hoey, San Francisco.
804,475.—THILL LOOP—C. A. Jacky, Coulee City, Wash.
804,408.—GOLD SEPARATOR—F. M. Johnson, San Francisco.
804,412.—DUMPING CAR—J. H. Kelly, San Francisco.
804,734.—ROTARY CUTTER—W. Kinley, Seattle, Wash.
804,477.—TALKING MACHINE—G. Konigstein, San Francisco
804,749.—PIPE CLEANER—W. J. Mecredy, San Francisco.
804,245.—STONE SAW—C. L. Meil, Sacramento, Cal.
804,246.—STONE SAW—C. L. Meil, Sacramento, Cal.
804,247.—STONE SAW—C. L. Meil, Sacramento, Cal.
804,248.—STONE SAW—C. L. Meil, Sacramento, Cal.
804,492.—FOLDING RACK—Mills & Izer, Pomona, Cal.
804,759.—HEATER—J. A. Noble, San Francisco.
804,496.—BUNSEN BURNER—L. Page, San Francisco.
804,675.—HOP SPRAYER—G. Roberts, Tacoma, Wash.
804,676.—CURRENT MOTOR—J. Roen, Spokane, Wash.
804,774.—PUMP—J. L. Shepard, Los Angeles, Cal.
804,631.—BEET PLOW—E. G. Smart, Salinas, Cal.
804,509.—GAS BURNER—S. H. Ury, San Leandro, Cal.
804,354.—MATTRESS—N. J. Walls, Pozo, Cal.
804,646.—CALCULATOR—C. M. Young, San Francisco.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

COUCHES.—No. 804,538. Nov. 14, 1905. John Hoey, San Francisco, Cal. This invention relates to improvements in couch or bed bottoms, or equivalent surfaces in which it is requisite or desirable to have an evenly elastic surface. As an article of manufacture, it consists of a curved bar having notches in the convex edge and diagonally inclined surfaces extending from the lower side of each notch to the higher side of the next contiguous notch. There are other details of construction adapted to bring about the desired result.

ATTACHMENT FOR TALKING MACHINE.—No. 804,477. Nov. 14, 1905 Gabor Konigstein, San Francisco. Cal. This invention relates to an attachment which is especially designed for use upon the movable arms used in gramophones or talking machines, and which arms are swiveled and turnable, so that the points carried thereby conform to the movements of the disks by which the audible sounds are transmitted. It consists in a gramophone having in combination a record, a stylus to operate thereover, a stylus support, said support attachable to and turnable concentric with the sound-box and cushion means carried by the support and adapted to contact with the record to hold the stylus out of contact with the record. or to allow it to engage said record, and other details of construction.

AUTOMATIC GAS BURNER ATTACHMENT.—No. 804,509. Nov. 14, 1905. S. H. Ury, San Leandro, Cal. The object of this invention is to provide a device by which the flow of gas will be cut off whenever the flame is extinguished, and danger to life or health of sleeping persons or others who might be exposed to a flow of unburned gas will be prevented. The device comprises a burner and member thereon expansible by heat, a normally spring-retracted, gas-controlling cock, mounted to slide in a direction parallel with its axis, and a trigger mechanism between the cock and the expansible member whereby the cock is maintained in open position against the pressure of its returning spring as long as the gas burns, and is released and automatically returned to normal closed position when the gas is extinguished.

SAW FILING MACHINE.—No. 804,531. Nov. 14, 1905. C. M. Henderson, Berkeley, Cal. The object of this invention is to provide an apparatus for the convenient and automatic filing of band saws, which are suspended so as to travel vertically through the apparatus. It comprises in a saw filing machine clamps, between which the saw is vertically held, and a feeding device by which it is advanced; a longitudinally reciprocating file carrier, guiding means for said carrier, a hollow cylindrical housing carried by the file carrier, and having a slot in its lower portion, a cylindrical plug slidable within the housing, said housing serving to prevent saw filings coming in contact with the moving parts, and means for oscillating the plug.

DRIERS.—No. 804,518. Nov 14, 1905. Guy Bos hke, San Francisco, Cal. The particular object of this invention is to provide a means for drying fish, skins, leather, or any flexible substance which may be hung upon hooks or supports, and which is caused to travel through alley-ways by means of endless chains from which the hooks depend. During this travel the articles to be dried are subjected to a current of heated air passing through the alley-ways from one end to the other. The device comprises a drying chamber, an endless horizontally traveling chain movable therein, loosely dependent hangers suspended from the chain and having hooks for the attachment of substances to be dried, and resistant backing devices, in contact with which the hangers move while the substances are attached or removed. There are other details of construction, all constructed and arranged to bring about the desired result.

STOCK SUPPORTERS.—No. 804,529. Nov. 14, 1905. Minna B Foster, Sausalito, Cal. This invention relates to a device which is especially designed for supporting stocks of soft material, such as are used by ladies for neckwear. It consists in a stock support, of rigid bar having transverse tubular ends, said ends having extensions or enlargements, pins slidable through the tubes with the points projecting, the shanks of said pins being bent to return across and exterior to the tubes, and being again bent and having concavities with which the points of the pins may be engaged.

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Causes of Failure in New Mines.

Why some mines fail to pay which have been unloaded on the investing public is a question asked in all seriousness by many of those who have purchased stock in these unprofitable propositions. The question is certainly a pertinent one. The prospective investor is led to believe that he stands little chance to lose in most of these ventures, and in some of them he is plainly told that his investment will be returned to him many fold—that it cannot fail to be largely profitable.

There are several reasons why some mines fail to pay which have started their career under apparently favorable auspices. The most usual reason for failure is that the property does not actually possess the elements essential to success and profit. The reports and prospectuses give some of the facts—those things favorable to it being given great prominence, while those unfavorable are lightly referred to or more often not mentioned at all. The size, and frequently the value, of ore bodies are mis-stated—often grossly exaggerated—and the estimate of costs is as often considerably below what is really necessary. It is usual to select as an example a successful mine where, owing to exceptionally favorable conditions, the costs are lower than the average of mines in the same district. The new mine, lacking these happy conditions, is unable to operate within the figure set by the optimistic promoter, and the result to investors is disappointing, if not disastrous.

Another reason for failure is the inexperience and incompetency of the management. In a rich mine this condition is not so much felt, for the rich ore can stand some extravagance, but a mine operating on a narrow margin of profit is likely to have this profit wholly absorbed in unnecessary expense or lost in faulty metallurgical operations.

General and office expenses are inordinately heavy, taking up much or all of the profit which should go to stockholders. This has been repeatedly proven where a good mine failed to net a profit under corporate management, but which by the leasing system paid the leasers handsomely in addition to a royalty of 20% or more to the company.

In many cases the mechanical equipment is out of all proportion to the demands of the property. A great hoisting plant and mill are built on a prospect which is insufficiently developed to warrant the large and expensive hoist, or to supply the mill with ore. Large plants can usually be operated at much lower cost per ton than small plants, when run up to their capacity, but there is no economy in a 500 horse power equipment to hoist forty tons of rock during twenty-four hours from a depth of 200 feet. Nor is a mill, concentrator or smelter many times larger than the mine can supply, a stroke of economy in installation.

Some promoters claim that it is impossible to raise money for mine development, if the property is not equipped with a mill, consequently a mill is one of the first things provided. The argument is then reversed—having a mill, required the ore, and development is undertaken in hope of finding ore to supply the mill. It would be indeed strange if this kind of management resulted in anything else than failure.

Open Cut Mining at Mount Lyell, Tasmania. (See Page 375.)

IT is not many years since the occurrence of gold in an intrusive igneous rock was stoutly disputed by men recognized as high in authority in matters geological. Now, it is known that gold and silver ores occur in many dike rocks in payable quantity. The experienced geological student is now slow to deny the existence of gold in any kind of rock, either basic or acid, for the reason that the research of recent years has shown that gold may be found in almost any kind of rock, either sedimentary, intrusive or volcanic, except possibly in the true glassy rocks and in the basalts. In these two latter types no gold has as yet been announced, though it would not be surprising to learn of its occurrence in basaltic rocks, as it is known to occur in diabase, which is but a little way removed from basalt in composition. As a rule, when igneous rocks contain appreciable amounts of gold they are considerably altered. The feldspars are kaolinized, quartz is usually infiltrated into the mass, replacing other normal constituents removed in solution, and ordinarily the sulphides of the base metals occur in greater or less abundance, particularly iron sulphide.

ONE of the latest ideas in modern mining equipment in Mexico is the proposed installation of a wireless telegraph plant near Guadalupe y Calvo, Chihuahua, to facilitate communication with the outside world. Truly Mexico is coming into the very front rank in up-to-date practice. The material progress of that Republic within the past ten years is really astonishing, even if the greater portion of it is due to foreign capital and brains.

IN consideration of the distinguished services he has rendered the California Miners' Association and the State of California, particularly in his masterly handling of the debris question before that Association, Prof. S. B. Christy, dean of the Mining College of the University of California, has been honored with a life membership in the Association.

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COPPER has taken another advance and has touched the 18-cent mark. This brings aluminum into more active competition with copper in electrical work, and it is not probable that the price of the latter will go much, if any, higher. It is manifestly not to the best interest of the copper producers to force the price of the metal up to a point where other metals will be substituted for copper, which would be the result of an abnormally high price of copper.

THE efforts now being made at a copper mine in Mexico to produce copper direct from high-grade sulphide ore, by feeding the ore to a converter in blast, is one of the most interesting attempts at the lowering of cost in the production of copper. To what extent this new idea may be safely carried is at present problematical. The matte ordinarily running to a copper converter is an artificial copper sulphide. Whether the natural sulphide will work in the same manner on a large scale remains to be seen. With the copper ore is some matte, the result of previous operations in the blast furnace. At Butte, Mont., something similar is done by charging concentrates to a converter charged with molten matte, and this is said to operate successfully and economically. The idea in both instances is without doubt based on the Huntington–Heberline process of lead reduction.

THE deepest gold mines in the world are in Bendigo, Australia, where the mine workings have passed the 4000-foot mark. In California some of the mines in Amador and Nevada counties have worked to a depth exceeding 3000 feet on the veins, but no vertical shaft has yet reached that depth on a California gold mine, the deepest being the Kennedy, in Amador county, now down nearly 2800 feet. Theories concerning the depth to which gold-bearing veins may be profitably worked are undergoing some change, but it will probably be found in this, as in almost everything else in mining, that no arbitrary lines can be safely drawn, and while many gold mines will be found unprofitable below 2000 feet, there are those which will continue to pay at 3000 and 4000 feet, and possibly at greater depth. In the early history of copper mining in the Lake Superior region, it would have been commercially impossible to work to the tremendous depths at which profitable operations are now being carried on, but a change in economic conditions, by reason of which costs are diminished, will make profitable mining possible at increasingly greater depths as time passes. We have not, therefore, in all probability, yet learned how deep a gold mine may be operated with profit.

Open Cut Mining.

Inexpensive mining methods are always being sought by careful managers, who, in a desire to accomplish work at a minimum cost, look about for the least expensive way of breaking and handling ore. Obviously, that method is cheapest which operates by gravity. Where shoveling must be resorted to, the cost at once goes up, for manual labor is always more expensive than properly applied mechanical methods of handling materials such as ore and rock. When the conditions are such that an excavation can be made beneath the mass of rock to be mined, such as a drift or crosscut, and a raise put up from this adit to the bottom of the cut, ore broken on the slopes of the cut will descend by gravity through the mill hole, and may be drawn from a chute into cars without handling, and trammed to the reduction works. This fortunate condition is not always obtainable, and shoveling becomes necessary, as shown in the illustration on page —, which is that of one of the flat sheets of telluride ore in the Black Hills of South Dakota. There the ore is blasted down from the face and the ore shoveled into the cars, which are hauled away in trains, as shown. The waste is shoveled across the track and as the work of mining progresses inward the track is shifted nearer the face as it recedes. In this case it would probably be inexpedient to run a drift beneath the ore body as its thickness would not make available sufficient tonnage at any particular mill hole to justify the expense.

In excavating for mill grades it is often possible to remove the soil and loose rocks by hydraulicking, but where water is not available for this purpose the excess debris and alluvial must be removed by shoveling. Occasionally the cost may be reduced by the construction of temporary chutes on the several terraces of the mill grade, so that the rock removed from one bench may be easily loaded into cars on the next bench below and these trammed off the grade and dumped at one side. This is advisable where the benches are high and relatively narrow. The use of wheelbarrows on excavations of this kind is not to be recommended, as a given number of men can handle the material less expensively by the employment of track and cars. Where the benches are high—15 to 20 feet or more—30 to 40 feet wide and up to 150 feet long or more, it will generally pay to put in several turnplates, with a system of tracks so arranged that cars may be always held in reserve, near at hand, to immediately take the place of those which have been filled and pushed onto the main line, which runs longitudinally with the excavation. The shovelers are thus obliged to wait less than a minute for an empty car, when otherwise they may be obliged to wait from two to five minutes at various points along the line, a delay which in the aggregate would mean a very material increase in expense, for long waits are to be avoided wherever possible. The arrangements for expediting work should always be commensurate with the magnitude of the undertaking. It would be poor business to put in an elaborate system of trackage for a small job, but where from 7000 to 20,000 tons or more are to be handled on each terrace of the excavation, it usually pays to make the necessary preliminary arrangements to lessen the cost of handling the rock. In such situations, where large tonnages are to be removed quickly and cheaply, a double line of sectional track, which may be quickly moved, when necessary, to another situation, should be laid, provided with turnplates or turntables, at stated intervals—usually about 30 feet apart. This permits the loaded cars to be promptly moved off the grade while empties are returned on the opposite track and distributed wherever required. By systematic arrangement and skilled handling there need be no delay and the cost of moving material thus by hand is reduced to a minimum. The tracks used in operations of this kind may be employed again elsewhere about the works, or at the mine, so that it is not limited in its usefulness.

Some of the largest mines of the world handle enormous quantities of ore in open cuts. Many of the great iron mines of the Lake Superior region mine all of their ore in great open cuts. This is usually done in a systematic manner by means of cuts in which the ore is blasted down in terraces and loaded into cars by steam shovels. A few of these mines have mill holes, and rock broken in the cuts passes by gravity through the holes to loading chutes below, from which it is loaded into cars and trammed to a shaft or adit, and taken to the surface. In some of them, where mill holes are in use, steam shovels deliver the ore to these ore passes when it no longer will run to them from the face by gravity. The illustration on page 384 is that of the open cut and mill hole of the Big Indian mine near Helena, Mont.

Not infrequently there is a large amount of waste rock, or alluvial, overlying an ore body, and this must be removed before the clean ore beneath can be mined. Where such a condition occurs it is the most economical method to open underground stopes with raises driven to the surface, through which this overburden may be sent for filling. In some instances this use of the waste material so fortunately placed above the ore is not put into operation until a large open cut has been made in the superficial portion of the ore body, and the overburden has become a source of trouble and danger. It is the most natural thing to mine the ore lying at the surface and most easily obtainable early in the history of the mine, the more difficult engineering problems presenting themselves later, when some solution for them is worked out. The engraving on the first page shows a portion of the great open cut at the Mount Lyell copper mine in Tasmania. There the ore is being broken from the sides of the cut and the overburden removed to one side. Later this overburden became such a large proposition that steam shovels were put in to handle it. Large amounts of this waste were accumulated at the sides of the cuts. More recently this waste is being sent down into the lower workings for filling.

A CASE was recently decided by a jury trial in a Butte, Montana, court, where a locator of a quartz vein within a patented placer was declared to be within his rights. The ground was located in 1880 as placer. This placer was patented later, but in 1890 other parties entered the placer and located a lode claim on it. Defendant claims that the patent gave him exclusive right to the ground and that he had held undisputed and undisturbed possession of the claims for six years, and that the claim was good against all comers, and moved a non-suit. The court decided that such claim could only be allowed when the Government contested the title. The defendant further claimed that there was not a sufficient showing of quartz on the claim in 1880 to justify working the property as a lode claim. This contention was overruled by the court. A patent to a placer claim is not prima facie evidence of the fact that no known lodes exist within the limits of the placer claim at date of application. The disposition of the department is to consider that if the lode actually did exist at the time of filing application for placer patent, such lode is reserved by operation of law, whether located or not. The law relative to lodes within placers is another phase of existing mining legislation that needs a change to remove from it that element of ambiguity and uncertainty.

THE somewhat paradoxical statement is made by a current electrical journal that in the south of England large distributing electrical companies can supply power to coal mines at a rate cheaper than the power can be produced by the mining companies themselves, notwithstanding the fact that they have to buy the fuel (coal) from the coal companies. The reason for this lies in the fact that the electrical companies have built extensive power houses of modern design and burn a cheap grade of fuel, producing electrical power at a minimum of cost.

CONCENTRATES.

USUALLY where injury is done by the use of oily lubricants, or there is other objection to its use, graphite in some form may be substituted for grease or oil.

A CUBIC foot of quicksilver weighs 849 pounds. A flask contains 75 pounds, and at present price is worth $40, more or less, depending on where it is purchased.

A HOLE in a fly wheel or other iron casting may be filled by a cement made of one part gum arabic, one part plaster of paris and one part iron filings mixed with a little water.

GARNETS, unless very clear, of good color and free from flaw, are of no value as gems. The same may be said of any gem stone—the finer the stone the more value it has as a gem.

THE cost of treating silver ores of the Comstock by pan amalgamation at Virginia City is now usually figured at $6 per ton. This includes power, labor, chemicals, wear and tear, etc.

A GOOD iron cement is made from 20 pounds of iron filings, 1½ pound sulphur and ¼ pound sal-ammoniac. These materials are mixed to a pasty consistency with water, so it may be spread without running.

PULLEYS upon which a shifting belt is to be run should have a flat face, while those on which a belt is to be run without shifting have the face raised at the center, which keeps the belt from running off the pulley.

TUNGSTEN ores are bought by some of the steel manufacturers in the United States and Germany. The ore from Nevada, containing manganese oxide and tungstic acid is doubtless hubnerite, a tungstate of manganese.

IN constructing a dam in a stream, when the structure is not on bedrock, it is very necessary to so arrange it that the overflow will not undercut the dam itself. This is a fault that dams built on gravel, etc., often have.

MATHISON & CO. of Chelsea, N. Y., are engaged in the reduction of antimony ores. At present there is no reduction works on the Pacific coast reducing antimony ores, though there was one formerly in San Francisco, Cal.

ALL of the gold mines of the Transvaal, S. A., are not at or near Johannesburg, on the conglomerate beds, called there "banket." There are a number of producing mines in the schist area at some distance from the Rand.

RHYOLITE is not known as the lava of a recent active volcano, but is found in great quantities in beds, sheets, dikes and plugs. It is an abundant rock in the Great Basin region, between the Rocky mountains and Sierra Nevada.

THE minerals of economic value associated with serpentine are chromic iron, platinum, asbestos and chrysotile, gold, copper ores, cinnabar and mercury. The most important of these is chromic iron, which is particularly characteristic of serpentine.

IT is not always a safe proposition to trust wholly to a stone used for grinding gold-bearing rock when prospecting, for the reason that these stones are often "salted" with the gold derived from previous tests, particularly where the samples were rich.

QUARTZ commonly occurs in all acid rocks, but is rarely present in basic rocks, particularly in the highly basic kinds, like basalt. However, at a volcanic vent known as the Cinder Cone, 10 miles east of Lassen's peak, in California, is a black basalt flow in which there are abundant quartz crystals.

HAND JIGS may be employed to advantage where labor is cheap, or where there is only a small amount of material to be treated. These machines can not be given as many vibrations as are ordinarily given power driven jigs, but good work can be accomplished with them when properly manipulated.

IT is bad practice to divide mill plates into narrow strips. It is far better to increase the width of the plates and lessen their grade, that the pulp may be spread thinner and run more slowly and evenly. This usually results in better amalgamation than narrowing the plates and giving them a heavy grade.

BRUCKNER cylinders are horizontal roasting furnaces open at both ends and lined with fire brick. The smaller sizes are slowly rotated by means of friction wheels, the larger are driven by means of gears. The charge is retained in the furnace as long as desired, it not being a continuously discharging furnace like the White-Howell.

THE pressure gauge of a steam boiler should indicate the same pressure as that at the safety valve, where the latter is blowing off. If this is not the case the gauge should be examined and repaired. Never pump cold water into a boiler where the steam is low and the boiler hot. Better draw the fires and allow the boiler to cool down first, and thus avoid an explosion.

IN the United States the line of no magnetic variation passes through the Carolinas, eastern Tennessee and Kentucky, through Ohio and Michigan into Canada. In Colorado it is about 14° east; in Montana 18° east in the central portion, increasing to 22° east in the northwestern corner. In California it ranges from 14° east in the southern portion to 18° in the northern part.

WHEN it has been determined to stop the loss in mill tailings, it is necessary first to ascertain in what form and where this loss occurs. If it be in slimed sulphides, arrangements must be made for finer classification and concentration. If the loss be in the coarse sands, then finer crushing must be resorted to. Gold which will not amalgamate is often amenable to cyanide treatment.

SOLDERS for different metals are composed of different substances. A solder for lead is made of one part tin and one and one-half lead; for tin, of one part tin and two of lead; for brazing (hard), three parts copper and one part zinc; bronzing (medium), one of copper and one of zinc; for bronzing (soft), one of tin, four of copper and three of zinc, or two of copper and one of antimony.

A CURRENT wheel is an inefficient method of obtaining power. Only a small portion of the energy of a running stream can be applied to be wheel. Small powers may be obtained from a large stream, and a number of current wheels placed in series will supply power in proportion to the number of wheels. Generally speaking, such a plant would not justify the expense of its installation.

IN rotary rock breakers the power required to operate the machine is about 1 H. P. for each ton of rock crushed per hour—this varying with the character of the rock and its size upon reaching the crusher. Thus a crusher which will break from forty to sixty tons per hour requires about 50 H. P. Some makes of rock breakers require more power than others to produce stated results.

THE melting point of various rocks differs in the same manner that the fusing point of various metals differs. The acid rocks require a higher degree of heat to fuse them than the more basic ones. Thus basalt and the more basic rocks require about 2250° F. for fusion; andesites and rocks of this type melt at 2520° F., while 3000° F. or more are necessary to fuse trachyte and similar acid rocks.

BAUXITE is mined in the United States in Arkansas. The mineral is shipped to Niagara Falls, N. Y., where it is used in the manufacture of aluminum and in making carborundum. There is also a plant in East St Louis, Ill. The mineral is treated by electricity and as the entire business is in the hands of practically one company the costs are not available. There is no reduction plant handling bauxite on the Pacific coast.

TO prevent the loss of quicksilver in the stamp mill requires much careful attention to the condition and operation of the mill. Ordinarily, more mercury is lost where inside amalgamation is practiced than where all amalgamating is done on the outside plates, but better amalgamation usually results from inside amalgamation. The character of the ore must determine whether inside amalgamation shall be practiced or not.

IF sand banks at the side of the concentrator belt, the probability is that there is too little water being used. The remedy is to feed more fresh water to the machine. The arrangement of the mill should be such that this amount of water cannot vary except at the will of the concentrator man. Particular care must be taken to keep debris out of the pipes, such as leaves and small chips, which would have a tendency to clog the feed pipes.

WHENEVER black oxide of manganese occurs in the surface portion of a vein, it may be expected that manganese minerals will be found in depth. The primary manganese mineral may be the comparatively rare sulphide, alabandite, though more commonly the metasilicate, rhodonite, is found, and in higher zones the carbonate, rhodochrosite. These latter often occur in the same zone. These alter to the black oxide upon being subjected to oxidizing surface waters.

ASBESTOS occurs usually in greenstone schists and in serpentine. Those occurrences where the fiber crosses the vein-like deposit from wall to wall are chrysotile. This is often silky in fiber and usually of light green to white color. Both chrysotile and asbestos of the amphibole variety are mined commercially. Much asbestos must be cleaned and freed from impurities before it is suitable for the market. Clean and pure asbestos is unaffected by either heat or water. Impure ground asbestos is used as a non-conductor of heat on boilers, etc.

MINE DAMS may be made of timber and clay, of rock, of bricks and of concrete. Of the several materials that may be used, concrete is probably the best for permanent work. If considerable pressure is likely to be exerted upon the dam as by water, the dam must be securely anchored by cutting a channel in the solid rock at the bottom, top and sides. If the dam is extended up to the roof, it may be finished from the inner side, leaving a manhole about 20 inches square through which the workmen may pass. This manhole must be provided with a door or gate which may be tightly and securely closed.

WHERE gold is extracted from roasted sulphides by chlorination and the gold precipitated in the tank, after stirring the solution should be given plenty of time to settle, as there is usually considerable gold in an extremely fine state of division held in suspension in the solution. It has been held by some that if the gold long remained in contact with the iron sulphate or the iron perchloride, due to addition of iron sulphate as a precipitant of gold, the latter would be redissolved. Concerning this, C. H. Aaron says that iron perchloride does not dissolve gold in presence of the iron protosalts, and precipitated gold in the chlorination vat is not redissolved by remaining many hours in contact with the solution of iron per-salts, which is produced when gold terchloride is decomposed by iron protosulphate.

VARIOUS mixtures are used in greasing hoisting ropes—mixtures of crude petroleum, pitch, tallow, tar, etc., being used for this purpose. In California several mines have found the heavy viscuous crude oil produced in some of the oil districts of that State to make an excellent rope grease. Any oil used for this purpose should be tested for acidity, as the presence of acid would be detrimental to the rope. Rope grease is usually applied to flat ropes by carefully applying the "dope" with brushes, and round ropes are slowly run downward through a sectional hopper-shaped box having a hole in the bottom slightly larger than the diameter of the rope. A half gunny sack is packed around the rope in the bottom of the box and the hopper filled with the oil or heated compound, and the rope allowed to run through the box until the dope is about exhausted, when the hopper is again filled, and the process continued until the entire rope has been lubricated. The oil or compound employed must be of such consistency that it will not melt and run off the rope at the normal temperature of the shaft.

THE careful assay of raw iron sulphides containing gold, and an equally careful assay on the tailings after roasting with salt and the extraction of the gold by the chlorination process, which indicates a high extraction, but which fails to be represented by the recovered gold, suggests the loss due to volatilization of gold in the furnace. To chloridize silver it is necessary to add salt to the charge before roasting, but such addition of salt is almost certain to be followed by loss of gold from the cause stated. The effect of adding salt to auriferous sulphides before roasting can easily be determined by making the experiment in a muffle. Take two lots of the same ore, of even weight, add 3% to 4% of salt to one of them and none to the other. Place side by side in a muffle and roast with a bright heat. When the sulphur has been eliminated, withdraw from the muffle, add the necessary fluxes to each and assay separately. The ore which was roasted without salt will be found to assay more per ton than the raw ore, due to decrease of weight in roasting, while the other lot, though also decreased in weight, will show little if any gain in assay value per ton—due to loss of gold by volatilization.

THE loss of power by the slipping of belts may amount to 20% or more, but is usually corrected before so unsatisfactory a result is reached by use of a tightening pulley, or by shortening the belt. Where the loss is small by reason of only a slight slipping of the belt this may be remedied by the use of some material on the belt which will increase the friction between the belt and the pulleys. Among substances used for this purpose are resin, soap, asphaltum, etc. Some of the substances thus used, although affording a temporary remedy for slipping belts, do more damage to the belt than is gained in power. Resin, particularly, is bad, as it renders a belt brittle, and consequently short lived. Covering iron or wooden pulleys with leather by means of glue always gives good results, as it largely increases the friction between the surface of the belt and the pulley, and consequently gives higher power transmission. Where leather belts are used on iron faced pulleys the belts must be tightly drawn to secure the best results, and this makes the belts wear faster. Tallow warmed to 100° F. and applied to leather belts and dried in by sun or artificial heat makes belts soft and pliable, and also tenacious. When a belt becomes dry an application of neat's foot oil will be beneficial, but the belt must not be soaked in water before applying the oil, as some suppose. Belts are likely to slip immediately after oiling, but they soon become adhesive again and are better for the dressing. Another good belt dressing is made from one part beef kidney tallow and two parts castor oil well mixed and applied while warm. Rats will not attack a belt that has been treated with castor oil. Rubber belts from which the rubber has been worn off can be improved by painting the worn side with lead paint in which sufficient japan has been mixed to cause it to dry quickly. The japan is made by cooking linseed oil and shellac in a varnish kettle.

The California Miners' Association.

At the annual meeting of the California Miners' Association, which closed its session at Nevada City on November 25, a number of interesting papers were read and addresses made by representative men. One of the most important matters directly connected with the mining industry of the West is the mining law. This was reviewed by John F. Davis in his report of the committee on legislation, in so far as California laws affected mining. He said that the need of additional legislation had been recognized long since, and attempts made to remedy existing conditions by new legislation. At the last session of the Association, in 1904, a large amount of legislation was recommended, much of which was acted upon by the last session of the California Legislature. The following abstract is made of the remarks of Mr. Davis:

A new section was added to the Code of Civil Procedure, to be known as Section 1927, and to read as follows: "1927. Wherever any patent for mineral lands within the State of California, issued or granted by the United States of America, shall contain a statement of the date of the location of a claim or claims, upon which the granting or issuance of such patent is based, such statement shall be prima facie evidence of the date of such location."

This Act was approved March 7, 1905, and is to be found in the Statutes of 1905, at page 78.

There was also passed by the last Legislature an Act repealing the Act of April 23, 1880, and the Act amendatory thereof of March 9, 1897, requiring certain ratifications by stockholders of any act of a board of directors in a mining company in buying, leasing, selling, mortgaging or in any other way disposing of additional mining ground. The repeal Act was approved March 7, 1905, and is to be found in the Statutes of 1905, at page 74.

The attention of this Association has been called to the desirability of having a law for the punishment of frauds and misrepresentations in prospectuses and, in general, for punishment of fake mining promotion. In 1878 there had been passed an Act entitled "An Act to Protect Stockholders and Persons Dealing With Corporations in This State" (statutes of 1877-8, page 695), which read as follows: "Any superintendent, director, secretary, manager, agent, or other officer, of any corporation formed or existing under the laws of this State, or transacting business in the same, and any person pretending or holding himself out as such superintendent, director, secretary, manager, agent, or other officer, who shall willfully subscribe, sign, indorse, verify, or otherwise assent to the publication, either generally or privately, to the stockholders or other persons dealing with such corporation, or its stock, any untrue or willfully and fraudulently exaggerated report, prospectus-account, statement of operations, values, business, profits, expenditures, or prospects, or other paper or document intended to produce or give, or having a tendency to produce or give, to the shares of the stock in such corporation a greater value, or less apparent or market value than they really possess, or with the intention of defrauding any particular person or persons, or the public, or persons generally, shall be deemed guilty of a felony, and on conviction thereof shall be punished by imprisonment in the State prison or a county jail not exceeding two years, or by fine not exceeding five thousand dollars, or by both; provided, that this Act shall be construed to apply only to corporations whose capital stock has been or shall hereafter be listed at a stock board or stock exchange in this State, or whose shares be regularly bought and sold in the stock market of this State."

This Act was absolutely of no use whatever on account of the proviso at the end of it. On account of that proviso the Act, in terms, applied only where the stock of the corporation had been or should thereafter be listed at a stock board or stock exchange in this State, or whose shares should be regularly bought and sold in the stock market of this State. This, by inference, excepted the very class of cases where these frauds are most numerous, namely, where the faking is done by promoting corporations whose stock is not listed in this State at all. In by far the greater part of these great frauds the stock is generally listed in some Eastern board, nearer the home of the victim than the location of the property. The most gigantic promotion frauds have been of this class.

At the last session of the Legislature two bills passed, each of which received the sanction of the Governor and became a law.

The first was approved March 21, 1905, and is to be found in the statutes of 1905 at page 683. It consists in so amending and amplifying section 564 of the Penal Code that, as amended, it reads as follows:

"564. Every director, officer or agent of any corporation or joint stock association, who knowingly concurs in making, publishing, or posting either generally or privately to the stockholders or other persons, any written report, exhibit, or statement of its affairs or pecuniary condition, or book or notice containing any material statement which is false, or any untrue or willfully or fraudulently exaggerated report, prospectus, account, statement of operations, values, business, profits, expenditures, or prospects, or any other paper or document intended to produce or give, or having a tendency to produce or give, the shares of stock in such corporation a greater value or a less apparent or market value than they really possess, or refuses to make any book or post any notice required by law, in the manner required by law, is guilty of a felony."

The second Act was approved March 22, 1905, and is to be found in the Statutes of 1905, at page 786, and consists in re-enacting the original Act of 1878, with all its drastic provisions, and eliminating the proviso clause at the end thereof, which had heretofore rendered it nugatory. There is, therefore, more than enough State statutory legislation on this subject to cover every possible phase of fake mining promotion, and the Federal Statutes with reference to the use of the United States mails is already drastic enough to cover the subject from the Federal point of view.

Another law passed at the last session of the State Legislature was promoted by the State Mining Bureau, making an appropriation for the erection of guide posts on the deserts in certain counties of the State, approved March 22, 1905, to be found in the Statutes of 1905, at page 805, and is as follows:

"SECTION 1. The sum of $5000 is hereby appropriated from any money in the State treasury, not otherwise appropriated, for the purpose of procuring metallic guide posts, upon which are to be indicated the distance and direction from said posts, the location of wells, springs, or tanks of water fit for drinking purposes and other information of value, in the desert sections of California, particularly in the counties of Kern, Ventura, Los Angeles, Inyo, Riverside, San Bernardino and San Diego; providing, however, that each of said counties (for its own county) shall bear the expense of the proper erection of said guide posts at such points in the county as may be designated by the Department of Highways, and shall pay all expenses attendant upon the placing of said posts, as well as the expense incurred in placing the directions above mentioned upon said posts.

"SEC. 2. The purchase and distribution of such posts is hereby placed under the management and control of the Department of Highways of the State of California, and it is made the duty of said Department of Highways to designate the points at which said posts shall be placed. Said posts shall be at least 10 feet in length, and shall be made of not less than 2-inch nor more than 3-inch iron pipe, to be set in metallic cross-pieces of such size and to be sunk in the earth at such depth as will insure proper anchorage. Said posts shall have iron cross-arms on which shall be affixed metallic letters stating the information mentioned in Section 1 of this Act.

"SEC. 3. Any person removing, defacing or in any manner injuring said guide posts shall be deemed guilty of a felony.

"SEC. 4. The State Controller is hereby directed to draw his warrant in favor of the Highway Commissioner for the sum of $5000, and the State Treasurer is hereby directed to pay the same."

At your last convention your committee felt that the amendment of Section 1183 of the Code of Civil Procedure passed by the session of 1903 of the California Legislature, under which an attempt was made to defeat the right of an owner of a mine which was being worked under contract or agreement or bond from divesting himself and the mine from liability from liens that might be attempted to be placed upon it, was ill-advised. Two companion bills amending two other sections of the lien law had disclosed this to be the purpose of the amendments. These two other bills failed to receive the executive sanction. It was not admitted that the amendment of Section 1183 standing alone did accomplish the object intended by the author of these three bills, but it would take a decision of the Supreme Court to say just what its effect, standing alone, would be in this regard.

At the last session of the Legislature several bills amending Section 1183 were introduced, but a division of counsel among the men representing the mining sections arose, and it was too late in the session before any chance of a compromise measure came in view. It is believed that at the next session of the Legislature there will be no difficulty in obtaining such remedial legislation as shall be unobjectionable from any reasonable point of view.

As a prelude to further legislation looking to a rehabilitation of hydraulic mining in any degree, your committee has, for a number of sessions of this Association, strenuously urged that we obtain a decision of the Supreme Court of California testing the efficacy of such Federal legislation as we now have upon our Statute book. In a late issue of the Sacramento Bee that journal makes the following claim as to the result of the work of the Anti-debris Association under the working of the California Debris Commission Act:

"The Anti-debris Association has closed at least 95% of the hydraulic mines, and has closed all the large ones. There may be cases where hydraulic mining is prosecuted on a small scale, or where it is practiced so surreptitiously that the utmost vigilance cannot detect it."

Under present conditions an actual injunction is not necessary, for as long as there is no authoritative decision of this State or of the United States with reference to the efficacy of a permit to mine by the hydraulic process issued by the California Debris Commission, and as to whether the permit is a finality or not, capital will not invest in these mines. There will be no practical resumption, because capital will not be tempted under such conditions to resume.

Recognizing, therefore, that it is of supreme importance to the mining industry of this State that this question should be tested in the Supreme Court, your executive committee made arrangements under which such a test could be had, and it is proposed to obtain the same through a decision on an appeal in the case of the County of Sutter, plaintiff, vs. William Johnson and William Nichols, defendants, commonly called the "North Star Mine Case." A motion for a new trial in this case had been regularly made and denied and an appeal therefrom taken. A motion to vacate the judgment has been made and denied and an appeal from that decision has been regularly taken, and an appeal itself from the decision and judgment rendered in the case has been regularly taken. A statement on motion for a new trial has been settled, and a bill of exceptions has been settled. Every care has been taken so that in the review by the Supreme Court the very point desired by this Association to be decided shall be the only point to be decided, and that the record of the case shall be before the Supreme Court in every way possible so that a decision upon this point can be had. The Supreme Court has decided that upon an appeal from an order denying a motion for a new trial the court is limited in its review to the ground upon which the new trial was asked, and cannot review the sufficiency of the pleadings or findings to support the judgment or consider any errors in the conclusions of law or in the judgment.

In order that there might be no possible question of obtaining a decision upon the point of whether the conclusions of law arrived at in the lower court in the Polar Star mine case are supported by the findings of fact, a motion to vacate the judgment was made under the provisions of Sec. 633 and 633½ of the Code of Civil Procedure, and an appeal has been taken from the judgment of the court denying that motion. It is impossible to foresee at this time how the Supreme Court can, under such circumstances, allow the decision to go off on any other point than the one expressly desired by the attorneys on both sides in the action. All necessary stipulations waiving bonds on behalf of the appellants, allowing the whole record to be printed in one transcript, and allowing all appeals to be argued at one hearing, have been signed and filed. The printed transcript on appeal was filed with the Clerk of the Supreme Court in his office at San Francisco on Tuesday morning, November 21, 1905, and it is expected that the case will be set down by the Clerk for hearing by the Court on its coming calendar which will be called in February next.

This committee now hands to the secretary of the Association a printed copy of the transcript which has been filed.

In line with the suggestions of the detailed report of your committee at the Convention of 1903, showing the necessity for the legislation, three bills were introduced in the House of Representatives by Mr. Gillett of California, to-wit: H. R. 8891, being an amendment to the Removal for Federal Causes Act; H. R. 8892, being the amendment requiring the date of the original location to be inserted in the patent to a quartz mining claim when issued by the Government, and H. R. 8893, being the well-known bill for the classification of the mineral lands, and commonly known as the Mineral Lands bill. While none of these bills have been passed, Congress and the respective committees have become familiarized with their provisions and intent so that we are now in a position to forecast their course at the coming session of Congress.

In reply to my telegraphic request for the very latest word on the present status of these bills, I yesterday received the following telegram:

"All three bills will have to be re-introduced; 8891 will be favorably reported; 8892 opposed by the Secretary of the Interior; 8893, Land Committee divided, chairman against it. J. N. GILLETT."

This means that, with the proper work, in all probability two or three bills will become law at the next session of Congress, and that a desperate fight must be made to convert the chairman of the Lands Committee so that the Mineral Lands bill may be also saved.

The Debris Question in California.

OUTLINE OF ADDRESS ON THE DEBRIS QUESTION BEFORE THE CALIFORNIA MINERS' ASSOCIATION.

Professor S. B. Christy of the University of California, in his paper read before the Miners' Association in Nevada City, called attention to the fact that the placer miners had never asked for any aid from the United States Government until their industry, to which California owed her existence, had been closed down by the action of the Federal Courts, rendering property to the value of over $100,000,000 unprotected and worthless, and bringing ruin to large communities in the mountains. Under these circumstances he claimed that the National Government owed it to the miner to render him assistance in bringing about a resumption of this important industry as far as is possible without injury to the farmer and to the navigable waters of the State.

He called attention to the work which had been done and is being done by the Federal engineers who composed the Debris Commission, in restraining debris from the mines and protecting the navigable waters of the State from debris already contained in the beds of existing streams. He called attention to the fair-minded and impartial manner in which the Debris Commissioners have administered the features of the Caminetti Act, and to the energetic efforts which they had made to restrain the debris in the Yuba river above Marysville. He also called attention to the fact that these restraining barriers were experiments of very great importance, and that the problem undertaken was one of extreme difficulty, viz., the erection of an over-flow dam upon a gravel foundation, in which it was extremely difficult to prevent the undermining of the toe of the dam by water discharged from its crest, and that the undertaking was almost without engineering precedents, but had been executed with great skill, especially in view of the fact of the limited appropriations at their disposition. And he called upon the mining communities to give them their hearty support in the work that they have undertaken, as an honest effort to make the best use of the means at their disposition.

He next called attention to the fact that the Debris Commission was not responsible for the enactment of the Caminetti Act. They were simply called upon as officers of the Government to enforce its provisions as they found it, and that there was not a miner in the State who would say that their execution of the law had not been undertaken with even-handed justice to all concerned. He also called attention to the fact that the efforts of the Commission were limited by law to the execution of the provisions of the Caminetti Act, and to the protection of the navigable waters of the State, and that the efforts of this

branch of the Government service could be made more effective if it worked in conjunction with the reclamation service of the Geological Survey. He explained that this Reclamation Service had been originally formed for the storage of storm waters in mountain reservoirs and the irrigation of arid lands, and that a fund of $28,000,000 arising from the sale of public lands was already available for the purpose, and that this fund was now increasing at the rate of $4,000,000 a year. He pointed out that there were fully 800,000 acres of overflowed and swamp lands in the Sacramento and San Joaquin valleys of comparatively little value, which, if reclaimed by the deposition upon them in a rational manner of the finer sediment coming from the mountains, could be increased in value when entirely reclaimed so as to be worth at least $80,000,000. He pointed out that these swamp and overflowed lands needed sediment from the mountains just as much as the miners needed a place to deposit their sediment, and that if such a plan could be carried out it would render available for the benefit of the entire State mining and agricultural lands worth at least $200,000,000. He pointed out that the interests of the farmers and miners were not antagonistic, but supplementary, and urged the miners to suggest an increase of the scope of the Reclamation Service so as to include not merely the reclamation of arid lands, but also the reclamation of swamp and overflowed lands under conditions similar to those already enforced by the Government for the reclamation of arid lands.

He called attention to the prompt and cordial action of President Roosevelt in answering the request of the miners that the United States Geological Survey should undertake the solution of the two problems which had been presented to them last year, viz.: First, the selection of reservoir sites for the storage of flood waters in the mountains, so as to prevent destructive floods, and to conserve the waters for irrigation and power purposes; and, second, the selection of waste lands upon which to deposit the detritus of the mountains. He stated that the Director of the Geological Survey had promptly begun this work and had sent for the preliminary examination of the problem—Dr. G. K. Gilbert, one of the most experienced and able geologists in the United States, to investigate the problem; that Dr. Gilbert had been in the field the entire summer and had expressed himself as deeply interested and hopeful of the solution of this problem. He had collected data concerning the present condition of the streams in their dry condition, and expected to examine them again in their wet season; and that in order to determine the minimum gradients upon which detritus of various sizes, particularly the finer sorts, could be carried, he has undertaken an investigation as to the sediment-carrying power of running water, which will be undertaken with the natural sediments taken from our rivers, during the present winter, in the mining laboratory of the University of California; that he had also taken samples of sediment from a number of streams, and that analyses were now being made by the Reclamation Service to determine their food values for plants, and that there were also to be undertaken actual experiments upon the growth of various plants upon this sediment.

He requested all persons who are familiar with cases of the actual growth of plants upon this detritus to send to him at the University of California at Berkeley as much detailed information as actual results from their growth upon the "slickens" they may have at their disposition, with the promise of the Survey that all cases of importance will be given a thorough study by the Reclamation Service.

In order to prove that the interests of the farmer and the miner are not antagonistic, but supplementary, he read a very important letter from Prof. Hilgard, which is here given in full:

UNIVERSITY OF CALIFORNIA,
COLLEGE OF AGRICULTURE.

PROF. S. B. CHRISTY, University of California—DEAR SIR: It would have given me great pleasure to accept your suggestion to attend the meeting of the Miners' Association at Nevada City, to be held this week. But being unable to do so, I beg leave to communicate to you in writing, briefly, some of my views on the solution of the vexed debris question, which has agitated the State so long and has led to the practical stoppage of hydraulic mining. I do so because this seems a promising time for the rational adjustment of the claims of the contending parties—the miners, and farmers of the valley—to the benefit of both and of the State at large. It seems to me that a calm consideration of the subject, instead of hot contention in public meetings and in courts having but a limited and one-sided knowledge of the wide bearings, would serve to largely reconcile the conflicting interests.

In your excellent and judicially written paper read at the last meeting of this Association, you presented some points of view which are of great importance in this connection. While recognizing the serious injury inflicted upon certain portions of the valley lands by the wholesale rushing down of cobbles and gravel from the hydraulic mines, and that these coarse materials can and should be impounded by the miners within the mountains and foothills, you contend that the fine materials, now all comprehended under the unpleasant term "slickens," are on the whole not really different in kind from the natural wash of the mountain torrents, such as must always be brought down by them, and can, if properly distributed over the agricultural lands of the valley, be made a benefit instead of a detriment to the farmer. To this view I fully agree, it being evident from the rapid and vigorous growth of the trees and chaparral on the debris within the placer and hydraulic mines themselves that the finer material is well adapted to vegetable growth, even though lacking in humus content. It is the excessive amounts deposited over limited areas, and sorted into beds of sands of several feet here, and sheets of fine, impervious slickens there, that are chiefly objectionable.

Of course, the same things happen where there are no hydraulic mines or debris, wherever streams inundate agricultural lands, and it is not easy to define the exact increase caused by these mining operations, aside from the gravel masses clearly originating there. If the fine debris could be so controlled that only a relatively thin layer would be deposited each flood season, to be plowed in, or if they could be deposited on the peaty tule lands, they would be a material benefit to agriculture, as alluvial deposits are all over the world.

But a proper distribution of these materials means control of the flood waters of the rivers, an improvement now called for so urgently by so many interests that enormous sums have been set aside by the United States Government for the selection and establishment of reservoirs wherever, possible, to serve for irrigation as well as for the development of water power now so urgently needed in the numerous industries connected with electric power, including therein the working of the mines themselves.

Since it is the turbulent flood waters that have been chiefly instrumental in bringing down the debris promiscously upon the farming lands of the valleys, this work, placed under the direction of the United States Geological Survey, bears in the most direct manner upon the debris question and the possible renewal of hydraulic mining without injury to the agricultural interests. In fact, such efficient and accurate work as is now being done by the Geological Survey in this connection is the condition precedent of the practical usefulness of any Debris Commission, however competent in its membership. The first thing needed is a thorough ascertainment of the facts as they exist, not only in one limited region, but over areas sufficiently great to serve for the framing of a comprehensive policy, the operation of which shall not need amendment at each legislative session and give rise to renewed agitation and disturbance of industries; for the questions involved bear not only upon mining and agriculture, but as well upon commerce and navigation, upon the maintenance of deep sea navigation of the great port of San Francisco, and its bay and river connections, as well as the government works for coast defense. The problem is a very large one, but cannot be dealt with piecemeal.

In view of the broadness and importance of the interests involved, it seems to me that few questions of greater importance can come before this meeting than that of making a strong move for executive, or, if necessary, congressional action towards authorizing the Geological Survey to include within its reclamation work the matter of the proper utilization of mining debris and natural detritus for the reclamation of waste lands, in addition to the establishment of storage reservoirs for flood waters. The high character of Director Walcott, and his well-known promptness and efficiency in pushing the work under his charge, encourages the belief that if such action is taken we will in a comparatively short time be brought much nearer to the solution of the debris problem, and the resumption of the great hydraulic mining industry, than thirty years of contention and half-way measures have been able to bring about.

It cannot be too strongly urged that, instead of being antagonistic to each other, the agricultural and mining industries are vitally concerned in each other's welfare. The suppression of the development of the foothill and mountain regions of the State is injurious to the welfare and progress of the whole—both country and cities—and all good citizens ought to unite to work toward the establishment of a broad policy for the benefit of all.

Very truly yours,
Berkeley, Cal., Nov. 20. E. W. HILGARD.

Dust Chambers at Smelters.

Where the ore being treated is high-grade, and particularly where there are much fines, dust chambers are indispensable, if heavy losses are to be avoided. These must be so constructed that there will be no interference with the draft, which is a necessary condition where smelting is to be accomplished rapidly. The former practice was to build dust chambers with partitions alternately at the top and bottom, extending only part way between the floor and top of the chamber. This arrangement caused the dust to be carried under one partition and over the next, and so on throughout the series. This accomplishes only a small part of the desired result, as a strong draft still remains, which prevents the fine dust particles from coming to a state of rest.

The best and least expensive form of dust chamber is simply a considerable enlargement of the flue, constructed horizontally, and having transverse partitions extending from the floor upward toward the

Construction of Dust Chambers at the Smelter of the Shannon Copper Co., Metcalf, Ariz.

Dust Chambers of the Cananea Smelter, Cananea, Mexico.

arch, but leaving a sufficient space for a quiet passage of the gases, while the dust settles downward into the zone of undisturbed atmosphere between the walls. It is not unusual for the dust particles of ore to assay higher than the average ore under treatment—thus the advisability of dust chambers. The accompanying engravings show the dust chambers at the Cananea, Mexico, smelter and that at the Shannon Copper Co.'s smelter at Metcalf, Ariz.

Mine Drainage by Bailing.

The question of unwatering a mine always is a serious problem to the mine management, especially so when the water is impregnated with acids. When the amount becomes excessive the means to be employed for disposing of it taxes the ingenuity of all concerned to the uttermost.

In the anthracite regions of Pennsylvania there are mines in which for every ton of coal raised as high as fourteen tons of water must be pumped, and the latter must be done at a minimum of expense. Nowhere, probably, have a greater variety of pumps and lifting devices been tried. One satisfactory type for handling large quantities of water at comparatively low heads has proved to be large bailing skips operated by steam engines. These, however, lack the mechanical regularity inherent in a pump, as they are necessarily operated by men, and it remained for the Delaware, Lackawanna & Western R. R. Co. and its electrical engineer, H. M. Warren, to finally develop a water hoisting equipment which would preserve all the valuable points of the steam hoist and at the same time operate automatically. The carrying out of the mechanical details of the hoist and its automatic devices were confided to the Wellman-Seaver-Morgan Co., of Cleveland, Ohio, who guaranteed the machinery to accomplish the desired results. Most of the electrical controlling devices were furnished by the Electric Controller & Supply Co., Cleveland, Ohio. In the original specifications the D., L. & W. R. R. Co. called for the hoist to be operated by an alternating current motor of 800 H. P., and the question of starting, stopping and reversing so large a motor had, at the outset, to be met. The duty to be performed by the hoist called for the raising of 4000 gallons of water per minute to a height of 550 feet.

4,000 gals. × 8.27 = 33,180 lbs.
500′ 2″ rope × 6.3 = 3,465 lbs.

36,645 lbs. to be raised at 550′ per min.

$$\frac{36{,}645 \times 550}{33{,}000} = \ldots\ldots\ldots \text{ 610 net horse power.}$$

Weight of bucket = one-half weight of water, so that weight on rope = 53,235 lbs., or nearly twenty-seven tons, requiring 2″ steel rope.

The various preliminary speed and movement diagrams are laid out per accompanying diagram.

It was decided in carrying out the design that it would be impracticable to design the hoist other than have a motor running continuously in one direction, as it is a well-known fact that the amount of current required to accelerate a large motor of this type is enormous, and greatly interferes with the proper running of the power plant.

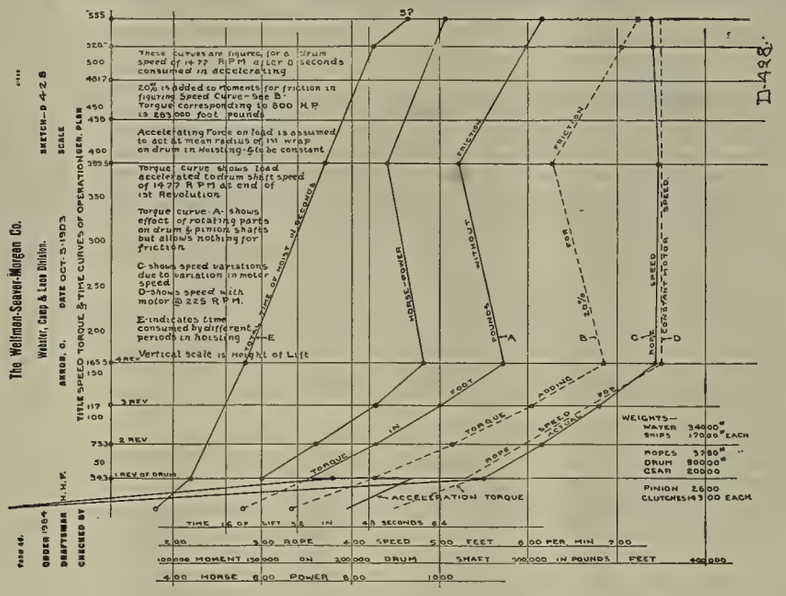
The D., L. & W. R. R. Co. desired to use an A. C. motor directly at the hoist, and as the motor was to run continuously in one direction this necessitated the use of friction clutches for accelerating and reversing the load. As the Wellman-Seaver-Morgan Co. had several smaller plants already in operation using A. C. motors on hoists which are operated similarly to the present hoist, and as they are running successfully, and the repairs and renewals for clutches had not exceeded that required for the other hoisting engines, it was decided to use this method.

Figs. 1 and 2 show a front and side view of the hoist. As will be noticed the general arrangement consists of a motor driving a pair of bevel wheels through a single bevel pinion. The bevel wheels run loose on a shaft and are fitted with the Webster, Camp & Lane friction clutches. The operating mechanisms for the clutches are so designed that only one clutch can be thrown in at a time, but both clutches can be out at the same time. Throwing in one clutch runs the drum in one direction; throwing in the other clutch reverses the motion of the drum.

To the shaft on which the bevel wheels run there is keyed a pinion, meshing with main gear on the drum shaft. The drums are of the cylindro-conical type, 10 feet at the small diameter and 16 feet at the large diameter. At a hoisting speed of 550 feet per minute the drum makes about fifteen revolutions per minute. There is one main brake located between the drums. All of the clutches and brakes are operated by auxiliary air cylinders fitted with oil cushion cylinders, the compressed air being furnished by a motor driven air compressor and the necessary tanks located near to the hoist. The hoist is controlled by a mechanical device shown in Fig. 2. This device consists mainly of a drum rotated by means of a friction drive from the motor through a sprocket chain. The drum shaft transmits its motion to a secondary shaft fitted with variable speed, which in turn operates a secondary stop. The main hoisting drum shaft operates a traveling nut which is so located with respect to the controller drum that at either end of its travels it releases a stop and allows the controller drum to make a quarter turn; this movement, through suitable electrical connections, operates the solenoids on the clutch valve, releasing the clutch and the solenoids on the brake valve, setting the brake, the further movement of the controlling drum being arrested by the secondary stop. This stop is released by the variable speed shaft and its connections, which has been given a predetermined time movement corresponding to the interval for emptying the bucket. The further movement of the controlling drum releases the brake and throws in the reversing clutch, thus starting the hoist in the opposite direction, and also starting the traveling nut on the controlling mechanism in the opposite direction. At the end of the hoist the cycle of controlling movements is repeated, and so on, making the hoisting operation continuous and automatic. Every attention has been given to the safe operation of the hoist. The main brake is of the gravity type, and to be released the current must be on the solenoid operating the valve so that air can be admitted to the underside of the brake piston.

If, for any reason, either the supply of current or of air pressure is interrupted, the valve drops, and the weights on brake lever set the brake. The clutches are designed so that they are thrown out by weights. As is the case with the brake, either clutch can only be thrown in when the current is on the solenoid, and if either current or pressure fail, the clutch is off. The motor shaft is fitted with an emergency brake operated by a weight controlled by a solenoid — any interruption in the flow of current to the motor sets the brake and stops the motor. Any interruption of the flow of the current stops the machine, throws out the clutches and puts on the brake. A safety cut-out is provided for in the head frame so that in case a bucket is carried beyond the proper height, the current is cut off.

Fig. 3 shows the head frame. The head frame is 93 feet from the base to the center of the sheave at the


The Wellman-Seaver-Morgan Co.
Webster, Camp & Lane Division.
AKRON, O.
DATE OCT. 5, 1905
SCALE
SKETCH-D 492-B
TITLE SPEED TORQUE & TIME CURVES OF OPERATION
DRAFTSMAN
CHECKED BY
ORDER 1904
These curves are figured for a drum speed of 14.77 R.P.M. after 8 seconds consumed in accelerating
20% is added to moments for friction in figuring Speed Curve-See B
Torque corresponding to 800 H.P is 283,000 foot pounds
Accelerating Force on load is assumed to act at mean radius of 1st wrap on drum in Hoisting-&to be constant
Torque Curve shows load accelerated to drum shaft speed of 1477 R.P.M. at end of 1st Revolution
Torque curve-A- shows effect of rotating parts on drum & pinion shafts but allows nothing for friction
C shows speed variations due to variation in motor speed
D-shows speed with motor @ 225 R.P.M.
E-indicates time consumed by different periods in hoisting
Vertical scale is Height of Lift
TIME OF HOIST IN SECONDS
HORSE-POWER
POUNDS
FRICTION
SPEED
TORQUE
ROPE
DRUM
SHAFT
ACCELERATION TORQUE
WEIGHTS—
WATER 34000#
SHIPS 17000# EACH
ROPES 3780#
DRUM 80000#
GEAR 20000
PINION 2600
CLUTCHES 1500 EACH
TIME IN OF LIFT IN 48 SECONDS
ROPE SPEED FEET PER MIN
MOMENT ON DRUM SHAFT IN POUNDS
HORSE POWER
D-498

Speed Torque and the Curves of Operation.

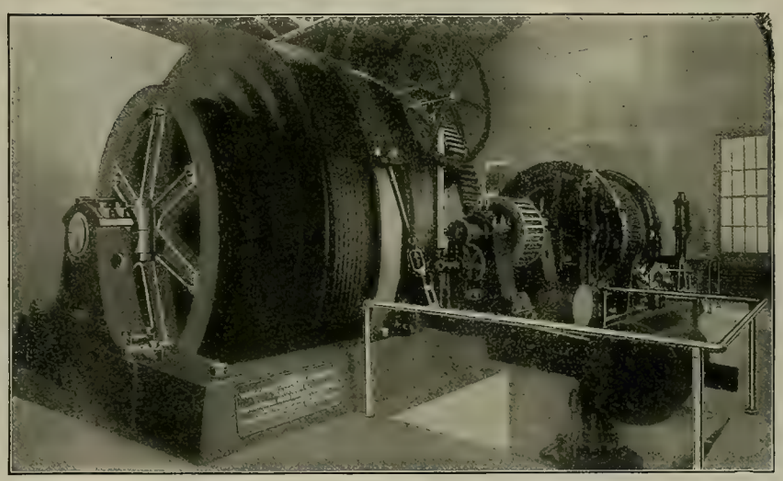


Fig. 1.

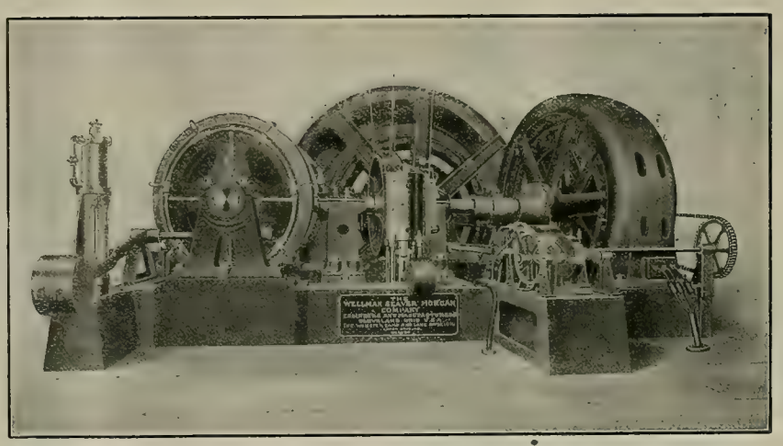


Fig. 2.

top. It is built of structural steel, roughly, in the shape of an "A." From the head frame are suspended two buckets, 6 feet in diameter and 19 feet 6 inches deep. The capacity of each bucket is seventeen tons of water. In the bottom of the bucket are located two lift gates with an area practically even to the cross-section of the bucket. These gates are lifted automatically when the bucket reaches the top,

Fig. 3

and the water is discharged through the bottom into a spout fitted below the bucket, and which deflects it to either side of the shaft. Each bucket makes a

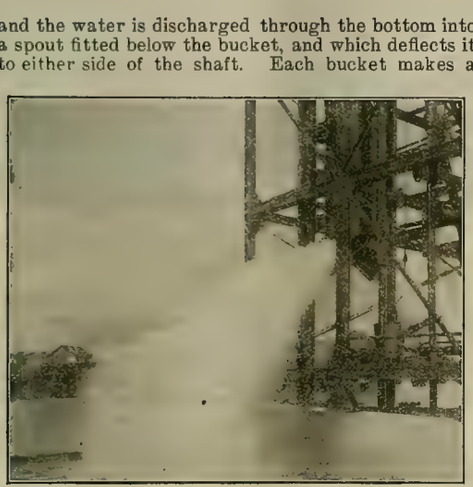


Fig. 4.

complete round trip in one minute and fifty-five seconds, the total lift being 555 feet.

Fig. 4 shows a nearer view of the bucket when discharging.

Efficiency in the Mining Industry.

In an address recently delivered by Ernest Williams, president of the South African Association of Engineers, before that Association, he indicated what he thought should be done to improve operating methods, particularly in the deeper levels. A portion of his address follows:

We no longer speak of stamp mills having 100 heads as the unit of equipment, as this is to be increased about ten times. The tonnage duty of the stamps will be almost doubled by the introduction of secondary reducers, principally of the tube mill type, and the recovery of the value is to be increased by about 10%. Never before in the history of this gold field has the same keenness for efficiency and permanency been in evidence. Standardization of work, simplification of method, multiplication of units and centralization of effort and control have been developed—it may be beyond what we are quite ready for, and, although I do not propose to cry a halt in the chase after magnitude, so as to give us breathing time, I would mention one or two points which seem to me to be worthy of consideration.

We must keep in view the necessity for economy in equipping as well as in the running of our undertakings. Every pound spent in excess of the actual necessary expenditure is so much money lost—it may be wasted—and it is here that good engineering judgment is best displayed. Our present system of work tends to specializing to a degree not serving in the best manner the greater interests of the country. We are in danger of raising a generation of engineers who can only equip on a magnificent basis, and we must guard against our successors saying of our work: "It was magnificent, but it was not true mining economics."

We are rapidly deliminating the area within which the payable banket beds occur in the Transvaal, and we are seeking for the reappearance in the Orange River Colony of the payable banket beds outcropping along the Rand.

Since the discovery of the main reef series and the realization of the gold values of these beds very many people have said we must revise our ideas as to the occurrence of gold, and such people would pass by the claims of the old and tried gold-carrying rocks of the world that for generations produced the most gold. But as careful engineers we must not allow the glamour of the new to deaden our hopes in the old, and in the Transvaal to-day the primary rocks or schists are being surely though slowly recognized as worthy of confidence, for they are proving to us their value as gold carriers. At points far apart in the Transvaal satisfactory gold values have been found in the primary or schistose rocks, and as prospecting is carried on further gold deposits will cetainly be found in these rocks, and this class of proposition will, I think, no longer be flouted by the financier, who is growing very specialized and wants the engineer's report setting forth in minute detail the value of any property he is asked to finance.

The mining propositions I have in mind—occurring in the schists—will, I believe, restore some of the romance of gold mining, and remove the present monotonous conditions surrounding the production of gold within the Rand area, which conditions are rapidly partaking of the routine obtaining in the production of pig iron. At our meetings we have had contributions from members dealing with this question of the probable gold-bearing value of the old crystalline rocks of the Transvaal, and the information given shows the advisability of paying more attention to these deposits.

Some good mining propositions in the schistose rocks have been exploited in the healthy districts of this colony, and the development of these in the so-called fever districts is progressing, but prospecting is difficult in some cases owing to the prevalence of malaria during the rainy season. I have recently visited some of the mines in the so-called fever districts, and am quite satisfied that one of the most important matters controlling the occurrence of malaria there is the almost utter disregard of all sanitary precautions. Most of us know something of the history of many of the gold mines in the north-eastern and eastern districts of the Transvaal—how the occurrence of gold deposits running a high value per ton was announced with great noise, and sometimes the company formed to work the mine ended in much more noise, after a career something like that of a rocket, going up like a comet and coming down like a stick. I make bold to assert that in many cases the ending of the life of such mines was not due to lack of payable gold value, but to lack of efficiency in other factors, chiefly—humanly controllable—at times through attempting to attain the magnificent on the surface before proving the actual value lying in the ground. Then came the old story, "No further money available for development," and then the end. It may be out of place to mention that the Klein Letaba gold field, with an area of hundreds of square miles, offers a splendid field for the prospector who understands his calling, as very good values have been proved, but so far the superior attractions of banket have depreciated the real value of such lines of country. It may be interesting to remark that in the Klein Letaba gold fields a new class of gold-bearing deposit has recently been proved. Here the occurrence of gold thus in the character of rock is a new mineralogical feature. We have gneissoid and stratified rocks, with an interbedded sheet of pyroxene rock, laid down under water, the whole strata subjected to lateral pressure, under which the rocks folded at points of greatest stress, when the elasticity of the sedimentary rocks, and of the lower and upper margins of the eruptive rocks, allowed these rocks to yield to this pressure, the central portion of the pyroxene sheet being crushed or fractured, and thus forming a somewhat permeable mass, through which chemical solutions circulated, altering its character. These solutions, which were auriferous, circulated freely throughout the mass, and deposited crystalline gold in the place of elements chemically set free by the action of such solutions.

THE PROSPECTOR.

Sample No. 1, Ukiah, Or., is quartz containing iron and zinc sulphide, and probably also contains gold. No. 2 is a piece of crystalline limestone (mottled marble), apparently of good quality if the stone can be obtained in good sized masses.

The ore sample from Homestead, Or., is mostly zinc sulphide (blende). It also contains a streak of more complex mineral, chiefly zinc and lead. This ore probably carries also gold and silver and should be assayed for those metals.

The mineral and rock samples from Quartzsite, Ariz., are described as follows: No. 1, jasperoid, possibly rhyolite which has been silicified. A number of rocks assume this appearance upon silicification. Shales may be compressed and silicified to resemble the sample. So may rhyolite, and petrified wood often looks the same. The geological occurrence is the best way to get a suggestion as to the origin of the material. No. 2 is green jasper. No. 3 is chalcedony. No. 4 is iron oxide and silica coated with chrysocolla (copper silicate) and malachite (copper carbonate). Package No. 5 contains one specimen of lead sulphide (galena), which is altering to lead carbonate (cerussite) around the edges. The gangue mineral is quartz, with a little calcium carbonate. The other specimen is mostly quartz, with some crystals of honey-yellow lead molybdate (wulfenite) on one side. No. 6 is chiefly jasper. The largest piece resembles petrified (silicified) wood. The black pebble in this package is a dense, silicified clay rock, probably originally shale, the others being jasper.

The ore from Ingot, Cal., is limonite (brown iron oxide). It may possibly contain gold, for which it should be assayed.

The rocks from Tombstone, Ariz., marked A. G., are: No. 1, basalt; No. 2, a scoriaceous lava considerably altered; No. 3, a much decomposed earthy lava or tuff.

The rock specimens from Lowden's Ranch, Cal., are: No. 1, amphibolite schist; No. 2, talc schist; No. 3, amphibolite schist colored black by carbon, and carrying considerable pyrite. It has the appearance of being a wall rock of a mineralized vein. No. 4 is diabase; No. 5 is scoriaceous lava; the vesicles were caused by inclusions of air or steam in the lava when it was molten, the rock solidifying before the gas could escape; No. 6 is seemingly a section of a small vein in a massive rock, and consists principally of epidote and feldspathic mineral; No. 7 is mispickel (arsenical iron sulphide.)

The rock samples from Cherry, Yavapai county, Arizona, are all of granitic character. No. 1 is probably aplite, much kaolinized and stained by iron oxide. No. 2 is a much kaolinized feldspathic rock, with remnants of hornblende, and may have been syenite. No. 3 is similar to No. 2, but is less granular and of finer grain.

The rocks from Prescott, Ariz., are mostly of similar character — altered greenstones, presenting various phases of texture and conditions of alteration. No. 1 is mica-diorite. No. 2 is the same, though finer in texture. No. 3 is diorite aphanite. No. 4 is evidently the same kind of rock, as No. 1 for instance, but is very much altered and silicified and carries a little pyrite. No. 5 is only finer in grain than No. 2 and much more altered. No. 6 is an aplite dike and is a granular mass of feldspar and quartz. No. 7 is diabase, and No. 8 is similar to No. 7, but more altered, and No. 9 is evidently a still further altered similar rock. All of these rocks have been so completely changed from various causes that in most instances the original minerals can no longer be determined, while the minerals now present may have been derived from any one of several original minerals. When the augite of a diabase, for instance, is changed to hornblende (uralite), and the change is complete, it is very difficult, if not impossible, to say whether the rock was originally diorite or diabase. Feldspars alter to kaolin, mica and other minerals, and the means of identifying the original material is lost in most cases.

Geology of Tonopah, Nevada.*

NUMBER II.—CONCLUDED.

RELATION OF THE DESCRIBED DISTRICTS TO TONOPAH.—Of all the described ore deposits of North America, therefore, Tonopah appears to be most closely related to many of the Mexican silver veins, and also to the Comstock in Nevada and the Silver City–DeLamar veins of Idaho. With Pachuca, as is seen, the relation is intimate, and Ordonez's description of the veins of this district would do, with a very little change, for a report on the Tonopah veins. The chief difference is in the occurrence of manganese silicate in depth at Pachuca, which has not been found at Tonopah, and also the less content of gold, with the absence of ruby silver. Ruby silver, however, occurs in the cognate and contiguous Real del Monte district; also gold in considerable quantity occurs with silver in some of the Mexican districts of this type. Those enumerated by Aguilera all occur in hornblendic andesite.

This group of veins is characterized by the following features: They occur in Tertiary volcanic rocks of similar character in the different localities, being chiefly Miocene andesites or rhyolites. They constitute strong masses or frequently branching and "linked" veins of quartz, which have as gangue essentially quartz, with frequently a little calcite, while adularia, barite, rhodochrosite or rhodonite may also be present in limited amount. The ore is characteristically a silver-gold one, silver being usually predominant in the values in varying proportions, though the relative value may be reversed, and in some extreme cases either metal may occur with little admixture of the other. In any case the abundance of silver or gold, or both, in reference to lead, zinc, iron, etc., is characteristic. Silver sulphides, especially argentite, also stephanite and polybasite (with ruby silver) and gold, probably largely in the free state, are distinguishing features in the great majority of cases. Tellurides and selenides may also be present. Pyrite, blende, chalcopyrite and galena are usually present in varying quantity. Where they become predominant the vein becomes relatively low grade. Tetrahedrite, stibnite and bismuthinite are also known to occur. The wall rocks are characteristically much altered to quartz, sericite, chlorite, calcite, epidote, pyrite and sometimes adularia, etc. Frequently the rocks nearest the veins are chiefly altered to quartz and sericite, those farther away to the softer "propylitic" alteration, consisting of calcite, chlorite, pyrite, epidote, etc.

The rich ores occur in regularly outlined portions of the lode called bonanzas. These bonanzas are of limited extent, both horizontally and vertically. They are believed to have arisen as a consequence of the irregular intersection of transverse fractures or fissures with the main vein channel, producing maximum deposition in these portions. Intervening portions may be low grade or barren.

In the oxidized zone silver chlorides and bromides, free gold, manganese oxide, etc., occur.

THE PETROGRAPHIC PROVINCE OF THE GREAT BASIN.—After a study of the lavas of the Great Basin region of Nevada in 1900, the writer came to the conclusion that the whole region "southward into the Mojave desert, together with a portion at least of the Sierra Nevada, constitutes a petrographic province—that is to say, it is underlain by a single body of molten magma, which has supplied at different periods lavas of similar composition to all the different parts of the overlying surface. The limits of this subcrustal basin, however, are not yet defined in any direction."

The general sequence of lavas, roughly outlined, was concluded to be as follows:

1. Rhyolite (Eocene).
2. Andesite (Miocene).
3. Rhyolite with occasional basalt (Miocene–Pliocene).
4. Andesite (Late Pliocene–Early Pleistocene).
5. Basalts and occasional rhyolites (Pleistocene).

EXTENSION OF THE GREAT BASIN PETROGRAPHIC PROVINCE INTO MEXICO.—Later in the same year, Ordonez, in a study of the rhyolites of Mexico over a northwesterly trending belt extending from the northern boundary southward past the City of Mexico, found that the author's conclusions were also applicable to this province. He writes as follows: "With very slight differences, which are without decisive importance, one may say that everywhere the relative order of eruptions, judging from the composition and structure of the rocks, has been the same. Let us here present the example of the Great Basin of Nevada. Many ranges of that region show a succession strictly comparable with that of Mexico."

The general succession is found to correspond with that given by the writer above, and the rhyolites occupy the same position and are of the same age (Miocene–Pliocene) as those under No. 3. The andesites, which preceded the rhyolites, correspond with No. 2 and are Miocene.

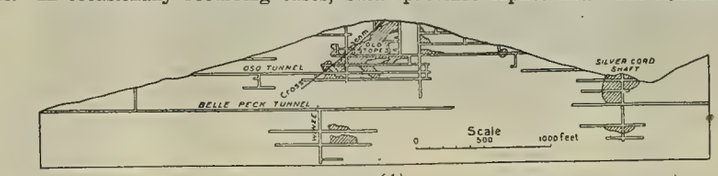
A METALLOGRAPHIC PROVINCE CO-EXTENSIVE WITH THE PETROGRAPHIC PROVINCE.—In the paper above referred to the writer brought forward the idea of metalliferous provinces (perhaps better, metallurgical provinces) characterized by the presence of certain metals, and pointed out that these provinces may or may not be closely identified with petrographic provinces, although they probably generally are so, to a certain extent at least.

Unquestionably, the close relation between the Nevada mineral districts, Tonopah and the Comstock, with the far more numerous array in Mexico, and the individuality of this group as compared with other known veins of North America, shows a metallographic province, which in this case coincides with a portion of the petrographic province previously mentioned.

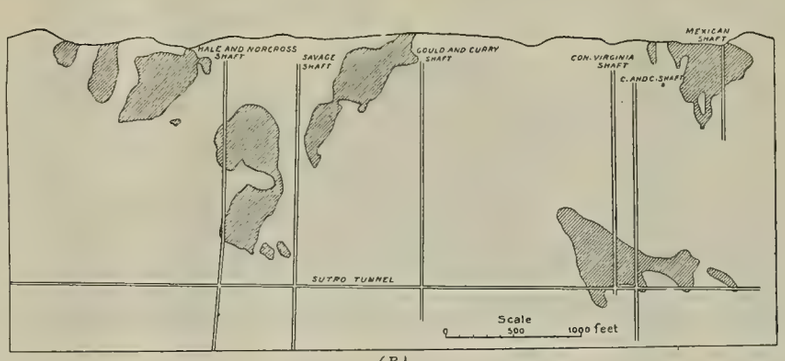
In this metallographic province ores occur in Miocene andesites in the great majority of cases, and their formation followed soon after the eruption of these rocks. In occasionally recurring cases, such as Silver City and De Lamar, Idaho, and others, they appear in Miocene–Pliocene rhyolites, which succeeded the andesites.

In general, however, the Miocene andesites of this province are, as Humboldt noted, the metalliferous formation par excellence, and if the conclusions which have been arrived at regarding Tonopah are correct (which coincide with a number of similar conclusions concerning other districts reached by other authors), the ore is due to the after actions of the eruptions in the shape of fumaroles, solfataras and hot springs. Moreover, since similar manifestations (of fumaroles, solfataras and hot springs) follow most volcanic eruptions, it is probable that the metals deposited by the after processes at this period arose from an unusual proportion of them in the andesite magma; indeed, the very definition of a metallographic province implies this. The existence of such metal-

BIRD'S-EYE VIEW OF TON



(A)



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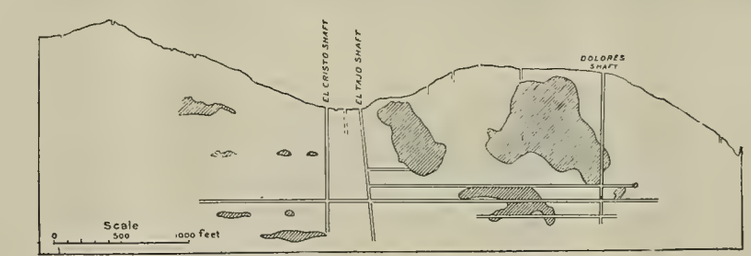


(C)

(A) Vertical Cross Section Showing Form of Ore Bodies at Tonopah, Nev. (B) Vertical Section of a Portion of the Comstock Lode, Nev. (C) Vertical Section of Cristo Vein, Pachuca, Mexico.

*Abstract Prof. Paper No. 42, by J. E. SPURR.

lographic provinces is evident; and the theory of their origin, as propounded by the writer, is like that long entertained by many petrographers for the origin of petrographic provinces—namely, that they are formed by magmatic segregation.

Origin of Shoots or Bonanzas in the Veins of This Metallographic Province.—Light is thrown upon the origin of the shoots, chimneys or bonanzas in this class of veins by the studies of the influence of cross fractures on their formation in Tonopah, and the similarity between these bonanzas and those at Silver City and De Lamar, Idaho, the Comstock and Pachuca

DA, FROM THE MINES.

(see accompanying figures). At De Lamar the shoot or chimney form is evident, some of the bonanzas having been followed downward over a thousand feet, yet the local irregularity of the outline is like that of the typical bonanza. At Tonopah a similar shoot-like form with a definite pitch has been discovered, but the developments thus far made do not show so great a persistency as at De Lamar. At Tonopah the connection of the shoots with cross fractures is evident, and the localization of the ore deposition at intersections of especially fractured zones seems the correct explanation. It is doubtful, however, if, when the bonanzas in the Tonopah veins shall have been worked out, the shoot-like form will always be discernible; in the case of the richer eastward-pitching shoots of the Mizpah vein, for example, the spaces between the shoots would probably be considered together with them, in the larger sense, as parts of one great bonanza, whose eastward pitch and shoot-like form would be less emphasized, or not at all.

In the case of Pachuca the bonanzas are irregular or roughly elliptical and are not shoot-like; yet the fact observed by Ordonez, that the bonanzas on the different veins group themselves into a definite zone running transversely across the strike, is hardly to be accounted for except by the explanation arrived at in the case of Tonopah, that the bonanzas are due to the influence of an intersecting fracture system. At the Comstock the bonanzas are similar to those in Pachuca, although no local evidence has been found explaining their origin.

The above explanation is readily acceptable for bonanzas that are elongated into definite shoots and are actually known to be associated with and dependent upon cross fracturing, as in Tonopah; but it is not so easily acceptable, perhaps, in the case of wholly irregular bodies, such as those of the Comstock. Yet at Tonopah the bonanzas are irregularly cut off and do not continue indefinitely downward on the pitch; and to this limitation the explanation of the controlling effect of cross fractures must unavoidably be extended.

When making concrete do not use cold water nor mix the materials in a freezing atmosphere. Do not mix up more concrete materials than can be put in place within a half hour, and do not undertake to ram or otherwise mould or disturb concrete after it has taken the initial set. Sand and gravel or broken rock are essential to concrete, but cement is also, and enough of the latter must be present to make the concrete durable and give it the necessary strength.

Transportation and Handling of Explosives.

As the result of the explosion of a large quantity of nitro powder while in transit on a railroad in Pennsylvania, some months ago, a commission was appointed to inquire into the dangers attending the handling of explosives. C. B. Dudley, C. E. Munroe, H. S. Drinker and C. F. McKenna comprised this committee, and, being scientific and experienced investigators, their report is of interest and value. The whole matter is published at length in the Engineering News, from which the following from the report of the committee is abstracted. The first portion of the report is a part of that by C. B. Dudley:

The nitro-glycerine powders are all sensitive to shock. It is fair to state, however, that since liquid nitro-glycerine is not transported at all, and since the form in which nitro-glycerine is carried is with the nitro-glycerine absorbed in some absorbent medium, such as sawdust, wood pulp, nitrate of soda, etc., the sensitiveness of the nitro glycerine powders to shock is infinitely less than in the case of liquid nitro-glycerine. If the nitro-glycerine is properly made, and properly absorbed in a well-dried absorbent material and the powder is made up into cartridges and properly packed in good boxes strong enough to prevent rupture of the boxes and consequent leakage of the powder while in transit, there is very little danger in transporting high explosives due to the ordinary shocks of transportation. It is quite possible to throw a box containing fifty pounds of almost any high explosive from a point 50 feet in the air down on rocks without causing an explosion, and individual cartridges can be thrown with full force of a man from any height upon rocks without doing anything more than to rupture the cartridge. Moreover, a properly made nitro-glycerine powder can be hammered on a wooden surface until the hammer head beds itself in the wood without causing an explosion, yet it may frequently be exploded even by a glancing blow of wood on wood. Furthermore, a properly made nitro-glycerine powder is rarely exploded by the first blow when it is laid on an anvil and struck with a hammer. The second blow usually causes explosion. We are clearly of the opinion that if the nitro-glycerine powders are properly made and properly packed in sufficiently strong packages, there is almost no danger due to the ordinary shocks of transportation. It is badly made nitro-glycerine, broken packages and leaky cartridges that usually produce the risk, due to shock, in the transportation of high explosives. Decomposing and deteriorated nitro-glycerine powders are dangerous to transport. Decomposing nitro-glycerine powders give off acrid, irritating fumes. It is difficult to fully describe deteriorated nitro-glycerine powder; but powders which have been stored for six months or more may be regarded as suspicious, especially if the boxes show excessive dampness from storage, or are mouldy. If the boxes show any oily stains, the powder is so deteriorated that it is certainly dangerous to transport.

It may not be amiss also to mention one or two characteristics of nitro-glycerine explosives. It is a well-known fact that if a box of cartridges or a single cartridge of nitro-glycerine powder is detonated within a few feet of another box of cartridges of the same, the firing of the one will fire the other, although there is apparently no contact between them. This is not, as might be supposed, a case of transmission of fire from one cartridge to the other, but it is the shock produced by the firing of one cartridge which fires the other. There are cases on record of the explosion of a magazine in one locality producing an explosion of another magazine some distance away. Such explosions are called "explosions by influence," and this fact has a bearing on the transportation of explosives, in that there is an increased risk in having several cars containing explosives in the same train.

We have mentioned above carelessly made nitro-glycerine. There is a critical point in the manufacture of nitro-glycerine which, if ignored, leads to no end of difficulty. As is well known, nitro-glycerine is made by pouring a stream of glycerine into a mixture of the strongest nitric and sulphuric acids. The whole mass is stirred during the operation, and as heat is generated by the chemical change the material is cooled by artificial means. The eye of the operator is kept on the thermometer which is in the liquid, and it is believed that many explosions which take place in the manufacture of this material are due to its being insufficiently cooled. As much as, and sometimes more than, 1000 pounds are made in a batch. After this operation is completed it becomes essential to remove the remaining acid from the nitro-glycerine, and this is the important part of the whole process, as regards the safety of the finished product. The acids and the nitro-glycerine being of different specific gravities, this fact is made use of to effect their separation. The nitro-glycerine is then washed with water to remove the bulk of the acid adhering to it. It is subsequently treated with soda solution to neutralize any acid which may be left, and finally with another washing of water to remove the soda solution. If, now, this operation be properly performed and all the free acid be removed, the nitro-glycerine may be said to be well made and a safe material to proceed with. On the other hand, if all the acid be not removed, in the course of a short time, possibly a week or two and possibly a shorter time, the nitro-glycerine becomes changed in its properties and becomes infinitely more sensitive to shock. Such badly made nitro-glycerine is very hazardous to transport. To neutralize any possible traces of acid which might still remain after the washing or be produced by decomposition, it was formerly the almost universal custom to add to the absorbent material in nitro-glycerine powders a small amount of some substance called an ant-acid, such as carbonate of magnesia or zinc white. This practice has been abandoned by some, but it is of the highest importance that it should be resumed.

This is the place, perhaps, to mention a modification of nitro-glycerine explosive known as "gelatine dynamite." It has been found that nitro-cotton dissolves in nitro-glycerine, and that when the proper proportions of these two ingredients are mixed together they mutually dissolve each other and a material is formed which is even stronger in its explosive power than nitro-glycerine alone. The material becomes gelatinous and is mixed with absorbent in much the same way as ordinary nitro-glycerine, except that being gelatinous it is possible to use more of the explosive and less of the absorbent, thus making a much stronger powder. With the ordinary nitro-glycerine powders, the safe limits for transportation are sixty parts nitro-glycerine and forty parts absorbent. In the gelatine dynamite as high as eighty parts "gelatine" and twenty parts absorbent material may be used. This material behaves much like the ordinary nitro-glycerine powders, and, although a stronger explosive, is believed, if properly made, to be fully as safe to transport as the ordinary nitro-glycerine powders.

As already explained, the nitro-glycerine in high explosives is absorbed in a mixture called a "dope," such as a mixture of wood pulp and nitrate of soda or other substances already mentioned. If the proportions of liquid nitro-glycerine and of absorbent are what they should be, there will be no danger of leakage of the nitro-glycerine, even during a warm summer day, but, unfortunately, during the last few years a change has taken place in the manufacture of high explosives. Formerly dry sawdust and nitrate of soda were the principal absorbent materials. Within the last few years ground wood pulp has been used, but wood can not be ground after it is seasoned on account of the materials taking fire. Green wood must be used and green wood contains about 18% of water. Some of the manufacturers have not dried their wood pulp previous to mixing, and the moisture of the wood pulp has united with the nitrate of soda, which is a hygroscopic substance, liquefying it, and therefore diminishing the absorbent capacity of the dope. Furthermore, powders as high as 75% nitro-glycerine and 25% absorbent have been made. It will readily be understood that under these conditions the liquid nitro-glycerine may run out of the cartridges and indeed this is a well-known

phenomenon. If, now, the liquid nitro-glycerine does exude from the cartridges and finally reaches the outside of the boxes, and gets between a nail in the box and a nail in the car floor, the ordinary shocks of transportation would fire the nitro-glycerine, with the result of blowing up the car load. The skidding of the boxes over the floor may produce the same result.

INFLUENCE OF THE WEATHER. — Nitro-glycerine freezes at about 40° F. if exposed for some time to this temperature. In the frozen condition it is less liable to explosion from shock, and it has been proposed to transport nitro-glycerine powders in refrigerator cars. This does not seem to be advisable, however, for several reasons. The subsequent artificial thawing of these powders for use would probably increase their danger, as a whole. Moreover, their transportation in the frozen form would not result in entire freedom from accident, since fire following a wreck is the most frequent cause of disaster, and such fire would thaw the material and heat it locally to a sufficient degree to cause explosions. Furthermore, according to Hess, by long continued exposure to high temperatures, both volatilization and decomposition, in a greater or less degree, result. Nitro-glycerine begins to decompose at temperatures between 112° and 122° F. and decomposes quite rapidly at 158° F. Moreover, the tendency to leakage and also the sensitiveness to shock increase with the temperature. The increase in the temperature of a car, owing to exposure to the sun in very hot weather, tends to produce these results. It would seem to be advisable, when transporting these powders in warm weather, to have cars ventilated and to make the transportation in the hottest part of the summer as small as possible, and to have the cars on the road as short a time as may be.

FULMINATES.—Fulminate of mercury is made by reaction taking place between a solution of mercury in nitric acid and grain alcohol. As the reaction goes on the fulminate separates out from the liquid as a gray crystalline solid. This material, when dry, may be fired by fire, heat, friction, concussion or shock, and, however fired, it always undergoes a detonating explosion. It may even be fired when saturated with or submerged in water if some dry fulminate be detonated in contact with it. It should never be transported in the dry condition in quantity, and in transporting wet fulminate extreme care should be taken that no portion of this wet mass, however small, is allowed to become dry. Fulminate of mercury is the characteristic component of detonators, blasting caps or dynamite exploders, and they are essential for use in firing dynamite and other high explosives. Owing to the United States internal revenue tax on grain alcohol, very little fulminate of mercury is manufactured in this country, and consequently this necessary substance must be imported in considerable quantity.

Detonators, blasting caps and dynamite exploders should never be transported or stored in the same car or compartment with other explosives or with inflammables, and they should be carefully protected from fire, heat or shock, or contact with acids. It should be borne in mind that fulminates are the most sensitive of the explosives commonly met with, and the most violent.

PRACTICES OF MANUFACTURERS IN HANDLING EXPLOSIVES TO AVOID ACCIDENTS.—Not very much can be said on the subject that is applicable to transportation matters. The manufacturers, after the explosives are made, only have to handle them from the magazine or shipping house to the freight station or siding, where they are loaded in cars. This carrying is usually done in wagons, and cases are known where blankets were spread on the bottom of the wagons to relieve the shock due to the jolting produced in going over rough roads. This is especially true when materials have been returned to the works to be remade. It is a well-known fact that all explosives deteriorate on standing, and sometimes the railroads are asked to take deteriorated explosives from local magazines distributed throughout the country back to the original works to be remade. Of course, in all establishments manufacturing explosives great care is taken to avoid fire, to avoid high temperatures, and to avoid shocks, these three being the principal causes of accident. It is claimed that only very careful men, who have had experience and are strictly trusty, are ever employed to handle the finished explosive. In putting the cartridges in boxes at the works they are sprinkled over with sawdust after the box is filled and then the boxes are nailed up in the regular way. The parties doing this work seem to have no hesitancy, and do not seem to fear any danger from the nailing, and, as a matter of fact, so far as our studies have gone, the accidents, especially in nitro-glycerine works, are more connected with the manufacture of the nitro-glycerine itself than with the handling of the powder after it is made. It is not rare for a nitro-glycerine house to be blown up. It is rare for a magazine to explode. It is customary to have several at a works that all the product on hand shall not be involved in a single explosion. It should be mentioned, perhaps, that large mounds of earth are often thrown up about the danger buildings at the works in order to limit the extent of damage done in case of an accidental explosion taking place. Moreover, the different operations are separated as much as possible, the buildings being small and widely scattered, so that an accident in one part of the works will not involve the whole.

CHAS. B. DUDLEY.

Altoona, Pa., July 24, 1905.

REPORT OF COMMITTEE OF EXPERTS.—(1) Your committee finds the explosives industry in the United States to be of importance and continually growing in the quantity and value of its output. This is exhibited by the accompanying table, taken from Bulletin No 210 of the United States Census of 1900.

(2) It finds that the important and extensive industries of mining and quarrying, the many industries which employ the products of mines and quarries, and engineering operations, can not be economically or safely carried on without explosives.

(3) It finds that the well-being, comfort and advancement of our modern civilization is to a large extent dependent upon the utilization of explosive substances, and that the raw materials from which explosives are manufactured, the products of the mines and quarries made available through the use of explosives, and the great variety of articles manufactured from these products, constitute a considerable part of the freight carried by railroads, while the various industries that are fundamentally dependent on the use of explosives give employment to an enormous number of persons.

(4) It is of the opinion that the explosives industry is now so well established a feature of our industrial operations that its products must be transported and that the best interests of all will be conserved by their being publicly transported by the ordinary routes of travel under such restrictions and conditions as will protect the traveler and the carrier without unduly hampering the producer, dealer or consumer.

(5) It is of the opinion that a carrier has the right to know the character and the properties of the goods he carries, for without such knowledge he may be unable to protect such goods from injury or to so handle and transport them as to prevent their injuring persons and property. He should, therefore, be definitely informed regarding the composition and properties of all inflammables and explosives or of substances which may, by contact with other substances, form inflammables or explosives which he is called upon to transport. He also has a right to demand a guarantee that any consignment offered of an inflammable or explosive possesses the same or a higher degree of stability, both as regards its composition and its method of packing, as the previously accepted or standard substance of this class or variety possessed.

(6) It is of the opinion that explosives and inflammables should be started on their way as soon as possible, forwarded as speedily as practicable and promptly delivered, since the shorter the time they are in possession of the carrier the less the risk.

(7) To indicate somewhat the magnitude of the risk following the quantity of explosives shipped in a single lot, your committee submits the following table, compiled from a table prepared by H. M. Inspectors of Explosives and adopted by the United States authorities. In the original table, among other data, is given the distance which a magazine or factory containing the given weight of explosive should be separated from a public railway in order to protect the latter. The conditions we are considering here are the reverse of those named by H. M. Inspectors of Explosives, for the explosives are on the railroad and the distance becomes the danger radius about the car for dwellings, churches and other buildings:

Amount of Explosive, Pounds.	Danger Radius, Yards.	Amount of Explosive, Pounds.	Danger Radius, Yards.
3,000	240	30,000	1200
4,000	280	40,000	1525
5,000	320	50,000	1850
10,000	525	100,000	3500
20,000	850		

This danger radius is not the limit of final effect, for glass may be broken, walls cracked and weak structures shaken down at greater distances, depending on the topography and geology of the locus of explosion. On the other hand, these very features last mentioned may operate to materially diminish the danger radius. It should be said also that these data are derived from a discussion of data obtained in accidental explosions in the past and represent extreme conditions.

(8) Your committee is of the opinion that the greatest danger which carriers have to contend with in transporting of explosives is fire and that every effort should be made to protect such shipments from fire.

(9) It recognizes a second and more remote cause of danger in friction, percussion and concussion, and packages containing explosives should be handled and stored in cars with due precaution against these conditions arising. Freight handlers should know that the striking of a corner of a wooden box smeared with nitro-glycerine against the wooden floor of a platform or car might give rise to an explosion.

(10) It recognizes a third cause of danger in high temperatures, which may start or promote decomposition and facilitate leakage. The practical application of this is that it is more hazardous to transport certain explosives in very warm weather, and that they should never be placed near a source of heat.

(11) Holding the above expressed views, your committee calls attention to General Notice No. 174B of the Pennsylvania Railroad Company, dated August 21, 1905, being "Information and Regulations for Shippers and Employes," relative to the "Transportation of Explosives." In our opinion, these regulations are practicable, reasonable and fair, and, if observed, offer a high degree of protection and insurance to safety.

(12) Your committee is of the opinion that the interests of all will be best advanced; that the danger to life and property will be reduced to a minimum; trade will be promoted and industries fostered by the adoption by all railroads of uniform regulations governing the transportation of explosives and inflammables, and we advise that such regulations be in general conformity with and on the lines of those now in force on the Pennsylvania railroad as cited above.

(13) Taking up in greater detail the regulations, your committee recommends:

(a) That, to guard against "so-called spontaneous combustion or explosion," no nitro-glycerine explosive, or an explosive of this class which gives an acid reaction, or which fails in the stability test, or which contains an insufficient amount of ant-acid, be accepted for transportation.

(b) That, as a precaution against leakage, cartridges or sticks of explosives be so packed in boxes that when loaded in cars the cartridges shall always lie upon their sides and never stand upon their ends.

(c) That containers be marked "Explosives—Dangerous" on all sides, and, to admit of the method of stowing recommended in (b), they be so marked that the position in which the cartridges lie is indicated.

(d) That, as a further precaution against leakage from the boxes and to reduce the chance of explosion by shock, cartridges or sticks be packed in dry sawdust or dry infusorial earth.

(e) That, as a precaution against explosion from friction or shock, care be taken in loading explosives that the packages are so stayed or chocked in the car that they can not shift or fall.

(f) That no inflammables, no detonators or blasting caps and no acids be shipped in the same car with explosives.

(g) That cars carrying explosives be strong box cars in good order and fitted with air brakes and, in trains, be placed between cars fitted with air brakes.

(h) That cars carrying explosives be located so far from the engine as to reduce to a minimum the danger from sparks from the engine.

(i) That cars carrying explosives be followed in the train by several cars so as to reduce to a minimum the chances of explosion in case of a rear-end collision.

(j) That cars carrying explosives be widely separated in a train from cars carrying petroleum or naphtha. So far as possible, cars carrying explosives and cars carrying petroleum or naphtha should go by different trains.

(k) That in making up trains no cars carrying pig iron, steel billets, heavy structural metal parts, machinery or other heavy material, which in a collision might crush adjacent cars, be placed adjacent to a car carrying explosives.

(l) That in view of the fact that explosives containing nitro-glycerine or other nitric esters are more liable to decomposition the higher the temperature, the transportation of these explosives should be limited as much as possible during the hottest months of the summer, and when transported in warm weather every available precaution should be taken to keep the temperature of the car as low as possible, such, for example, as wetting the car down at water stations.

(m) That it is essential that the containers should be so made and of such strength that they will not be broken in transit.

(n) That in the transportation of explosives containing a liquid component it is desirable that the containers be lined with a liquid proof lining.

Respectfully submitted,

CHARLES E. MUNROE,
HENRY S. DRINKER,
CHAS. F. MCKENNA.

Philadelphia, Pa., Sept. 15, 1905.

Mine Ladders.

Of all the things about mines, the ladders probably receive the least attention. Originally strongly made and of selected material, they are sent down into the mine and put in place, where they quickly become covered with dust or mud, according to whether the mine is wet or dry. Thousands of feet travel up and down the ladders, slowly wearing away the rounds. Rocks occasionally fall upon them, or strike the ladder from blasts, and in time the ladder becomes a much worn, mutilated and dangerous proposition. Rounds are broken out and remain out; the fastenings become weak and loosened, and no attempt is made to secure them. Ladders are suspended from timbers and strongly tied with iron baling wire. Acid waters wet and rust the wire,

which in a short time loses its strength; but still the miner trusts the ladder, or luck, and continues to use it. Ladders should be made of 2x4 inch scantling, with steps 1x4 inch, not over 10 inches from center to center, which are let into the sides and securely nailed with at least five 12-penny nails. The sides should have at least 14 inches space between them, making the ladder 18 inches wide. The ladder should be securely spiked or secured by large staples to timbers firmly placed, and they should receive inspection often enough to keep them in good repair. Ladders in shafts particularly should be kept in good condition constantly. Ladders with iron pipe for rounds, or even bar iron, are good for sinking. These need not necessarily be so wide as the regular shaft and raise ladders, and the rounds may be placed wider apart—12 inches—making the ladder lighter and easier to handle.

Reduction Plant and Process at the Oroya-Brownhill Mines.*

NUMBER II.—CONCLUDED.

Written by ROBERT ALLEN.

PRECIPITATION AND SMELTING.—The issuing gold-bearing solution from the presses is run into three storage tanks, from which it is pumped to an overhead tank. It gravitates from this through Excelsior clarifying presses to the extractor boxes, the exhausted liquor being run into "weak wash" sumps. The wash solutions from the presses are not passed through the precipitation boxes. The zinc boxes each have eight compartments 36 inches by 18 inches by 22 inches deep, and thus have 66 cubic feet capacity. There are five boxes for raw ore solution and three for concentrates solution. Mercury as well as tellurium is precipitated in the raw ore boxes, the former probably being derived from the mineral coloradoite previously mentioned. The spent solutions from the extractor boxes assay from the concentrates up to 24 grains per ton, and from raw ore from 6 grains to 12 grains per ton. The zinc in the concentrates boxes, on account of the richness of the solutions, is treated before use with lead acetate—zinc about $\frac{1}{300}$ inch is used. The boxes are cleaned up twice a month, the slime filter-pressed and smelted, two central filling cleaning-up presses being used. The cleaning up of the boxes takes five men four hours, while the roasting and smelting takes two men sixteen hours. Coarse zinc from the boxes which does not pass a No. 24 mesh screen is treated with sulphuric acid. The treated precipitate, together with the slimes (the whole containing about 40% of bullion), is then roasted in three muffles, 4 feet by 1 foot 10 inches by 1 foot, when the mercury contents and the bulk of the tellurium are got rid of, and most of the base metals, previously unacted upon, are oxidized.

The roasted precipitate is fluxed as follows: Precipitate 100, borax 50, sand 20, bicarbonate of soda about 8, and the mixture fused in an ordinary tilting furnace, there being about five hours to each cleanup, the retort being poured about every two and a-half hours. The slag is collected in trays and the gold in conical moulds. In case of accidents to the tilting furnace, there are two circular furnaces—each taking one "No. 100" pot—also available for smelting the slime.

A retort holding 6000 ounces is used for retorting the amalgam from the concentrates treatment.

The bullion from the tilting furnace is subject to a refining process, whereby its gold fineness is increased from about 730 to over 900, as follows: It is melted, 900 ounces at a time, in No. 30 graphite pots, and poured in a thin stream from a height of about 2 feet 6 inches into a fairly deep tub of water, which is constantly agitated and stirred. The resultant granulated metal varies in size from coarse sugar to rice. The product, about 900 ounces at a time, is put into earthenware jars, covered with water to a depth of 1 inch, and the necessary commercial nitric acid added. The jar is treated on a sand bath for nine hours, when the acid is drawn off, and the acid treatment repeated twice more, the whole acid treatment taking twenty-four hours. After this the bullion is well washed, and 105 pounds at a time put into an iron tray, which has been previously sprinkled with sand, and evenly spread over it. It is then dusted over with powdered nitre, and the tray heated in a muffle to a dull red heat for one and a-half hours, the contents occasionally rabbled. After this treatment the granules are fluxed as follows: Granules 105 pounds, borax 20 pounds, sand 2 pounds, bicarbonate of soda 1 pound, and black oxide of manganese a few ounces, and then fused in No. 60 graphite pots with clay liners. The cost of this refining of the bullion is a half-penny per fine ounce.

DISPOSAL OF RESIDUES.—The six filter presses, which are in two rows, discharge on to two 18-inch belt conveyors, which discharge on to a cross conveyor, which in turn delivers to an incline conveyor. This last, set upon the side of a large conical residue dump, delivers the residues at the summit by means of another belt, which, supported by a boom and telescoping below the former, is extended upwards as the dump grows. The rate of extension is, of course, being gradually reduced as the dump grows in height.

*Abstract Jour. Cham. Mines, Kalgoorlie, W. A.

The Mill-Hole System in Open Cut, Big Indian Mine, Helena, Mont. (See page 375.)

Open Cut Work in a Flat Ore Body, Black Hills, South Dakota. (See page 375.)

VALUE OF ORE MILLED.—May, June and July, 1905:

	Dwt. Per Ton.	Per Cent Of
Gold extracted by amalgamation of roasted concentrates	4.34	13.9
Gold extracted by cyanide agitation of concentrates	9.15	29.2
Gold extracted by bromo-cyanide agitation of raw slimes	16.13	51.5
Total gold extracted	29.62	94.6
(July, 1905		95.1)
Gold in residues	1.70	5 4
Total value of ore	31.32	100

DISTRIBUTION OF LABOR UPON THE PLANT FOR 24 HOURS.—The following is a list of the labor employed in actually running the plant:

Battery men	6
On Wilfley tables	3
On flint mills	3
On spitzkasten	3
On belts and pumps	3
On solution work	3
On taps, etc	3
On press work	12
Foremen	2
Bromo mixer	1
Belt transport of ore	1
Residues beltmen	3
Roaster men	3
Grinding pans	3
Casuals	2
Rock breaker	3
Aerial tramway	3
Total	57

The following tabulated statement of costs is valuable for the purpose of comparison with milling elsewhere:

SUMMARY OF TREATMENT COSTS FOR THE MONTHS OF APRIL, MAY AND JUNE, 1905.

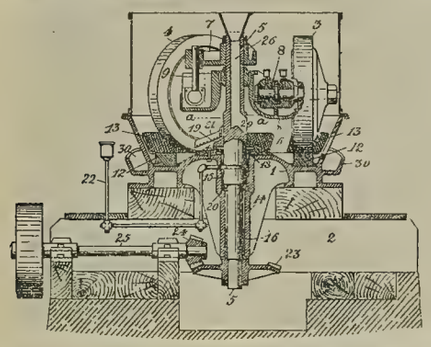
DEPARTMENT.	Total Tons of 2000 Lbs.	Labor and Salaries.	Power.	Repairs and Mainten'ce.	Supplies and Sundries.	Total Cost.	Cost per Ton Milled.	Cost per Ton Milled.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	
Rock breaking	26,852	305 2 2	307 0 11	327 11 8	23 16 3	963 11 0	0 8.61	$0.1722
Ore transport	26,852	423 4 11	92 4 0	54 19 10	40 19 0	611 7 9	0 5.50	0 1100
Milling	26,852	546 0 3	1,078 13 9	1,006 13 1	282 9 4	2,913 16 5	2 2.04	0.5270
Concentrating	1,679	203 3 11	214 19 0	317 0 5	68 17 9	804 1 1	0 7.19	0.1438
Roasting concentrates	1,679	212 17 6	97 15 8	215 8 2	251 9 5	777 10 9	0 6.91	0 1382
Cyaniding concentrates	1,679	37 16 0	19 11 6	11 2 2	366 16 1	435 5 9	0 3.89	0.0778
Fine-grinding concentrates	1 679	170 11 1	191 4 8	139 7 0	49 5 10	550 8 7	0 4.92	0.0984
Fine-grinding sands	15,574	401 15 2	851 1 6	336 18 5	118 13 7	1,708 8 8	1 3 27	0.2087
Filter-pressing concentrates	1,679	79 18 3	36 1 3	38 17 5	34 12 7	189 9 6	0 1 69	0 0338
Cyaniding by agitation (raw ore), including royalty—is. 8.56d.	25,173	417 16 11	495 5 0	270 7 5	8,990 7 1	10,173 16 5	7 6 93	1.8417
Filter pressing (raw ore)	25,173	898 13 6	463 13 8	317 19 5	327 10 3	2,007 16 10	1 5.94	0 3621
Precipitation and smelting	26,852	383 3 1	20 19 8	133 11 10	769 17 11	1,307 12 6	0 11 69	0.2338
Disposal of residues	26,852	259 13 9	155 10 3	136 15 4	23 8 9	575 8 1	0 5.16	0.1032
Totals	26,852	£4,339 16 6	£4,024 0 10	£3,306 12 2	£11,348 3 10	£23,018 13 4	17 1.74	$4.1707

Mining and Metallurgical Patents.

PATENTS ISSUED NOVEMBER 14, 1905.

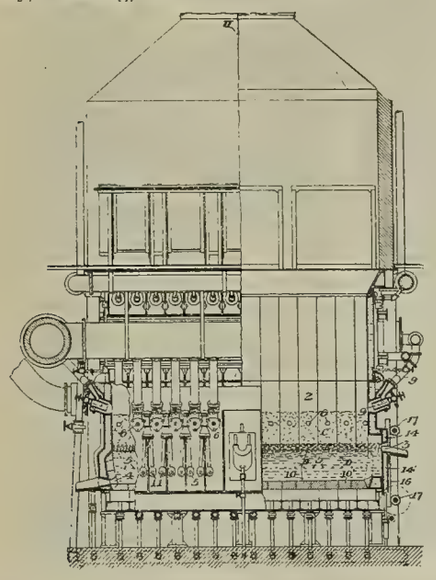
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE CRUSHING MACHINE.—No. 803,903; G. Johnston, San Francisco, Cal.



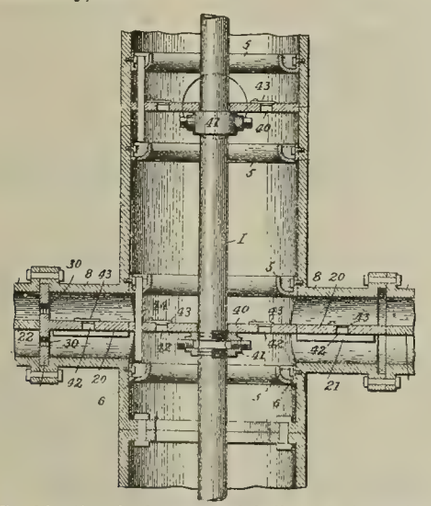
In roller crushing machine of character described, pan, die ring therein, sleeve depending centrally from pan, rotary shaft within and sustained wholly by sleeve, shaft being hollow and provided with lateral passages delivering on fixed conical apron, means for rotating shaft from bottom, and rotary crushing rollers, rolling on die ring and actuated by shaft.

FURNACE FOR SMELTING ORE.—No. 803,737; R. Baggaley, Pittsburg, Pa.



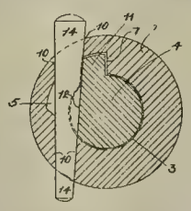
Matte furnace having converting tuyeres near bottom, smelting tuyeres at higher level, connections extending from converting and smelting tuyeres to source of air under pressure, and burner supplying heat above smelting tuyeres.

ROASTING FURNACE.—No. 804,751; A. R. Meyer, Kansas City, Mo.



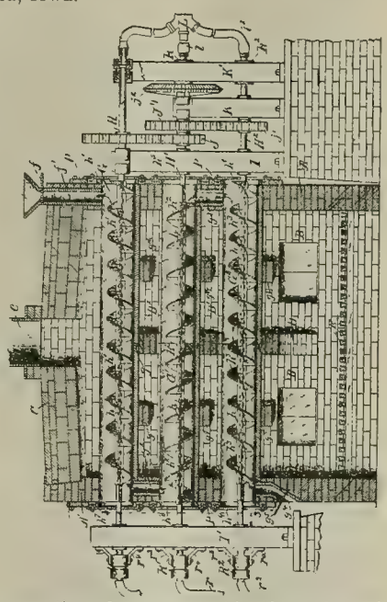
Combination in furnace, of hollow shaft, series of hollow arms extending in pairs from opposite sides of shaft and communicating with latter, rod extending centrally through shaft, and series of partitions extending across shaft between ends and centrally through arms and supported in part by rod.

CHUCK OF ROCK DRILLING MACHINE.—No. 804,686; J. H. Thomas, Johannesburg, Transvaal.



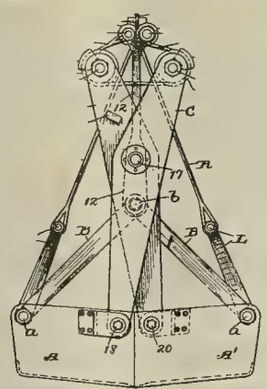
In chucks of rock drills or rock drilling machines and means for fixing bits or boring tools therein, in combination, chuck body constructed with axial bore, longitudinal slot formed in bore, longitudinal recess formed inside chuck in communication with bore, bit or drill shank constructed with lateral projection adapted to be brought into engagement with longitudinal recess inside bore by axial rotation of drill or bit, keyway or tapered slot formed through chuck passing down one side of longitudinal recess, and tapered key or wedge arranged in keyway engaging shank and lateral projection of bit or tool to maintain projection in engagement with recess.

ROASTING FURNACE.—No. 804,379; A. W. Chase, Avoca, Iowa.



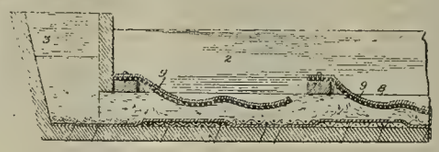
In roasting furnace combination of series of troughs, located one over other and arranged to feed from one to other, conveyors in troughs, means for operating conveyors, means being so proportioned as to drive several conveyors at rates of speed increasing from top to bottom of furnace.

EXCAVATING, HOISTING AND CONVEYING BUCKET.—No. 804,235; R. W. Kaltenbach and J. Griess, Jr., Cleveland, Ohio.



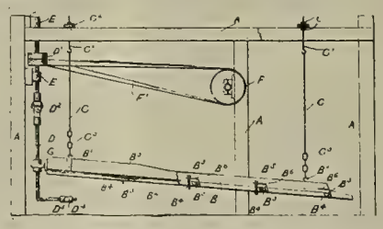
In bucket whose body portion is composed of suitably supported trays arranged to swing outwardly and upwardly or inwardly and downwardly, according as bucket is opened or closed; combination of trays; bail arranged centrally and transversely of bucket; bucket-closing levers operatively attached to trays and fulcrumed to bail with axes of levers coincident and parallel with axes of trays; bars pivotally connected at one end to trays at rear ends and pivotally supported at other end below fulcrums of levers, and means for operating levers.

GOLD SEPARATOR.—No. 804,408; F. M. Johnson, San Francisco, Cal.



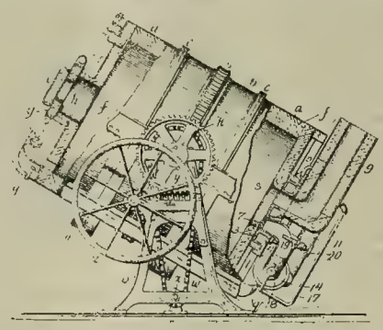
In gold separator, box or sluice having retaining bottom composed of fibrous or textile material, in combination with wire screens, arranged one above other and in contact, and forming two continuous layers, upper layer being, alternately, such wire screen and such fibrous or textile material.

CONCENTRATING AND AMALGAMATING TABLE.—No. 804,466; J. A. Hamilton, St. Peters, South Australia, Australia.



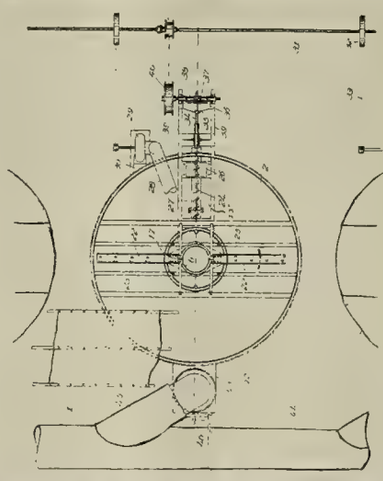
In concentrator, combination with table, and means to freely suspend it, of rotatable shaft, shaft section on end thereof, universal joint connecting shaft and shaft section, weight connected to and eccentric to shaft section, and means fixed to table and through which shaft section can freely move longitudinally, whereby table is moved in elliptical paths when shaft is rotated.

COMBINED SMELTING AND REFINING FURNACE.—No. 804 330; C. C. Medbery, New York, N. Y.



In combination, heating chamber provided with fuel supplying device comprising compressed air and fuel nozzles at one of ends; frame provided with trunnions and in which chamber is longitudinally rotatably supported; means for rotating chamber; means for rocking frame; air pipe extending from one of trunnions of frame to fuel supplying device; slip joint in air pipe in line with axis of trunnions; and another slip joint in pipe adjacent to nozzle, whereby nozzle may be swung away from end of chamber.

MECHANICAL ROASTING OR DESULPHURIZING FURNACE.—No. 804,227; H. Howard, Brookline, Mass.



In furnace of class described, drying chamber mounted thereon to receive and dry material to be treated, manually controlled means to directly introduce waste heat from furnace into drying chamber and subject contents thereof to action of such heat, agitating device within chamber, and means to positively feed dried material from chamber into interior of furnace.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

The annual report of Director Roberts of the United States mint bureau shows that the domestic coinage for the year amounted to $91,172,729 and to 152,422,302 pieces. The coinage for the Philippine islands was 29,390,526 pieces, for Panama 6,435,000 pieces, for Costa Rica 450,000 pieces and for San Salvador 400,000 pieces. Total coinage, 189,097,828 pieces. The total coinage for the Philippine islands to June 30, 1905, was 116,484,859 pieces, and the total payment by the insular government to reimburse the United States for the cost of the same has been $398,335. The insular government also supplied the metal. The original deposits of gold at the mints and assay office amounted to $143,378,969. The total earnings of the mint, including seigniorage on silver and minor coins, amounted to $5,034,635, and the total expenditures were $1,445,615. The director recommends that the provision of law which requires the mints to pay out subsidiary coins on demand should be repealed and all coin paid out hereafter through the office of the treasury. There is a constant demand on the mints for new coin, although an abundance of coin in good condition, but which is not wanted because it has been in circulation, is in the treasury. The director announces that all silver bullion purchased under the acts of 1878 and 1890 is now gone, the accounts closed, and the coinage of the silver dollar is at an end unless in the future new legislation upon the subject is passed. The report takes up at some length the history of coinage of silver dollars in this country, beginning with 1793, and continues: The total issue of silver dollars from 1793 to the cessation of the dollar coinage has been $578,303,848. The aggregate of all seigniorage on coinage under the acts of 1878 and 1890 was $134,164,986. The average purchase price of silver bought in the fiscal year 1878 was $1.204 per fine ounce, and the average price in the last purchases, made during the fiscal year 1904, was 73.1 cents per ounce. The bullion value of a silver dollar in 1878 was 93.1 cents and in 1894 56.5 cents. The stock of gold in the world on Jan. 1, 1905, in use as money, is estimated at $5,000,000,000. The amount actually in sight in reporting banks and government treasuries was $3,364,600,000.

The report of C. G. Yale, in "Mineral Resources of the United States," states that all the output of borax in the United States continues to come from California, and the larger proportion from the extensive colemanite deposits in San Bernardino county. The total product for the year 1904 amounted to 45,647 tons crude, valued at $698,810. Of this amount 38,000 tons, valued at $508,000, came from San Bernardino county, Cal., the remainder coming from Ventura and Inyo counties. In 1903 the returns gave an aggregate production of crude amounting to 34,430 short tons, valued at $661,400. The production in 1902 was 17,404 short tons of refined borax, valued at $2,447,614, of which 862 short tons, valued at $150,000, were stated to be boric acid, and 2600 tons of crude borax, valued at $91,000—a total of 20,004 short tons, valued at $2,538,614. The refiners of borax in the United States are: Borax Consolidated (Ltd.), Bayonne, N. J.; Pfizer & Co., Brooklyn, N. Y.; Brighton Chemical Co., New Brighton, Pa.; Thos. Thirkelson & Co., Chicago, Ill.; Stauffer Chemical Co., San Francisco, Cal.

ALASKA.

The Golden River Placer M. Co. of Windham bay have shut down their works for the winter.——A. Gefeler, manager for the Helvetia M. Co. at Windham bay, has completed the tram and started the mill.——C. W. Young of Juneau, president of the Windham Bay G. M. Co., has let a contract to R. L. Rowe to run 50 feet of tunnel on the Windham Bay G. M. Co.'s property on Spruce creek.

A. L. Pearse of the Alaska-Perseverance Co. has seventeen lode claims between Juneau and Sheep creek, on Gastineau channel, and the property at the head of the Basin, together with a tunnel site, dumping ground and wharf rights. A tunnel which will eventually be the outlet for the workings of the company 10,000 feet back will be driven 9x9 with a 2 foot drain. An hydraulic drilling machine, similar to the ones used to drive the Simplon tunnel, in Italy, is to be used. The tunnel will on completion tap the Perseverance property about 2500 feet below the apex of the lode and fully 1200 feet below the present working tunnel, which runs from the Basin side of the property.

ARIZONA.

A bulletin issued by the census bureau places the aggregate value of manufactures of Arizona for the last year at $28,083,192, as against $20,438,987 for 1900. Copper refining is the principal industry represented, the production amounting to $22,761,981. The capital employed in 1904 amounted to $14,395,656. There were 4975 wage earners, and wages amounting to $3,963,248.

Cochise County.

Official statements of the Copper Queen M. Co. of Bisbee show that the company has mined since its beginning 3,352,000 tons of ore and is now mining at the rate of 40,000 tons a month. Its average copper saving has been 7½%. The mine began production of ore in 1879 and opened its original small oxide smelter during 1880. The mine is consuming in underground timbering 1,100,000 feet of lumber per month and is burning about 17,000 barrels of oil for fuel.

A connection has been made between the Lowell and the Sacramento shafts in the Copper Queen mine, at Bisbee, a distance of 2200 feet, which furnishes better ventilation and opens up a new territory for exploration. The Copper Queen continues to carry on considerable exploratory work in the several shafts, in addition to the shipments of ore required to feed the Douglas smelter. At the Cuprite, the newest shaft being sunk by the Copper Queen, a depth of 230 feet has been attained.——The Copper Queen Con. M. Co. has three producing shafts, the Czar, Holbrook and Spray, and four developing shafts, the Lowell, Gardner, Sacramento and the Cuprite. The mine is timbered with square sets of 10x10-inch and 12x12-inch timber, mainly Washington fir, and an average of 30 feet of timber, board measure, is required for each ton of ore won. All ore is hand sorted underground after breaking, and culls used for filling in worked-out stopes. The Douglas reduction works of the Copper Queen Co. are 28 miles from the mine and within a mile of the Mexican border. The smelter has five furnaces, each 42x204 inches, with capacity of 400 tons daily, and three furnaces from the Bisbee, smelter each 42x120 inches. There are four stands of converters. The Paradise mining district in the Chiricahua mountains is tributary to Douglas and embraces a territory 4 miles in width by 18 miles in length. The average elevation is 5500 feet.——The Chiricahua Dev. Co. is working 1½ mile west of Paradise. The shaft is three compartment and has been sunk 425 feet. The equipment includes three boilers of 150 H. P. each, one fifteen-drill compressor, one double-drum hoist, etc. The main drift, which runs to a depth of 600 feet, shows white iron with a small percentage of copper.——The Manhattan Dev. Co. has thirty-nine claims joining the Chiricahua on the west.——The Black Queen, owned by Walker & Myers, has ten claims.——The Savage C. Co., with J. A. Lewandowski as superintendent, lies nearer to the railroad point, Rodeo, than any other property in the district. A sixty-ton smelter is on the ground.

The Cochise Gold & Silver Co. has started work on mines near the State of Maine, near Tombstone. J. M. Montgomery of Pittsburg is president. H. T. Fisher is manager at Tombstone.

Gila County.

Work has been started at the Old Dominion smelter, at Globe, upon the fourth unit of the smelter. With the addition of this furnace capacity the plant will be able to handle one-third more ore than it does at the present time. The furnace is doing excellent work, but is still not up to the mining capacity of the plant. The smelter has eight double storage bins holding 1000 tons of ore, limestone, and coke. There are three blast furnaces each 44x180 inches at the tuyeres, arranged tandem, with common settlers between. Furnaces are charged automatically from side-dumping cars, and water for the jackets is brought from the mine. The brick dust chamber is 20x20x250 feet, connecting with a smokestack 200 feet high. Flue dust is briquetted for resmelting. The converter department has three stands. The shells are 7x11 feet, lined with a mixture of clay and quartzite carrying 4.5% copper, the lining carrying 75% silica, and making eighteen tons before burned out. The converter blast is 18,000 feet per minute. The shells are handled by electric crane.

Graham County.

The Detroit Copper M. Co. is arranging poles for an extension of their electric lines to the Santa Rosa group, which they own, near Coronado. It is proposed to put in an electric drill for development work.

Mohave County.

J. W. Guinn, foreman of the Enterprise mine, near Kingman, reports that the shaft has been timbered to the first level and the east drift cleared of debris. The mine is being put in condition to carry the shaft to the 300 as soon as the big sinking pump is put in. The new hoist is in commission.——L. Hoffman, superintendent Chloride G. M. Co. at Chloride, has shipped four carloads of ore from the Samoan mine to the Needles smelter.——Good molybdenum ore has been opened up in the Leviathan and Whale claims near Berkeley.

Pima County.

W. F. Stanton, general manager Imperial C. Co., at Silver Bell, reports that the ore shipments are 100 tons daily. They are 80 feet below the 500-foot level, in high-grade ore, and are still sinking. The management is at work on plans for a smelter and concentrating mill. The capacity of the smelter will be 300 tons per day. The mines are in the Silver Bell mountains, at elevation of 2900 feet.

Yavapai County.

Manager Tyson has put in a boiler and new machinery at his mill near Turkey and is running it.——The 5-stamp mill of S. Parker, near Turkey, is running steadily.——The Rainbow gold and copper group 1½ mile from Turkey is to be developed.——The Lone Star M. Co. is working J. S. Johnson's mines, 7 miles from Turkey creek.——The Fuller mine and mill on Squaw creek, 6 miles east of Goddard, are to be started up.

The Renegade shaft, 3½ miles from Mayor, is being sunk to a depth of 800 feet. G. A. Howe is manager.

The new 50-ton cyanide plant recently completed on the Braganza Gold Mining Co.'s property at Henrietta has been started.

CALIFORNIA.

Reporting on the production of magnesite, Chas. G. Yale says that in Alameda county the King magnesite mine is 22 miles southeast of Livermore, on the Arroyo Mocha road. No product has been hauled to market. There is also a small undeveloped deposit 24 miles southeast of Livermore, in the Arroyo Mocha canyon. In Mendocino county the Vassar claim is 12 miles north of Cloverdale, near the line of the California-Northwestern Railway. This is as yet undeveloped. Napa county has several occurrences. The Mathai mines, North and South, are owned by Frank Mathai of Chiles and have been worked to a small extent within a few years past. The mining was done by means of open cuts. The North mine is in Soda Creek canyon, and the South in Greasy Camp creek. The Prest mine, in Chiles valley, 13 miles from Rutherford, has been opened at several places, but has been idle. The deposit owned by E. T. Russell of Chiles, 15 miles from Rutherford, has produced a small quantity, but is idle. The Snowflake, 11 miles from Rutherford, was worked for about twelve years and was very productive during that period, yielding, in fact, nearly all the magnesite produced in the State. The workings are extensive and mainly in the form of tunnels. The occurrence is in a series of ledges in a serpentine formation. The mine is at present idle. The Stanley and Bartlett mines, 12 miles from Rutherford, are on the property of the Phelan estate, and were productive for ten years, though they are now idle. The White Rock mine, 15 miles from Rutherford, is owned by J. B. Duval of Lidell and the Western Carbonic Acid Gas Co. of San Francisco. The deposit was opened in 1894 and continued to produce for five years. This, like the Fairweather claim adjoining, is unproductive. The deposit owned by J. C. Sullenger of Oakville, Napa county, is in Pope valley, 20 miles by road from Rutherford, but has not produced for several years. In Placer county there are undeveloped deposits in the mountainous regions about Damascus, on the Forest Hill divide. They are too far from a railroad and in too rough a country to be at present of much value. There is also an undeveloped deposit near Walkers Pass, Kern county. Near Winchester, in Riverside county, the Fireproof M., M. & M. Co. has 323 acres of land on which magnesite deposits have been found. The American Magnesite Co. has claims on Red mountain in Santa Clara, Stanislaus and Alameda counties. The mines are 32 miles southeast of Livermore, at an elevation of 3350 feet. The ore is to be hauled by traction engine to Livermore and thence shipped by railroad to Oakland, where the manufacturing plants have been built. The mines and factories are in operation. The A. F. Cochrane mine, near Madrone, in Santa Clara county, is idle, not having been worked since 1897. The Weber Ranch deposit, in the same county, is on the west side of San Felipe Creek valley, and is owned by the Bay Cities Water Co. Sonoma county has numerous deposits of this mineral. The Creon mine, 4 miles northeast of Cloverdale, is owned by J. Kolling of San Francisco and has been opened in three places, but is not being worked. The Cummings deposit, 2½ miles from Cloverdale, is operated by the Sotoyome Magnesite Co. of Healdsburg, Thomas Merchant manager. Operations on the mine were not commenced until the summer of 1905. The Eckert ranch deposit is 2 miles southeast of Cloverdale. The deposit owned by George Madeira of Healdsburg is 11 miles from that place, and is as yet undeveloped. The Sotoyome Magnesite Co. owns a deposit on the Norton ranch on Dry creek, 10 miles northwest of Healdsburg, but it is not productive. Extensive deposits occur 3 miles northeast of Porterville, Tulare county, on the first range of foothills, and it is from these that nearly all the magnesite produced in the United States has come for the last few years. Part of the magnesite mined is carried by chute and tramway to the kiln and shipped as magnesium oxide and part is hauled by wagon to Porterville and shipped as magnesite. The deposits are worked by open cuts and tunnels. The mines are well developed, and Manager W. P. Bartlett states that he could readily ship two or three times as much as he does annually if the consumption warranted it. A considerable portion of the output is shipped to the Western Carbonic Acid Gas Co. of San Francisco, where it is calcined and the gas utilized commercially. Kilns for calcining the magnesite have been erected at Porterville, and began operations in 1905. The calcined material is shipped to the paper mills of California and Oregon.

Amador County.

The Bay State mine, near Plymouth, is being profitably worked by the miners on a co-operative plan.——Work at the Markley mine, northeast of Volcano, has been discontinued by the parties who bonded it recently.——Work has been resumed at the Telegraph placer claim, situated in Upper Rancheria.——At the Mitchell mine, near Pine Grove, twelve men are employed in underground operations and getting the mill in order.

El Dorado County.

It is reported that drill tests near Pacific House have developed gravel under the lava.——The 40-stamp mill at the Union mine, near El Dorado, was recently destroyed by fire. It is to be rebuilt by A. Harpending.

Humboldt County.

(Special Correspondence).—A suit in which J. Salstrom and wife were plaintiffs and the Orleans Bar G. M. Co. defendants was recently on trial in the Superior Court of Humboldt county. Salstrom, as owner of an 80-acre tract at the mouth of Crawford creek, on Klamath river, valuable, as claimed, for the minerals it contains and for agricultural purposes, complained that the dumping of boulders into the creek by the mining company resulted in cutting a new channel through the land, destroying six acres and rendering the remainder comparatively worthless for either mining or agricultural purposes. The original damage claim was $15,000, but since commencement of the suit Salstrom claimed to have discovered that there was more gold in the ground than he had supposed, and the claim was amended so as to increase the amount of demand to $25,000. The case was submitted to a jury. The Orleans Bar Co.'s claim is the most extensive and important placer proposition in Humboldt county.

Eureka, Nov. 22.

(Special Correspondence).—What is believed to be a copper deposit has developed in the claim of George Henderson of Eureka in the Horse mountain region, Willow Creek district, on lower Trinity river.

Willow Creek, Nov. 26.

Inyo County.

The Western Borax Co. owns a deposit near Big Pine, where borax is being produced from marsh dirt or mud containing from 8% to 10% of borax. All the product is the result of concentrating and crystallizing the borax, which is found mixed with large quantities of earth. In Death Valley are large borax deposits controlled by the Borax Con., Ltd.

Kings County.

The Florence Mack M. Co. has ordered new machinery and will commence operations at once on the mines on San Benito creek, near Hanford. G. E. Barton is manager.

Placer County.

A. Weske is running a tunnel to tap the gravel channel of the Dam claim at Centerville.——It is reported Peach & Schmitt will start work at the Kittler mine, near Ophir, and sink the shaft 500 feet.——Rich ore has been found at the 200-foot level of the Bellevue mine, near Ophir, being worked by Buchanan & Sazano.

San Bernardino County.

According to a United States Geological Survey report, the main borax deposit of the Borax Con., Ltd., known as the Calico deposit, is that from which by far the largest portion of the product of the United States is derived. This deposit is not found in well-defined ledges, but in pockets which may develop into very large deposits. The mining has not been carried on to any considerable depth — not more than 500 to 600 feet. The ore found is colemanite, and varies in percentage of boric acid contained, but is seldom shipped unless it averages 35% or more. Any lower grade is calcined at Marion, where it is put through a Holthoff-Wethey furnace. At Daggett the company is running its roaster to full capacity. The American Borax Co.'s works at Daggett are connected by rail with the mine 7 miles distant. The ore is a borate of lime, varying in boric acid contents from 7% to 30%, and is treated by a process invented by Henry Blumenberg, Jr. The resultant material is shipped to the Brighton Chemical Co., New Brighton, Pa., and is there converted into borax and refined boric acid. It is now producing from these low-grade ores a carload of boric acid every week. The Columbus Borax Co. owns a mine 5 miles south of Daggett, but is at present only operating the deposit it owns in Ventura county. The mines of the Palm Borate Co. are 6½ miles from Daggett. The ore is a borate of lime in a clay formation. The boric acid was probably formed in the bed of a lake and tilted up during some upheaval of the earth's surface.

Shasta County.

The shaft in the Clara mine at Keswick is to be changed to two compartments and will be sunk to a depth of 100 feet, when drifting will begin. J. Kahny is manager and W. C. Stanley superintendent at the mine. Electricity is to be put in to run the hoist.

Sierra County.

It is reported that blue gravel has been struck at the Columbia Channel gravel mine near American hill, near Forest City, by J. M. Harper. An 1800-foot tunnel was run.——A gravel channel has been cut in the Forest City mine.——Drifts are being run and breasts opened out in the South Fork mine at Forest City, preparatory to washing gravel when water is plentiful. The main tunnel is being pushed ahead for the other two channels.

Siskiyou County.

R. McDowell, manager of the Oregonian mines, on Tauni mountain, in the Salmon River district, near Sawyer's Bar, has uncovered $84 sulphide ore while drifting on the ledge at a depth of 300 feet. Ground has been broken on the Salmon river, 1¼ mile from the mine, for a 10-stamp mill, which will be put up at once. The ore will be carried to the mill by an aerial tramway.—— Tetherow & Co. have completed their tunnel on the Highland property, having tapped the vein at a depth of 400 feet. Ore bunkers are being built to hold the output during the winter, as the 3-stamp mill on the premises is not able to work it. As soon as spring opens a larger mill will be built below the mine on Salmon river, near Snowden.

Trinity County.

(Special Correspondence).—Placer claims on New river are in readiness for work. At the Trinity mine ten men are at work and three stamps in the mill dropping. The Mountain Boomer is working a crew in the best ore handled for years.

Denny, Nov. 26.

(Special Correspondence).——F. P. Burris, owner of the Bear's Tooth quartz mine, on New river, 15 miles from its confluence with the Trinity, intends to put in an aerial tramway to convey ore from the mine to the mill at the foot of the mountain, a distance of 2800 feet. Buckets must be carried at intervals of 200 feet. The mine, which was discovered last year, will be equipped with a Huntington roller mill, shipped via Humboldt bay. It was so constructed that it could be taken from the end of wagon navigation on Trinity river to the mine on pack mules. It will be used as an adjunct of the triple-discharge stamp mill now in service.

Eureka, Nov. 26.

Tuolumne County.

Work is to be commenced at the Mack mine, near Big Oak Flat, probably working through the Wooten shaft.——The Gold Queen shaft, north of Soulsbyville, is down 275 feet on the vein. Geo. Dean is superintendent.

Ventura County.

A recent Government report says that the Frazier mountain borax deposit is owned by the Frazier Borate M. Co., controlled by the Stauffer Chemical Co. of San Francisco. The colemanite is shipped by traction engine from the mine to the railroad and thence by rail to San Francisco, where it is refined into borax and boric acid. The ore is considered very high in boric acid contents. The Columbia Borax Co. also owns a deposit near Griffin, which began to be productive in 1904. This company does not refine their product.

COLORADO.

According to a recent report of the U. S. Geological Survey, there was an increase of 17,838 barrels in the oil yield of Colorado in 1904 as compared with 1903, and the production was the largest credited to this State since 1894. The average price was $1.15 per barrel and the total valuation was $578,035. The greater portion of the increase came from the deep wells drilled in the Florence field, which in some instances found a fourth pay streak at a depth of 2100 feet, which did not exhaust the Fort Pierre shales of the Cretaceous. The deepest well in the field is 3650 feet, which was dry. The formation was such, however, that there is a probability of finding pay beds at that depth. There were eighty producing wells operated during 1904, and about 120 wells have been abandoned since the field was first opened in 1887. The sands are loose and gritty, resembling shale, and are in lenticular beds deposited in the shale at different depths. One may develop four pays of beds which contain petroleum, and it is possible that another may well miss all of them. There are two wells in this field which have produced over a million barrels each of petroleum. None of the wells are of the gusher character, and the driller is often unaware that he has pierced an oil sand until the oil begins to flow into the well and its presence is shown in the sand pumpings. Small flows of natural gas and some showing of water are found. The Boulder field in 1904 did not produce one-half of its output in 1903, although a number of wells were completed during the year 1904. The uncertainty of production and the failing wells have robbed this field of its prominence, which was given to it about the close of 1902. In northwestern Colorado petroleum has been found in Rio Blanco county, where eight wells have been drilled which produce from one-half to five barrels per day by bailing. The gravity is from 30° to 35° Baume, and, in common with the other Colorado petroleums, the oil has a paraffin base, flashes at 90° F., and burns at 116° F. An analysis showed: Light naphtha, 7%; heavy naphtha, 12%; illuminating petroleum of 45° Baume, 60%; paraffin, 16%; coke and loss, 5%.

Boulder County.

The Coney Island tunnel, near Eldora, is being driven an additional 800 feet from the 200-foot point.——The cyanide mill of the Cash Co. at Magnolia is working on high-grade ore struck in making an upraise from the 250 to the 140-foot level in the Cash mine.——The Cashier M. & M. Co. intend building a 50-ton concentrating plant to handle the silver and lead ores from their mines at Camp Albion. T. L. Wood is manager.

A 50-ton cyanide plant is being put in at the Inter-Ocean mine at Wheelmen, via Boulder, under the direction of F. Weed of Denver.

The Marcasite M. & M. Co. has been formed to work the Old White Crow and Osceola claims on Gold hill, near Sunshine. R. A. Trevarthen is superintendent.

Chaffee County.

It is reported that operations have been resumed at the Mary Murphy mine and that ore shipments are being made to the Pawnee mill at St. Elmo.

Clear Creek County.

The Silver Glance mine, on Democrat mountain, near Georgetown, is being worked by C. Clark.

The Key West and McKinney properties on Leavenworth mountain, near Georgetown, are being developed by E. W. and L. G. Shepard, under bond and lease. Drifting on the McKinney lode has shown high-grade ore. The drift is in 350 feet.——Drifting is to be resumed on the Domino vein by Superintendent H. Cochran of the Domino M. Co. of Georgetown.

Several important strikes have been made at Yankee lately.——B. F. Musgrove, engaged in running the Puritan vein, owned by G. R. Steuart, has exposed over a foot of smelting ore averaging $54 per ton.—— Manager Seeman of the M. M. & T. Co. has proved the practicability of sinking the Lombard shaft by striking 2 feet of smelting ore at the starting of the 100-foot level. Owing to the difficulty in securing fuel, the mine is not in operation at present. —— The Gold Anchor at Yankee is making preparations to sink.

The U. S. Geological Survey has recently published a map of the Georgetown quadrangle on a scale of about 1 mile to the inch. The topography is shown by contour lines of equal elevation, having a vertical interval of 100 feet. The area represented is a high, mountainous region, ranging in altitude from 7500 to 14,260 feet above sea level. In the northern part of the quadrangle are the mining towns of Idaho Springs, Georgetown and Silver Plume. Georgetown is one of the oldest mining towns in Colorado. The central portion of the quadrangle about Mount Evans is very high and generally inaccessible. Having escaped in a measure the forest fires, the area is heavily timbered. A large part of the quadrangle is, however, above timber line. A peculiar feature of the topography of this portion of the quadrangle is the presence of numerous cirques. Formerly the heads of glaciers, they are now occupied by Alpine lakes. This map is printed in three colors, the water in blue, the topography in brown, and the cultural features in black. The triangulation for the map was executed by L. H. Baldwin Jr., the topography by F. Tweedy.

Custer County.

The low grade ores of Custer county are to be treated by the new mill and cyanide plant being built near Silver Cliff by J. W. Northrop. Crushers and rolls, with a capacity of 200 tons per day, have been put in, and four tube mills are being set. W. H. Mest has charge.

Dolores County.

A. B. Roeder, manager of the United Rico Mines Co. at Rico, intends to sink a deep shaft to prospect the lower contacts of Newman hill. Their Gold Tunnel mill is being remodeled and new machinery put in under the direction of C. G. Smith. The Syndicate tunnel, the main entrance to the Rico-Aspen mines, has been retimbered. The Black Hawk group of the company is being worked through the tunnel at the upper terminus of the 3000-foot tram. This tunnel is to be retimbered and used until the new tunnel, 200 feet below, cuts the ore body. The tramway will then be reconstructed and the new tunnel will be used to take out the ore from the mine. Franz Cazin is making plans for remodeling the Atlantic Cable concentrator of the United Rico Co. so as to treat the lead and zinc ores from the Atlantic Cable mine. A tramway is to be built from the Atlantic Cable shaft to the concentrator.——Ore is being stored on the dump as it is taken from the main working tunnel being driven by the Rio Dolores Co. on the C. V. G. claim at Burns, north of Rico. J. W. Burns is superintending work.——The Dunton Con. M. Co. intends to build a mill near Dunton to treat ore from the America group. Nos. 2 and 6 levels are being connected by a 300-foot raise. Tunnel No. 6, the main working adit, is in 1200 feet. V. L. Brown is secretary of the company. ——The Horlick property near Rico is being worked by the Milwaukee G. M. Co., under the management of A. B. Green.

Gilpin County.

The Register-Call reports that a shipment of smelting ores from the Perrin mine in Russell district to the Chamberlain sampling works at Black Hawk brought values of $137.03 per ton. The lot weighed 9780 pounds, and the total returns were $653.35. The ores came from a depth of 240 feet. The property is being worked by Ed. Jones and J. Jones of Russell Gulch under a lease and bond.——Mill machinery is being hauled for the Ann Rutledge G. M. Co. to the millsite in Vermilion district. The new mill is to be equipped with ten rapid-drop stamps. Amalgamation and concentration methods will be used.——Lumber has been hauled from Central City to the Mattie May mine in the Yankee Hill district for a new shaft building 30x40 feet. Machinery is to be put up on the property next spring.——At the Chase mine in Willis gulch operations are being carried on in the 200, 250, 300 and 400 west levels, as well as in the 300 and 400 east levels, and the leasers are doing a large amount of development work. Manager J. A. Gilmour has had the shaft building repaired, the sheave frame has been rebuilt and the collar of the shaft has been retimbered for a depth of 20 feet.——M. Harris, E. R. Fouts, G. Miller and D. Davis have taken a lease and bond on the Willow Gulch and Tyrol lode claims on South Willis gulch, near Central City. The main work is to be carried on at the Willow Gulch, which has a shaft down about 175 feet, and the lessees intend to sink another lift.

Regarding operations in the Nevada district, near Central City, the Gilpin Observer reports that Horning & Williams, lessees on the Kansas Burroughs, are working thirty men in the mine, most of whom are subleasing. They are taking out a good quantity of mill ore, besides getting some fair smelting ore. The smelting ore is shipped in carload lots to the valley smelters. The work is being done mostly around the 500 and 600-foot levels. —— The United Mining & Exploration Co. of Denver have an option on the Modoc mine on Quartz hill and are taking out mill ore in good quantities, the vein being 70 feet wide. The ore is soft and easily mined and the Modoc is capable of working a large number of miners and outputting a heavy tonnage. The ore at present is all milling and is shipped to the Hidden Treasure mill at Black Hawk. John Lyng has charge. —— Ed. Straub & Co. of Denver, who have formed the Goldfield-Homestake M. Co., have taken a lease and bond from Lewis & Murphy on the Gold Retort lode on Quartz hill, near the Modoc. Sinking is being continued from the 70-foot level. A shaft house is to be built and the shaft sunk to a depth of 500 feet. M. Riley is mine superintendent. —— The Pozo mine in Nevada gulch is being operated by Lewis & Son of Denver. This property is being worked principally for its zinc values, although some of the ore gives values of from two to three ounces gold per ton. The tailings net $12 per ton and the zinc values are $25 per ton. The shaft on the Pozo is 165 feet deep. A. W. Rucker is manager.——R. W. Pearce of Nevadaville is operating the Ute mine in Nevada district and is shipping to the mills in Black Hawk. The main shaft on the Ute is 650 feet deep, but operations are being confined to the 300-foot east and west levels. They are also sinking a winze on the 300-foot level for prospecting purposes.——Cody & Co., who are operating the Hawley-Gardner on Quartz hill, are carrying on devevelopment work and opening up the property in a systematic manner.

Gunnison County.

The New York group on Forest hill, near Tin Cup, is being worked by Dilworth & Abbott. Drifting has been commenced from the bottom of the 200-foot shaft.

Lake County.

R. W. Miller has cut the Eureka vein in his crosscut tunnel, near Twin Lakes.——Work is to be resumed on the Miley properties, near Twin Lakes, by V. Anderson.

From their claim in Birdseye gulch, near Leadville, Burkhardt & Sullivan lately shipped twenty-five tons of 5-ounce gold ore. The ore was packed out from the mine on jacks to the Resurrection switch and there loaded on cars for the smelter. The New York, Oliver Twist and Moffat tunnels in the Mosquito section will continue work all winter and the ore taken out will be stacked. The London mine will also work continuously.——The draining of the Leadville mines has resulted in lowering the water level of the Leadville basin so that deep shafts can now be sunk without the necessity of pumping. These pumping operations have been conducted by the Coronado and Penrose. At least ten shafts which have been sunk in the Leadville basin in the last few years at a large expense, some of which have been abandoned owing to the heavy pumping expense, are now dry and can be operated without great expense. One of the immediate effects of the draining of the Leadville basin is the resumption of sinking on the Bohn shaft. Several years ago the ore was worked out of the 500-foot level. Drill-hole exploration revealed the presence of large bodies of mineral below the present workings; but, owing to the heavy expense of sinking the shaft and handling water, the company decided not to do any further work, as it was not at that time financially strong. It is now sinking another lift of 150 feet and no water has been found.——Richard Spensley is preparing to explore the new strike which he recently made in the Silver Nugget, on Breece hill, Leadville, and the shaft is down 130 feet.——The Ida May property, in Lake Park mining district, has recently opened up a fine body of silver ore. The owner is J. Jones.

Mineral County.

The Ridge mine and mill in the King Solomon mining district, near Creede, is to be started under the direction of E. R. Mosher.

Routt County.

A Craig report says that it is proposed to build a smelter to treat the copper and iron ores and also the uranium and vanadium ores in the Blue Mountain country, between White and Bear rivers.

San Miguel County.

A steam hoisting plant has been put in for all the buildings at the Pandora mill by the Smuggler-Union Co. An electric hoist has been substituted for the steam plant at the Union shaft.

The official report of the Tomboy G. M. Co. of Telluride for the year ending June 30, 1905, states that the profit for the year amounted to $186,530, and, adding the carry-over from the previous year, the surplus is $300,235. The percentage of yield has risen from $7.01 per ton in March to $8.82 in September, 1905, while the profits advanced from $1.52 per ton to $4.16. Costs show a satisfactory reduction, having been brought down in the same period from $5.49 per ton to $4.66. Manager Herron reports that the extension of the 1050-foot level into the Red Cloud section has continued in milling ore, while the raise started on the same level at a point which was supposed to be the eastern end of the ore shoot, extending from 123 raise on the west, came into ore a short distance above the 1050-foot level, and at the date of report showed a good width of ore.

Summit County.

(Special Correspondence).—Summit county received the gold medal awarded by the Portland Fair for the finest collection of gold specimens shown at the exposition.——The mill of the Washington-Joliet M. & M. Co. on Nigger hill, near Breckenridge, has been started again. The ore being milled and concentrated is coming chiefly from the Berlin and Cornish tunnel workings.——The mill at the Lucky mine, near Breckenridge, is running during the day and is making a good product of lead concentrates.——The Jessie mill is turning out a good quality of bullion as well as concentrates. In four days the amalgamation plates produced $1000. ——A good streak of ore showing free gold has been cut in the Morning Star mine on Mt. Baldy. This was met with while connections were being made between the tunnel and shaft workings. The owners are preparing to work all winter.——On the Summit Banner placer, near Breckenridge, some rich boulders of gold-bearing quartz have been found which give assay returns of $290 per ton. The manager is prospecting for the ledge.——Ore has been struck in the Novelty mine in driving a crosscut west from the main shaft.——The Wonderful London M. Co. on Hoosier Pass has its main two-compartment shaft down 100 feet. When the 200-foot mark is reached, a crosscut will be run to cut the extension of the iron vein. M. M. Howe of Breckenridge is manager.——The Lucky Fisherman Co.'s mine, near Montezuma, is being worked by manager Charles H. Campbell.——In the Rothchild tunnel, at 3100 feet in the Black Bear shoot, at the base of Coopermountain, a 2-foot vein has been cut.

Breckenridge, Nov. 27.

The Wellington mine on Mineral hill, near Breckenridge, owned by the Colorado & Wyoming Development Co., is shipping zinc-lead ore. The owners are R. W. Foote, G. H. Evans and O. K. Gaymon, all of Breckenridge.

A 60-ton cyanide plant is to be put in by the Carrie M. & M. Co. on Mount Wise, 12 miles east of Breckenridge.

Teller County.

An air compressor has been put on the Gold King claim of the Savage G. M. Co., on Gold hill, by the International M. & L. Co. T. C. Bradford of Cripple Creek is superintendent.——A new hoist is to be put in at the No. 1 shaft of the Portland G. M. Co., on the south slope of Battle mountain, near Victor.——The Jones shaft of the Pharmacist Co. at Cripple Creek is to be sunk from the 650 to the 850-foot level.——The Dillon shaft on Battle mountain is being sunk 200 feet to the 1000-foot level.

Thomas Finnerty, leasing on block 196 of the Stratton estate, on Bull hill, has made a good strike at a depth of 200 feet.

W. Braden, lessee of the Last Dollar mine, near Victor, has made a rich discovery at the 400-foot level in the No. 1 shaft.——Improvements are being made at the Golden Cycle mine, which is partly closed.——Excessive royalties at the Stratton Independence mine are causing a number of leasers to abandon work there.

IDAHO.

Blaine County.

The Alturas M. Co. has closed down its Virginia mine, in Minnie Moore gulch, near Hailey. Superintendent Ruthrauf will work the Bullwhacker mine of the Alturas Co.

The 800-foot drainage tunnel, being driven to tap the old workings of the Nay Aug at a depth of 500 feet, recently cut a vein of lead-silver ore after being run 450 feet. The zinc mill is being remodeled. John Williams of Hailey is manager.——W. T. Riley is working the Wolftone mine, 15 miles north of Hailey.——M. M. Tolle has charge of work on the Alleghany and Pittsburg mines, near Hailey, being worked by the Eclipse M. Co.

Custer County.

The Greyhound mine, in the Sea Foam district, is to be worked all winter. S. M. Smith of Boise is manager. Smelting tests have been made. A rock crusher and a concentrator to increase the lead contents is to be put in. Freight is hauled in from Ketchum.

Idaho County.

The Eagle Mountain M. Co. has bonded the Deer Trail claims, near Orogrande, and plan to develop them and put in a reduction plant. F. E. Bursall is manager.—— The Umatilla mine, near Orogrande, is to be worked all winter by Superintendent W. C. Brower.

W. A. Douglas, manager of the Pearl G. M. Co., has been operating on Divide creek, near Roosevelt. It is closed down for the winter, but it is the intention of the company to resume operations in the spring.——L. E. Moody has bonded the Royal Flush claims, at the head of Indian creek, near Roosevelt, to Eastern parties for $150,000.——A the Dewey mine, at Roosevelt, E. E. Haug is superintendent, with William Proyor as mine foreman and William Paddock as mill foreman. Their ten stamps are dropping steadily and are reducing fifty-five tons of ore daily. Straight amalgamation is used and 85% of the assay value of the ore is said to be saved on the plates. Thirty-five men are employed in the mine and mill.——At the Sunnyside, at Roosevelt, forty-five men are on the payroll.

Owyhee County.

The mill of the Pioneer M. Co. at Silver City is to be started as soon as the electrical equipment is put in. Arthur Buckbee is manager.——Work has been resumed in the Stormy Hill shaft, near Silver City, by C. W. Hill.

Shoshone County.

Work has been started on the Keating property at Wardner that was recently bonded to Portland capitalists, represented by J. F. Watson. Preparations are being made to put up a shaft house, and a shaft will be sunk 200 feet. John Keating is the sole owner.

The Pittsburg Lead Co. has made the final payment on the property it has had under bond on Nine Mile creek, near Wallace. The California mine has resumed shipments. The mill, which was shut down for some time for repairs and improvements, was started up on Nov. 19, and is treating an average of 200 tons of ore a day. The concentrates obtained from this ore will aggregate 600 tons monthly. The mill is operated by both electric and water power, its equipment consists of two waterwheels, a 150 H. P. electric motor, rock crusher, two sets of rolls, a Huntington mill, twelve jigs, four Wilfley tables, two round tables and four vanners. During the shutdown of the mill the work of developing the mine on the No. 3 level was prosecuted and a stope of galena ore has been opened on that level, 200 feet in length and four sets wide. The company employs seventy-one hands at present, most of them on the No. 3 level, where one big machine and three chippy drills are stoping and developing the ore chute.

Manager J. F. Whelan of the Capitol M. & M. Co. states that work has been suspended for the winter at the mine. The property is on Two-mile canyon, near Osburn. The company will start a new tunnel which will cut the vein 500 feet below the present workings. This tunnel will be 2000 feet in length.——The Morning mine of Mullan has on its payroll 300 employes.——The Hunter, at Mullan, is working eighty men.——At the Snow Storm the company and the leasers are working 150 men.——Among the properties near Mullan employing smaller forces are the Leslie M. Co., North Franklin, Ruth group, Bull Pen and San Quentin, Copper King and Heney group.

The Clearwater G. M. Co. has been formed at Wallace to work the Dora and Mabel placer claims, located in an unorganized mining district in Shoshone county. The incorporators are J. P. Rogers, A. E. McLeod, G. T. Johnson, J. A. Wayne and C. Goulding.

Encouraged by the success of the trial run of the concentrating plant established on the creek between Wallace and Mullan, to work the tailings of the mines on the canyon, the owners are planning a mill to be built on the same creek. The home-made plant, consisting of a revolving table and settling tanks, has been run for a month. This plant was built to determine whether the tailings would pay systematic working, and the results of the first month's run have convinced the owners of this fact. The old plant worked only the water carrying lead slimes. A dam was built in the creek, water carrying the mineral was run into settling tanks, and the mineral and slime material collected on the bottom of the tanks. The settlings were then passed onto the revolving tables and the valuable material saved. The new plant will handle all the tailings from the tailings dump. Jigs will be put in to divide the material into tailings, middlings and shipping products.——The Cœur d'Alene Concentrating Co. has been formed, with Joseph Felton as president, I. M. Cornthwaite secretary and treasurer.

MISSOURI.

Jasper County.

A concentrating plant is to be built by the Cuyahoga M. Co., west of Joplin. A. J. Donnan, Jas. Roach and Chas. Glover, all of Joplin, are interested.——The California-Buckeye mill at Cave Springs, 6 miles west of Joplin, has been started.——It is expected that the M., K. & T. mill at Baxter Springs will be started soon. ——A new concentrator is to be put up by the Mary M. Co. on the Cox land, 2 miles north of Joplin.

MONTANA.

Fergus County.

Rich ore has been struck in the Cumberland group at Maiden.

Missoula County.

The work of enlarging and retimbering the Monitor shaft at Saltese has been begun, and when that is completed the shaft will be put down 200 feet more to the 500-foot level and the vein explored by drifts in both directions at that depth.——A. H. Gray, of the Western Montana M. Co. at Saltese, reports that the mine will be worked all winter.——C. Heidenrich has made a strike on the Copper Age, near the Western Montana.

Silver Bow County.

F. A. Heinze and his associates have organized a Copper Securities Co., and it has acquired 2,000,000 shares of the common stock of La France C. Co. The latter owns the Lexington mines in Butte and the concentrating plant at Basin. Mining is done on the upper levels, the lower ones being filled with water. Work at pumping out the water will begin soon.

NEVADA.

Lincoln County.

The Josephine G. M. Co. intends to build a mill to treat the ore from its mines in the Chief district, north of Caliente. J. N. Elston is secretary and treasurer.—— H. Gentry is developing the Advance claim in the Chief district.

Good ore is being milled from the 8th level of the Quartette mine at Searchlight. —— The shaft of the Santa Fe mine at Searchlight is being retimbered and enlarged to 5x8.

Lyon County.

T. B. Gamble and T. Harris of San Jose, who, with other Californians, have purchased the Spragg copper mines, near Wabuska, announce that they will open the property. There are two other mines operating here, the Bluestone, which is owned by Californians, and the Boston mine, which is controlled by Eastern people. Both the latter companies have independent smelters, one of 40 and the other of 80-ton capacity.

Washoe County.

Regarding the White Horse district, the Nevada State Journal reports that operations on the property of the Springfield-Nevada Co. in the White Horse district, near Olinghouse, have been resumed and by the first of the year a full force will be at work. The company's mill is running on rich ore.——J. C. Effrick is milling high-grade ore on the Renegade mine in the White Horse district.——The East End M. Co. is working the Golden Eagle, purchased by H. Lincoln from J. C. Effrick and L. Kearney.——The Keystone-Nevada M. Co. of Olinghouse will put on fifteen men the first of the month. D. M. Harvey has resigned as superintendent, and Mr. Lloyd of Colorado has been appointed.——The Green Hill M. Co., with J. D. Poole as superintendent, is working twenty-five men, blocking out the ore body. ——The Ferncliff Co. will start a new shaft on Dec. 1, which they contemplate sinking to 300 feet.——The crosscut tunnel on the property of the Optimun Co. has been advanced 55 feet and a body of high-grade ore cut. ——The Texas-Nevada Co. is taking out and sacking ore for shipment.——O. M. Pudor, manager of the Texas-Nevada, is laying in a large supply of mining timbers, which will be used in the double-compartment shaft.—— C. P. Clemmons, manager of the Whitehorse-Nevada Co., will put on two shifts at the Jim Blaine.

White Pine County.

P. H. Cannon, the manager of the Imperial mine at Cherry Creek, says that the new railroad branch of the Southern Pacific is built 30 miles from Toano station, on its way to Cherry Creek. The grading is completed to within 10 miles of the camp and will be ready for business shortly after Jan. 1. The Old Imperial will resume shipments.——The Star mine, operated for the Glasgow & Western Exploration Co. by Stamann & Farron, is blocking out ore.——The National Mining Co. has purchased eight mines and is developing them.——The Wild West Co., composed of Boston people, is operating and has a mill running.——The Hartford-Nevada people are developing thirty claims. A hoisting plant is going in and a mill is also being built.——The Gold Canyon people have a new mill under construction.

NEW MEXICO.

Dona Ana County.

(Special Correspondence).—Considerable activity is being shown in the Organ mountains. This district is 15 miles from Las Cruces and 40 miles north of El Paso. Perhaps the largest operator in this locality is the Stephenson-Bennett Con. M. Co. This company has put in a new hoist and compressor and built a 50-ton mill to handle the ore from the mine. A double-compartment shaft is being sunk on the property, which will give them 450 feet of stoping ground on the incline below the lowest level. J. I. McCullough is general manager. This property is on the western slope of the mountains. On the eastern slope the Dona Dora Co. are driving a tunnel which is now in about 400 feet, and also sinking a shaft to connect with the tunnel. This company is putting in a new compressor and drills. The ore carries copper, lead and gold. G. W. Kent is manager. This property, and in fact all of the property on the eastern slope of the mountains, has bad roads and a long haul to the railroad to contend with, but as the mines are developed these obstacles will be overcome.

Organ, Nov. 27.

Socorro County.

The Graphic Co. of Magdalena, in order to reduce the cost of mining, has commenced a 1600-foot tunnel to cut the ore bodies 200 feet below the sixth level. This tunnel has already been driven 600 feet and has cut two bodies of sulphide ore, also encountered a stream of water furnishing 500 gallons per minute, insuring a permanent supply for milling and other purposes.——G. A. Freeman of Pittsburg, Pa., is superintending the erection of a stamp mill and concentrator for the Enterprise M. & M. Co. at Mogollon.

OREGON.

Baker County.

A steam hoist is to be put in at the Pyx mine, near Greenhorn.——The Snow Creek and Psyche mines, near Greenhorn, are closed because of litigation.

Grant County.

The Dame Fortune mine, near Quartzburg, has been sold to S. N. Gallaher.

Josephine County.

The long delayed rains and snows have arrived in southern Oregon, ending one of the most extended drouths ever known in this section of the State. Fears were entertained that this winter would be a repetition of last, with scant rains and slack water supply for hydraulic plants. Most of the large placer mines have increased their capacity and several new ones have been equipped.

On Grave creek, near Leland, the Blalock, Lewis, Goff, Van Brunt, Whitehead-Moore, Vindicator, Harris Flat, Archer and Columbia are to be worked. The Lewis mine, which J. C. Lewis manages, has a 65-foot gravel bank, and uses two No. 4 giants under a head of 250 feet. Water is secured through a 4-mile ditch, with an auxiliary supply from the lower ditch of the Columbia, the next mine above, of which L. A. Lewis is manager. Superintendent C. E. Foss of the Columbia has seventeen men putting the property in order and setting the giants. In four years the Columbia has washed a mile of channel, much of the lower gravel beds having a

depth of 40 and 60 feet. The plant is lighted for night work by 1000 C. P. arc lamps, deriving their energy from the Columbia's electric lighting plant.——Manager J. R. Harvey will operate three giants on the Royal group diggings near Galice. The explosion of 5000 pounds of dynamite, which has been placed at the end of a long tunnel bored under the high gravel banks, will loosen the ground so that it will wash readily. Last season 8000 pounds of No. 2 giant powder were used for this purpose.

At the Greenback mine at Greenback, electric power has been put in and the ten additional stamps finished. The forty stamps are running continuously. The 1400-foot level has been reached and the vein is holding its size and values in a way that is most encouraging to the owner, Mr. Brevoort. R. N. Bishop, the general superintendent of the Greenback mill and mine, has been in New York for some time on business in connection with the mine. He is expected back the last of this week. W. R. Thomas has been succeeded by I. L. Greninger as foreman of the mine.

SOUTH DAKOTA.

Lawrence County.

Statistics of the total gold production of the Black Hills since that region was surrendered by the Sioux Indians and occupied by the whites, contained in the United States assay offices and mints, show that the Black Hills to Dec. 1, 1904, produced gold to the value of $112,163,759. By adding to this the amount which has been produced so far this year, approximately $8,000,000, it gives a total production of $120,163,759.

The Montezuma mill at Rochford has been torn down and moved 1 mile to the mine, where it will be put up to treat ore from the 15-foot vein.——The Esmeralda mine on Blacktail gulch, near Deadwood, has been leased by E. Major of Central City.——Work is to be resumed at the Wauconda mine, near Lead.——The Golden Reward Co. is unwatering the Delaware mine, near Terry.——Work has been commenced on the Ulster and May Queen mines, near Preston, by the Victoria Extension M. Co., of which F. Steele is manager.

Pennington County.

It is reported that a contract has been let for a 100-stamp mill at the Bullion mine, near Keystone. F. H. Long of Chicago is president of the company.——Work is to be resumed at the properties of the Keystone Holy Terror M. Co., near Keystone. M. L. Fox is general manager.——The Grandview mine, near Silver City, has been bought by L. A. Richards. The shaft is to be sunk 300 feet.——The Black Tom M. Co. is putting up a 10-stamp mill on Slate creek, near Keystone.

TENNESSEE.

State Mine Inspector R. A. Shiflett of Tennessee has prepared statistics showing the mineral production of the State during 1904. The production and value of the various minerals are as follows: Coal, 4,847,242 short tons, valued at $5,617,095; coke, 386,875 short tons, valued at $923,120; barytes, 10,565 short tons, valued at $37,132; copper valued at $641,860; iron ore, 539,820 long tons, valued at $613,705; pig iron, 271,659 long tons, valued at $2,692,132; lead, 900 short tons, valued at $7200; zinc, 73 short tons, valued at $1204; phosphate, 468,443 long tons, valued at $1,485,665; marble, 372,560 cubic feet, valued at $523,872.

UTAH.

Juab County.

Work is to be resumed by the Argenta Copper Co. and by the Uma Con. Co. at Eureka.

Salt Lake County.

H. M. Crowther, general manager of the Continental Alta mine, at Alta, reports that the Flagstaff management is considering using the aerial tramway of the Continental to bring their ore over the 3 miles at a saving of $1 per ton.——The Columbus Con. at Alta have finished their ore bin and their bunkhouse.——Superintendent W. Zeigler of the Ohio Copper Co., at Bingham, reports that they are drifting from the 400-foot and 500-foot levels.

Daniel Guggenheim, president of the Guggenheim Exploration Co., makes the official announcement that the purchase of the Utah Copper Co. has been completed, and the latter is now in actual and physical control of the former. The company will develop the property. It will complete the concentrating works which are now being built.

Summit County.

The Creole mine, at Park City, has resumed work.——A new cable has been put in at the Silver King tramway at Park City.

WASHINGTON.

Ferry County.

Sinking is to be started from the 220-foot level of the Ben Hur mine, near Republic.

The 100-foot shaft on the Lone Pine mine near Republic has been completed, and the crew is crosscutting to the ledge. Should values continue to that depth, the company will put in additional machinery and increase the working force.

Snohomish County.

The Ethel Con. mines, near Index, have been sold to the Mineral City Power & Transportation Co.

FOREIGN.

AFRICA.

Transvaal.

The African Concessions Syndicate has been in consultation with the leading American and Continental engineers and experts on the subject of the transmission of power from the Victoria Falls to the Witwatersrand. These authorities have unanimously expressed the opinion that the scheme is not only quite feasible, but would be commercially successful, especially as the climate of South Africa is one of the most suitable in the world for the transmission of power. There is no ice in the rivers to interfere with the working of the turbines, and no snow to break down the transmission lines. The extreme dryness of the climate is also greatly in favor of the project. The experts consider that there is absolutely no difficulty in the way of the scheme so far as the distance of transmission is concerned. With reference to statements that the volume of water in the falls is not sufficient to produce the necessary power, it is pointed out that even in the driest season yet experienced there is sufficient water to produce 500,000 H. P., while at present the Rand only consumes 150,000 H. P. At the falls there is an available head of about 330 feet, and if more than 500,000 H. P. were needed it could easily be obtained by cutting a canal, 15 to 20 miles in length, to a point lower down, where there would be a head of 1000 feet, which would be sufficient to produce 1,000,000 H. P.

AUSTRALIA.

New South Wales

The New South Wales gold yield for October amounted to 37,187 ounces, valued at £130,341, as compared with 15,719 ounces, valued at £59,395, in October, 1904. The yield for the past ten months amounted to 267,066 ounces, valued at £934,384, as compared with 247,495 ounces, valued at £899,512, in the first ten months of last year.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Boundary mines ore shipments for the week ending Nov. 25 were: Granby mines, 15,696 tons; Mother Lode, 3328 tons; Rawhide, 150 tons; Providence, 60 tons. Total for week, 19,234 tons. Total for year to date, 810,324 tons.

Since the entire battery of eight furnaces of the Granby Co. went into commission the smelter is holding to a daily average of 2750 tons. The two large furnaces completed this year are holding up to at least 800 tons. Superintendent Hodges is pressing work rapidly for commencement of the 3-compartment shaft, the headworks for which will be erected this winter. An electric motor of 250 H. P. will actuate the hoist, which will have a depth capacity of 1000 feet.——Work has been resumed on the Sunset in Deadwood camp, with Neil Morrison in charge. The Sunset is owned by the Dominion C. Co.

Nelson District.

At the La Plata mine on Kokane creek, near Nelson, the new concentrator building is completed.

Rossland District.

The tonnage shipped fron Rossland mines for the week ending Nov. 25 and for the year to date was as follows:

Mine.	Week.	Year.
Le Roi	1,350	104,836
Le Roi (milled)	....	3,240
Center Star	1,620	89,530
War Eagle	1,230	61,850
Le Roi Two	270	7,582
Le Roi Two (milled)	....	9,430
Jumbo	100	9,629
White Bear	....	1,100
White Bear (milled)	....	3,220
Cascade-Bonanza	....	120
Crown Point	....	350
Spitzee	....	4,809
Velvet-Portland	....	1,977
Gopher	....	180
Homestake	....	30
Lily May	....	90
Inland Empire	....	30
Totals	4,570	298,003

The station on the 1350-foot level of Le Roi at the head of the winze is finished, and sinking from the 1550-foot level will be inaugurated as soon as the double-drum hoist is in place. No work is at present in progress below the 1350-foot level, pending the starting of the hoist. The crosscut, which is being driven on the 1350-foot level of the Le Roi into the territory of the Le Roi Two, is 90 feet in length. The station on the tenth level of the Center Star has been completed, and the work of deepening the shaft, which is about 120 feet below the level of the tenth level, has been resumed.

On the 1000-foot level of the Le Roi, at Rossland, the Black Bear ore shoot has been found. On the 800-foot level it is 108 feet wide, and on the 900-foot level it is 45 feet wide.——The new ore shoot of Le Roi No. 2 has been prospected with diamond drills.——The White Bear mine and mill at Rossland are to be started soon.

The War Eagle mine at Rossland, B. C., has been purchased by the Center Star M. Co., owning the adjacent property. For years the properties have been controlled by the Gooderham-Blackstock interests and operated under joint management. Recently both passed into the control of Canadian Pacific Railway interests, and now have been entirely merged, the War Eagle Con. losing its identity in the Center Star Co. James Cronin is general manager of the Center Star Co.'s properties at Rossland, and of the St. Eugene mine at Moyie, B. C.

Slocan District.

Attention is being paid to the magnetic separation of zinc by the Kootenay Ore Co. at Kaslo. The plant at Frank will probably handle the largest part of the zinc product of the camp.——The Payne mine, near Sandon, has opened a new shoot of lead and zinc ore below level No. 5, and is expected to supply the mill for a year. The lessee of the property has twenty men working.——John Bow has opened a shoot of galena ore on the Tramp Planet, adjoining the Payne on the south. The Majestic, farther south, operated by Bigney & Little, now has three levels. Stoping is being done between the second and third levels.——The Slocan Star is working three men in stoping ore and twenty men in development work.——The Silversmith has a showing of 2 feet of galena on the fourth level, 250 feet from the surface. Work will be pushed on the fifth level, 225 feet lower, into the new ore body.

West Kootenay District.

The tunnel in the Beatrice mine at the head of Mohawk creek, near Camborne, has reached the main level. The tunnel has been run over 500 feet. A tram has been built to convey the ores from the mine.

MEXICO.

The situation in Mexico resulting from the dynamite famine is rapidly becoming acute. A petition has been sent to President Diaz asking for some relief. There is a prohibitive duty of $210 per ton on dynamite. The Mexican national monopoly, which has the sole right to bring dynamite into the republic free, has entered into an agreement as agent to the American trust. It is pointed out that after allowing wide margins for all possible expenses there is a net profit of $6.65 per case, or $226 per ton, or $5320 per car for the company. The miners feel that this bonus is exorbitant and unjust and ask for immediate relief.

Chihuahua.

It is expected that the mill and cyanide plant of the Galanista G. M. Co. at the Esmeralda mine, southwest of Guadalupe y Calvo, will be finished by February 1. It is reported that a wireless telegraph outfit is to be put in. G. M. Holmes is manager.

NEW ZEALAND.

The Waihi G. M. Co. have applied for water rights on the Waikato river, near Cambridge, to furnish power for new tube mills to be put in at their Waikino and Union batteries. About 60 H. P. is required to drive three mills at their Waihi battery. The Mining Journal reports that two of the tube mills at the Waihi battery have been found equal to grinding the whole of the coarse sands passing through a 20-mesh from ninety stamps. The sinking of the main pumping shaft is proceeding satisfactorily, and a total depth of 101 feet has been reached below the "sill" at No. 7 level. The Royal lode continues strong in both the east and west drifts, and so far the stretch of pay ore being revealed at this No. 7 level is encouraging.

PHILIPPINE ISLANDS.

A recent government report states that old Spanish workings have uncovered large bodies of high-grade copper ore in Lepanto, in the district of Mancayan. About forty claims have been located here by Americans who plan systematic exploration work. In the province of Batangas work has been done in the Loboo mountains on a group of claims containing copper carbonate ores with a trace of gold. Platinum has been discovered in small quantity in the placer sands from Rizal. In Bulacan, in the mountains east of the towns of San Miguel de Mayumo and Angat, important deposits of rich hematite and magnetite have been known and worked by natives in a small way for over a century. Some of them are fully up to Bessemer grade. Correspondence is now in progress with iron works of Japan looking to the profitable shipment of these ores. Excellent coal, suitable for steamer use, is found in Albay Province, in Batan island. In Cebu are important deposits of steaming coal and two known deposits of lead ores. These coals have been proved by practical tests in steamships in Philippine waters to do very well. Petroleum is reported in Tayabas Province, but no wells have yet been driven to prospect this field thoroughly. At Binangonan occurs a limestone which is shown by analysis to be suitable for making cement. As there is available clay in the vicinity and good water transportation to Manila, capitalists are considering the erection here of a modern rotary kiln cement plant, to cost not less than $225,000.

Commercial Paragraphs.

L. S. PIERCE, 1653 Welton St., Denver, Colo., reports sale of a 15-ton set of riffles to the Denver Mint, a 25-ton set for Johannesburg, S. A., and a 25-ton set for Siberia.

THE Sullivan Machinery Co. announce that their St. Louis office, P. F. Jarvis, manager, has moved into larger quarters at rooms 1125A to 1127 Missouri Trust Bldg.

THE School of Mines of the State University of Washington gives a course each winter for prospectors and mining men in general. It is the aim of the institution to make this course thoroughly practical. To that end, the instruction is principally by laboratory methods and visits to smelters and mines in operation.

THE National Wood Pipe Co. has completed a line of 91-inch continuous stave pipe at Pendleton, Or. This pipe is made from 3x6 fir staves banded with ¾-inch round steel rods, which are held in place with malleable iron shoes, and carries the water which operates the Pendleton roller mills. A 54-inch continuous stave pipe line has been completed by them at Dayton, Wash., for the local electric company.

THE city of Alpena, Mich., has contracted with Allis-Chalmers Co. of Milwaukee for the complete electrical and power equipment of a lighting plant, consisting of a 60-cycle Bullock alternating current generator, normal capacity 150 kilowatts, direct connected to a Reynolds-Corliss cross compound heavy duty engine; an exciter unit, jet condenser, switchboards, sub-station apparatus, and equipment for 100 arc lamps connected in series.

CROCKER-WHEELER CO., manufacturers and electrical engineers, announce the establishment of an industrial engineering department, in which is concentrated all their work in the line of industrial engineering as applied to railway shops, machine shops, and industrial plants of every description. J. K. W. Davenport, E. E., has become associated with the company, that its growing activities along these lines may be handled in a satisfactory manner. Mr. Davenport and his staff of assistants are at the present time giving personal attention to several important industrial propositions.

Personal.

H. C. CALLAHAN is in Mexico.

F. J. SPARE is manager Pompeii M. Co., Searchlight, Nev.

J. T. STEVENS is manager Harris mine at Washoe, Nev.

A. E. BRYAN of Seattle, Wash., is examining mines in Mexico.

FRANCIS RULE of Pachuca, Mex., is visiting San Francisco.

MARK B. KERR is in Butte, Mont., en route to San Francisco, Cal.

CHAS. EATON is superintendent Con. Copper Co. of Boulder, Colo.

H. SAVILLE is manager Deep Down M. & M. Co. of Keystone, S. D.

J. W. POWER is superintendent Little Mendah mine at Pioche, Nev.

DANIEL KIRBY is superintendent Monarch mine at Atlanta, Idaho.

C. A. CLAY is superintendent Animas Power Co. at Silverton, Colo.

L. WHEATLEY is superintendent Duplex M. & M. Co., Searchlight, Nev.

R. HALES has been made foreman Kearns-Keith mill at Park City, Utah.

THOMAS JAY has been made superintendent Monitor mine at Saltese, Mont.

O. B. STEEN is superintendent Searchlight C.-G. M. Co. at Searchlight, Nev.

A. P. MAYBERRY has charge U. S. M. Co.'s Richmond properties at Eureka, Nev.

J. C. FOLEY has been appointed manager Shakespeare mine at Webwood, Ontario.

R. G. BAILEY is superintendent Nonpareil M. & D. Co., working near Dixie, Idaho.

J. J. PENDERGAST is general manager Cyrus Noble M. & M. Co. at Searchlight, Nev.

H. H. NICHOLSON has moved from Sumpter, Or., to 701, 135 Adams street, Chicago, Ill.

SAMUEL BRETHOUR has charge of work at the Gold Medal mines, near Idaho Springs, Colo.

S. F. EMMONS recently examined the Arizona Commercial Copper Co.'s mines at Globe, Ariz.

A. H. OLESON of Deadwood, S. D., is manager Homestake South Extension M. Co. at Lead, S. D.

M. O. O'BRIEN of New York has been appointed manager McKinley mines, near Grand Forks, B. C.

J. B. KEATING, general manager Bully Hill S. & R. Co. at De Lamar, Shasta county, Cal., has returned from the East.

F. J. HARRINGTON is superintendent, G. B. Wilson assistant superintendent and J. Luxon foreman Quartette M. Co. at Searchlight, Nev.

JOHN HAYS HAMMOND, general manager Guggenheim Exploration Co., has been made managing director Utah Copper Co. at Bingham, Utah, representing the Guggenheim Exploration Co.

Obituary.

B. J. CATREN, a pioneer mining superintendent of Clear Creek county, died at Silver Plume, Colo., November 18.

G. H. ALLEN, foreman Standard mine at Mace, Idaho, was killed Nov. 23 by being crushed by a cage in the Standard shaft.

WM. ORR, manager of the Glasgow & Western Exploration Co., Ltd., controlling the MacArthur-Forrest cyanide process, died at Denver, Colo., November 22.

W. H. EDGAR, founder and president of the Dearborn Drug & Chemical Works, with offices in the Rialto building, Chicago, Ill., died suddenly November 27 at the Arlington hotel at Hot Springs, Ark.

Trade Treatises.

The National Electric Co. of Milwaukee, Wis., illustrate and describe their polyphase induction motor in Bulletin No. 358, and stationary and portable and motor-driven air compressers in Bulletin No. 363.

Catalogue No. 20 of the Jeffrey Manufacturing Co. illustrates "Coal Handling Machinery for Mines," including tipples, conveyors, crushers, drills, cars, hoists, etc. Pictures of typical installations and of sectional parts constitute the essential of the booklet, as there is but little text.

"Water Lifted by Compressed Air," while listed as catalogue No. 73 of the Ingersoll-Sergeant Drill Co., of 11 Broadway, New York City, is really an excellent treatise on the theory and practice of pumping water with compressed air. Concise text and pertinent illustrations give the details of reason, operation and cost of the "air lift" system. It contains much valuable information for the engineer interested in economical pumping.

Books Received.

As extracts from "Mineral Resources of the United States for 1904," the U. S. Geological Survey has issued "Production of Borax" and "Production of Magnesite."

The annual report of the irrigation and drainage investigations of the Office of Experiment Stations for 1904 has been issued as Office of Experiment Stations Bulletin 158. This contains a review of the irrigation work of the year; a report of the drainage investigations for the year, and a number of reports covering local investigations.

Office of Experiment Stations Bulletin 157, entitled "Water Rights on Interstate Streams—the Platte River and Tributaries," has just been issued by the United States Department of Agriculture. It contains discussions of the water-right systems in Colorado, Wyoming and Nebraska; the rights to the Platte river and tributaries in three States; and the physical conditions which affect water rights within and between the States, including topography, return seepage and underflow—by R. P. Teele; and a general discussion of water-right systems, by Elwood Mead, chief of irrigation and drainage investigations. Only a limited edition of 1000 copies of this bulletin has been printed, a part of which is available for distribution by the department. Copies of the bulletin, as far as available, can be obtained by addressing the Director of the Office of Experiment Stations, United States Department of Agriculture, Washington, D. C.

Latest Market Reports.

SAN FRANCISCO, December 1, 1905.

METALS.

SILVER.—Per oz., Troy: London, 30 5/8d (standard ounce, 925 fine); New York, bar silver, 65⅝c, refined (1000 fine); San Francisco, 65¼c; Mexican dollars, 53c, San Francisco; 50¼c, New York.

Within the week silver has continued to advance, going from 63⅜c last week to 65⅝c to-day. With each small increase in the market value of fine silver the producer of that metal continues to feel correspondingly thankful.

COPPER.—New York: Standard, $17.50; Lake, $17.50 @18.00; Electrolytic, $17.50; Casting, $17.50 @ 17.75. San Francisco: $16.75. Mill copper plates, $18.00; bars, 18@24c. London: £78 10s spot per ton.

The copper market is firm and higher. In the New York market Lake copper can be bought for future delivery at $17.50, but where smaller lots are wanted immediately the price ranges from $17.75 to $18.00. It is now several years since copper touched 18c. It is probable that the upward limit in the price of copper is being, or has already been, reached. When the price of copper becomes so high as to make aluminum an aggressive competitor, the latter metal will find an increasingly wider use, particularly in electrical work, into which it has already entered largely.

LEAD.—New York, $5.75; St. Louis, $5.15; San Francisco, $5.00, carload lots; 5¼c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £15 16s 1d ℔ long ton.

SPELTER.—New York, $6.25; St. Louis, $6.20; London, £28 15s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $33.90@34.25; San Francisco, ton lots, 35c; 500 lbs., 36c; 200 lbs., 37c; less, 38½c; bar tin, ℔ lb., 40c. London, £155 17s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots 19.15c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17.35; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@ 25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11½c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12½c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ¼c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5½c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

OILS.—Linseed, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

ACETYLENE GAS MACHINE.—No. 805,091. Nov. 21, 1905. J. F. Philpott, Windsor, Cal. This invention relates to an apparatus for the production of acetylene gas. It consists in the combination and arrangement of parts whereby a limited amount of calcium carbide is intermittently delivered into a body of water, and the released gas is transferred to a gasometer, thence transmitted to a point of use. It is the object of the invention to provide a compact, portable, gas generating apparatus, comprising a receptacle superposed above a water chamber and in conjunction with an open bottom gasometer movable in circumferential liquid seal, and in conjunction therewith of an automatically operating valve, whereby the dry carbide will be delivered into the water in small quantities and at intervals dependent upon the rapidity with which the gas is consumed

DISH WASHING MACHINE.—No. 805,118. Nov. 21, 1905. C. S. Chamberlain, Emeryville, Cal. This invention relates to an apparatus which is designed for the rapid cleansing of dishes as they are returned to the kitchen after being used. The object of the invention is to provide an improved mechanism for rapidly handling containers within which dishes are placed for washing, means for transferring the containers through a series of washing tanks, means for transferring the washing water from one to the other, means for admitting steam to heat the water and to prevent the vacuum and the noisy operation which usually accompanies such use of the steam.

SHINGLE GAUGES AND CLAMPS.—No. 805,094. Nov. 21, 1905 G. Reed, Fort Bragg, Cal. This invention comprises a gauge and bracket made of a single piece of spring metal bent to provide two arms capable of a limited movement toward and from each other, one arm made flat and straight and adapted to be inserted beneath a shingle, the other having its end bent first outwardly from the first-named arm and then bent inwardly and abruptly and approximately at right angles to the first-named arm, and said inwardly bent end extending across the end of the second-named arm and serrated and forming a jaw member to grip the upper side of the shingle, and means to compress the arms.

Your Engine

will run even if in the grip of poor packing, but it will do 5% more work if packed with

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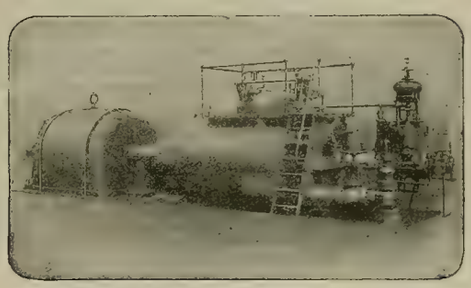
Westinghouse-Parsons Steam Turbines



High efficiency, large overload capacity and low operating cost are among the factors leading to the rapidly increasing demand for these turbines by the largest power plants in the country.

The Westinghouse Machine Co.

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will be best lighted (if you have a D. C. circuit) by our

D. C. MULTIPLE ARC LAMP.

Some of its many advantages are:
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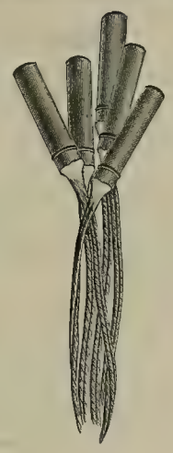

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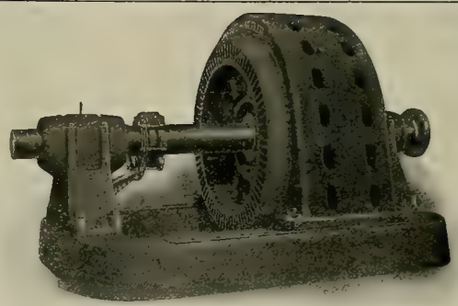

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MINING AND SCIENTIFIC PRESS

Whole No. 2368.—VOLUME XCI. Number 24. SAN FRANCISCO, CAL., SATURDAY, DECEMBER 9, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

The Mining Camp Knocker.

There are probably few mining camps that have not among their residents men who make it their particular mission to look into the business affairs of other people. Not a mining deal is negotiated or consummated into which this insidious individual does not attempt to inject himself in some manner. When he is not "in on it," he, on occasion, manages to meet prospective purchasers or examining engineers and gratuitously offers advice. In a recent instance of this kind the "city knocker" approached several engineers, who were strangers in the town and country and who were engaged in making an examination of a large mine, and said earnestly that he hoped, for their own good, the good of their clients and for the good of the country, that they would not pay too much for the property they were examining, as he was aware that the price asked was far in excess of the value of the mine. He was assured by the engineers that they felt abundantly able to protect themselves against any attempt to take advantage of them in the manner suggested, and plainly indicated that they needed no further advice in the matter. The following day the same fellow approached the engineers again and invited them to dine with him. An excuse being offered—and probably expected—he produced a report on another property, in which he modestly admitted he was somewhat interested, and urged them to look into its merits, as it was far superior to the one they were engaged upon. It seems needless to add that they gave the knocker and his property scant courtesy.

There are ways to invite the attention of engineers and capitalists to mines without condemning other property, whether justly or not; but these methods of doing legitimate business have not seemingly come to the notice of the knocker.

ONE of the vexed questions of the West is the fixing of a proper valuation on mining property for the purpose of taxation. Most of the States have no laws defining how a mine shall be valued. If the valuation be on the improvements, this can usually be arrived at, as far as its cost is concerned; but the equipment of a mine deteriorates rapidly—usually figured at 10% annually; but, in the event of the mine becoming exhausted, the plant is of small value, unless it can be used at once in the operation of another property. If the valuation be fixed by the output, this is manifestly unfair, as the output may cease. Nor is an arbitrary valuation on the entire property more just, safe or satisfactory. The assessment is usually adjusted through conference of the mine officials and the State and county officers at a figure mutually agreeable to all concerned.

Front View of Gold Dredger Near Golden, Colo.

Gold Dredger Cutting Into the Gravel, Near Golden, Colo.

ONE of the most important factors in the transportation problem in the desert regions of the Southwest is the automobile. There are scores of these modern vehicles in the Nevada, Arizona and southern California deserts. It is less than a year since the first long automobile trip was attempted in eastern Nevada, on which occasion the auto broke down. To-day these vehicles are in use as a means of quick, convenient and comfortable travel between camps where the railroad has not been built, and, without doubt, the auto is going to prove of great value in penetrating the undeveloped and unprospected regions of the desert, where heretofore the burro and prospector afoot were the only invaders of the desert silence and solitude.

Tailings Stacker of Gold Dredger Near Golden, Colo. (See Page 398.)

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WHERE constructive work is left to the inexperienced workman, he usually builds strong enough and well enough; but the engineer will build equally well, while not using nearly the amount of material that the other has employed. The result is a saving in first cost, with a probability that, all things considered, the engineer's constructive details are superior and that the whole structure is better adapted to the use to which it is to be put than that designed and built by the ordinary workman. It is much the same in underground work. There are excellent workmen—men who thoroughly understand every branch and detail of the mining work, and who are capable of performing anything that is to be done in a mechanical way in the mine, from mucking to running a machine drill or building a chute—and yet these men are often utterly incapable of initiative. Show him an ore body and give him orders to mine it out, and the work will be performed expeditiously, cheaply and well; but, this exhausted, he knows not which way to turn, and looks helplessly to some one to direct him further. His methods are good, or were considered good in the past, but he is not aware that better methods, possibly, have been devised, as he has never heard of them. The miner, like the superintendent and manager, must keep abreast of the times, and this can only be accomplished by either travel and careful observation, or reading. The former is not generally possible, but the latter always is, and the working miner may learn much to his advantage by the weekly perusal of a good mining journal, in which he will find the latest things in mining and metallurgical practice, and which will keep him in touch with the entire mining world. This is the age of progress and improvement, and when a man, whether miner, merchant or farmer, complacently reaches the conclusion that his methods can not be improved upon and that he knows it all, he has outlived his usefulness.

What Is a Fissure Vein?

Simply described, a fissure vein is a fracture in the crust of the earth, which has been filled by minerals infiltrated into the fracture and deposited along its course, either in open cave-like spaces, or in a mass of crushed debris, derived from the attrition and crushing of the vein walls. A fissure vein presents so many phases as to render its description in all of its characteristics a somewhat complicated matter.

Many geological text books contain sketches of "fissure veins," which show the successive deposition from the walls toward the center of minerals of various kinds, including silica and calcite, with various sulphides of iron, lead, zinc, copper, etc., giving the vein a comb-like structure and a banded appearance. Such veins exist, and in some mining districts are numerous, but ordinarily the fissure vein fails to show this banded structure due to successive deposit of different kinds of minerals.

More commonly the vein is bounded by definite walls, but the vein material is massive, showing little or no evidence of successive deposition, but rather an alteration of the crushed materials derived from the walls by the movements which have fractured a zone of the country rock within the limits of the walls and reduced much of it to a fine granular or pulverulent condition. This crushed rock, being easily attacked by the waters passing through the fissured zone, is decomposed, its soluble portions dissolved out, and the minerals thus removed are replaced by other minerals—usually silica (quartz) and one or more of the sulphides of the base metals, with sometimes gold or silver, or both. Calcite, baryta, fluorite, siderite and other minerals are also occasionally precipitated from these percolating solutions. Not infrequently the character of the fissure is distinctly influenced in its structure by the wall rocks. Thus in a slaty formation, the vein may have a slaty or ribbon structure, and in a massive rock, the vein is more apt to assume a massive structure, or a brecciated appearance, there being many pieces of more or less silicified rock which are clearly portions of the walls which have not been finely crushed, but which have nevertheless been altered by the mineralizing solutions.

How hard, firm rocks can be thus altered so that they no longer bear any physical resemblance to the original rock, can be readily understood by those who have visited geysers and hot springs in volcanic regions. There steam and sulphurous gases may be observed issuing from vents in the rock, and rocks recently fallen from surrounding cliffs within reach of the influences of these vapors and heated waters are found altered to kaolin, or otherwise changed. If similar waters pass upward through a vent in earth's crust—a fissure—the adjoining rocks will be altered in a similar manner, and in time the vein minerals with which we are familiar will be deposited. This is accomplished probably by upward moving waters, but in most instances where mining is now being carried on the process of vein formation has long since ceased, or is on the wane, and the water circulation is downward. This downward circulation produces other changes in the vein, and we find what is termed secondary enrichment, which is so beautifully exemplified in many copper mines, although this process is known to affect other classes of veins as well.

There is much difference of opinion among miners as to the direction of flow of underground waters. Some believe these waters are forced into the workings from below, others think they came from above, but it is fairly safe to assume that in most instances the ascending waters are hot, and that where the water is cold it has no direct connection with the sources of heat found in great depth. Much depends on local conditions. The waters in the deepest mines in California, nearly 3000 feet vertical, are not over 80° F., while in the Comstock Lode, Nevada, water having temperatures varying from 100° to 158° F. are found far above the 3000 level—between 1000 and 2000 feet from the surface, as well as deeper. The surface waters of the Comstock lode are cold. At Steamboat Springs, Nev., the attempts to mine have been futile, because the scalding waters and steam issue at the surface. In Colusa county, California, a quicksilver mine having what would be good payable ore under ordinary conditions cannot be worked owing to the intense heat of the mine workings and the existence of scalding hot waters at numerous places in the mine. In time, doubtless, both this and Steamboat Springs and similar places will become cold, and then the miner of the distant future may find profitable employment in the exploitation of the mineral deposits existing in these and like veins elsewhere.

In shaft sinking water often comes into the workings from below with considerable force, occasionally in such abundance as to temporarily drive the miners from the shaft, when only by vigorous and long-continued pumping can the water be controlled. Later this flood is overcome and the sinking proceeds as before; the "spring" is passed and sometimes completely drained and comparatively little water is encountered, when, without warning, another gushing spring is encountered, and the same process of pumping must again be gone through. This proves conclusively that the water is due to downward flow and is the result of tapping a fissure, seam or crevice which had communicated with a water-saturated zone.

The downward flow of surface water usually changes the physical appearance of the vein to a great extent. Oxides and carbonates abound where were originally sulphides and silica, the change from the oxidized zone to the sulphide being sometimes gradual, but often abrupt.

Veins are also altered greatly by movement of the walls and pressure which took place long after the vein was formed. Solid masses of ore are crushed to the condition of sand, or broken into millions of fragments, large and small, these being generally re-cemented by silica or calcium carbonate, or both, again forming a solid vein, but the evidence of brecciation may generally be plainly seen. Sometimes a gouge forms on one wall, occasionally on both. At one time it was thought that where the gouge occurred on the foot wall only it was due to fine particles of suspended clay, and other mineral matter, settling by gravity on the lower, or foot wall, from the solutions which filled the fissure. This theory contemplated an open crevice, and there may be examples of its occurrence, but ordinarily clay selvage, gouge, etc., at the side of a vein is due wholly to movement of the walls. This selvage may be but a fraction of an inch thick, or it may be many feet. On the Mother Lode of California gouge often occurs up to 40 feet in width—usually a mass of crushed, foliated, lustrous black slate, soft and easily mined, but extremely dangerous, swelling and crushing timbers and filling the excavations completely if not promptly held. Often these great gouges contain rounded masses of quartz, sometimes weighing a ton or more, but usually not over a hundred to two hundred pounds in weight. These are striated and polished, and show every evidence of heavy pressure and attrition. Occasionally these "boulders" are rich in gold and sulphides, and a fruitless search is made for the main vein from which they came, for it is evident that these masses of quartz originally occurred as kidneys, or lenses of ore, in an irregular vein, and that the tremendous movement to which the zone of fracture in which these lenses occurred was afterward subjected, resulted in obliterating the line of original crushing with its walls, if it ever had any, and the lenses become involved in the broad mass of crushed slate in which they occur without regularity or definite relation to each other. This has then become a fissure vein, though originally it may not have been such, but merely a succession of detached lenses formed along a common strike and dip, in a zone of crumpling, but not of clean fracture. The conditions here described are only a few of the many which may be observed in fissure veins, as it is a subject about which volumes have been already written and much still remains to be said, as knowledge is gained of the process of ore formation and alteration.

THE mining States of the West are already summarizing the results of the mining industry within their respective borders during the past year, and it is pleasing to note that there has been a material increase in almost every branch. Labor troubles have been few in the mines the past year, and this has been an important factor, when compared with the conditions of the previous year. At

no time in the past has the mining industry generally been more prosperous than at present, and with every promise of a continuance of the existing industrial conditions throughout the United States and the world, which make such heavy demands on the products of the mines, an increase in mining activity may be anticipated, so that the year 1906 is more than likely to show an important increase over the output of the present year. The market price of all metals used extensively in the industries is high, which naturally gives added stimulus to the efforts at increased production.

The New California Inland Sea.

Since the Colorado river has been steadily pouring its flood into the depression in southern California known as the Salton Basin, there has been much speculation as to the influence which this newly created inland sea may have on the climate of that portion of the Southwest. There are those who believe, and insist, it will entirely change the climate of southern California, and the adjoining portion of Arizona, and that an abundant rainfall will result, with correspondingly increased fertility of the soil and consequent prolific crops; also, that the temperature of the country will be much more bearable, particularly during the heated midsummer.

Such conclusions cannot fail to be pleasing to those dwelling in southern California, and particularly in the desert section, but there is seemingly nothing to warrant such hope of climatic change. That there will be a large and increasing evaporation from the surface of the Salton sea there is no doubt. It already covers several hundred square miles of territory, and as all attempts to turn the Colorado aside have thus far failed, and apparently will continue to fail, the Salton sea will doubtless increase in area, and may in time cover all of the territory lying below the level of the ancient shore line, so sharply defined about a great portion of this desert basin.

The original area of the ancient sea was over 4000 square miles, and its greatest depth was about 260 feet, at Salton. This lowest portion of the basin was, as a matter of course, the first to be covered by the recent flood. The water is, perhaps, 25 feet deep at the deepest place. The statement that the Basin will soon be filled to the level of the ancient shore line is without reason, for it will take several years to accomplish this, even if the entire Colorado river pours steadily into it, uninterruptedly, winter and summer. The river has been flowing into the Basin now for months, and only a comparatively small portion of the area is covered. Each additional foot in height now means a much larger superficial area, and from now on the rate of rise must be comparatively slow.

The evaporation in that arid region is very great, particularly during the summer months, and in time it may be that evaporation will equal the inflow, for as the Basin fills up the sand will again be deposited along the side of the river channel, and eventually build a spit across the breach through which the river now flows as it did before. When this occurs, should the flood continue until then, evaporation would soon begin to exceed the inflow, and the Salton sea would in time become once more dry.

The evaporation from the surface of this great sheet of water is taken up by the dry desert atmosphere and carried over the country in the direction of the air currents. Unless this moisture-laden atmosphere strikes a mountain range of much lower degree of temperature than the moist air itself, or it encounters other and colder currents of air, no precipitation will take place in that part of the country. Should the heavily laden clouds drift toward the snow-crowned San Jacinto or San Bernardino mountain ranges, prompt and heavy precipitation must result, which may be more damaging than helpful in its effects. The desert region is not noted for its gentle showers, but rather famous for violent storms and torrential down-pours, as evidenced in every mountain canyon and boulder-strewn wash of the desert country.

There is no evidence that the shores of the Salton sea, or the region within many miles of it, enjoyed a more salubrious climate when the ancient lake was full than it does now.

The Great Salt Lake in Utah was a much larger sheet of water in former times (Lake Bonneville) than the Salton Basin has ever been, and there is little evidence to show that that section of the Great Basin was more fertile in consequence than under the present conditions.

The anticipated change of climate, due to refilling of the Salton Basin, is without substantial support. Should the Basin continue to fill, the most important change that will occur will be that a hot and absolutely dry depression on the Colorado desert will have become a body of water which may be in part navigable for small and flat-bottomed vessels. The shores will present various conditions. In places there will be broad stretches of shallow water with exposed mud flats, between the higher land and deep water. In other places the water will be deep enough to float large vessels close to the shore. The ancient shore line presents all of the varied and interesting phases of lake shores elsewhere. There are sand spits and dunes and barrier reefs, enclosing shallow lagoons with mud flats; abrupt, rocky shores, and low-sloping flats. Where canyons entered the Basin from the mountains, carrying their torrents of flood water and laden with debris varying from sand to cobbles and boulders, the characteristic results may be plainly seen, and these evidences of nature's forces on the old shore line are still so well preserved as to make it seem that a month had scarcely elapsed since the waves washed the shores of this ancient lake.

There are mines in almost every mountain range and hill in the vicinity of the Salton Basin, particularly on the easterly and northerly side, and the development of these mines may be facilitated by the filling up of the lake. Whether or not the Basin will ever be completely filled yet remains to be seen. It is very far from it at present, at any rate.

Annual Assessment and the Multi-Claim Holder.

There is in some mining districts a very strong prejudice against the relocation of unpatented, but "unrepresented," mining claims, by any one, and those persons having the temerity to act within their legal rights, by relocating claims upon which no assessment work has been done within the past year, or perhaps within several past years, usually are made to feel the displeasure of those who consider the first locator entitled to all he claims without complying with the full requirement of the law, and in many instances with no part of it. It is fortunate that such sentiment can only prevail in those districts where mining activity is at a standstill, or near it, for in those districts where mines are being profitably operated the demand for claims is so great as to overrun the dog-in-the-manger policy, so evident in the stagnant camp. In former years much contention, and not infrequently bloodshed, resulted in the adverse claiming of mining ground. More recently the mining laws are better understood, and the lawless, bulldozing element which was often such a pronounced feature of mining camp life in the early days is much less in evidence. Gun fighting "miners" are seldom seen these days, even in the richest camps. Men understand their legal rights better and the communities which grow up about newly discovered mines insist upon law and order. As a result rich and poor mines alike are developed, and the fortunate owner of a claim that opens up well under development can retain his possessions without employing a small army of armed men of known bad reputation to hold it. The sluggish, or forgotten, camp is the one where the oldest inhabitants usually hang on tenaciously, locating all unclaimed ground, and relocating for themselves all claims abandoned by more wide-awake and progressive men, who have gone elsewhere to seek fortune. These "oldest inhabitants" quietly lay claim to everything in the district, some of them claiming more than a hundred locations, while performing less than a hundred dollars worth of work on the entire lot. They patiently wait for some capitalist to come along and buy them out—an event which rarely, if ever, happens. No policy could be more detrimental to the progress of the district, nothing more suicidal to the best interests of the selfish multi-claim holder. He does nothing to improve or develop his property himself, yet is unwilling to give up a foot of "his ground" without reward to any one else who will. The development of a single paying mine in such a district would enhance the prospective and speculative value of every other claim in it, but so long as these oldest inhabitants continue to claim and hold the principal portion of the district, and they singly and collectively threaten personal violence to any one who presumes to assert his legal rights by relocating claims which have not been properly represented perhaps for years, just so long will such districts remain undeveloped and obscure, and capital will continue to look elsewhere for investment.

There are numerous districts of the character here described, and they are found in most, if not all, of the Western mining States. The lack of large success in any of the mines of the district is probably largely responsible for such a condition, but so long as such conditions prevail there is little likelihood of any mine in the district becoming noted or profitable. It does not follow that there does not exist in such districts mines well worth equipment and development, but the attitude of the selfish claim holders is a great drawback, and the best prospects are likely to remain idle for years, as they have in the past. In such districts as these the claim holders should make an effort to have the possibilities of their section known to the world, and to offer the most liberal terms to capital to induce some one to undertake the development of the best claims. Should one such venture prove a success it would be comparatively easy to dispose of other promising claims at advantageous price and terms.

GOLD mining on the west coast of Africa is beginning to assume a more substantial appearance, and the industry is evidently growing and prospering. In 1880 the output was about $150,000; in 1889 it had increased to $500,000. From that year to 1902 it fluctuated between $100,000 and $500,000, but suddenly increased in 1903 to over $1,250,000, and in 1904 was further increased to about $1,750,000, the latter increase being due chiefly to addition of mill capacity at some of the mines. Gold is obtained by quartz mining and dredging. Both of these branches of the industry are on the increase in the West African territory. The climate is exceedingly bad, and a prolonged life of white men in that portion of Africa is almost impossible. The expenses of management are necessarily high, as competent men are required for the conduct of various branches, and good men will not accept such positions except at a high salary, with frequent vacations. White miners will do well to remain away from the Gold coast, for the opportunities for employment are few, and all engineers go there under contract, yet, in the face of the topographical and climatic disadvantages, mines have been equipped and developed, and railways built, and other engineering work accomplished, but at a great cost of money and human life.

THERE are those who believe geology is of little practical benefit or usefulness in mining. It is needless to say that those entertaining such opinions have no knowledge of geology themselves and represent a class of people whose opportunities have been either limited or neglected. Geology has a most important relationship with mining, as has been evidenced many times. The work of trained scientific geologists in several of the largest and most productive mining districts of the United States has been of distinct and almost incalculable value to miners. Instances of this may be mentioned in the iron mining region of Minnesota and Wisconsin; Leadville, Colo.; Cripple Creek, Colo.; the Comstock Lode, Virginia City, Nev.; and other fields in Nevada; in the bedded ore deposits of South Dakota and in the zinc-lead fields of Arkansas and Missouri. Many more instances of the value of geology to mining might be instanced, but the general and most valuable features have been pointed out by Prof. A. C. Lawson, a distinguished geologist, who read a paper on this subject before the recent convention of the California Miners' Association, at Nevada City, Cal., and which is republished herein in full.

IN working a mine by open-cut method, some note should be taken of probable future requirements and the work performed accordingly, but usually the future is left to care for itself, particularly in the early history of a mine.

CONCENTRATES.

IT is customary to line large steel stacks with bricks to prevent the steel being corroded by the gases passing through the stack.

DIABASE may be either fine or coarse, and ranges in color from almost black to light green shades. It sometimes contains mica and quartz.

THE only method of obtaining the actual capacity of an air compressor is by the use of indicator cards, from which the effective stroke in the air cylinder may be obtained.

THERE is no material advantage of vertical over horizontal engines or compressors for any purpose, except that the vertical type requires much less floor space than the horizontal type.

A VERY small percentage of copper ore in a furnace charge will act as a carrier for all the gold and silver present. Attempts to smelt pyritic ores without some copper, result in a loss of precious metals in the slag.

THE only material difference between compressors built to operate at comparatively low altitudes—5000 feet or less—and those to work at high altitude is a change in the relative diameters of the steam and air cylinders.

ASPHALTUM from different localities varies greatly in mineral composition, as indicated by analysis and by the action of heat, alcohol, naphtha and turpentine on samples. Asphaltum is found in many places and in rocks of no particular age.

REPEATED successful experiments in various parts of the United States have abundantly proven that a weak solution of copper sulphate will clear water polluted with algæ and other organic substances. When applied in proper amount the water is usually clear within four days from the time of application.

CALCINED MAGNESITE is employed largely in lining open hearth furnaces, cement kilns and where a refractory heat-resisting material is required. Magnesite is white or cream colored, unless colored by impurities, such as iron oxides, etc. It is usually hard, dense and brittle, but also occurs white, soft and earthy.

IT is difficult to anticipate the cost of mining by analogy. The fact that mining and milling is accomplished at a cost below $1 per ton at one mine is not a safe indication that these costs may be duplicated at another. On the other hand, under more favorable conditions, the cost per ton may be reduced somewhat.

WHEN it becomes necessary to take samples under the floor of a level, it is generally a good plan to shovel away all overlying debris and to get the floor as clean as possible, and then by a line of block holes blast out a trench across the vein or deposit, thus exposing new ground from which samples may be taken with a minimum chance of being salted.

THERE are scores of patents issued in the United States and other countries of the world for various modifications of the cyanide process. In selecting a process, seek one which will treat the ore by rational and inexpensive methods, and not one full of complex and difficult operations, wherein the profit, if any be possible, is wholly absorbed by the expense of treatment.

THERE still remain twenty-two days in 1905 within which assessment work may be done on unpatented claims for the year 1905. If work is started at any time prior to midnight, December 31, 1905, the claim owner may legally hold his claim against all comers, but he must continue the work so commenced to a completion at once or it will not avail as against the relocator.

THE minerals occurring most commonly in pegmatite dikes, those of unusually coarse crystallization, are: Quartz (white, colorless, pink and bluish); orthoclase (feldspar); microcline (feldspar); muscovite, biotite, phlogophite and lepidolite (micas); tourmaline of various colors; cassiterite, wolframite, beryls, apatite, columbite, spodumene, topaz, and other minerals. The most of these minerals have economic value when separated from each other.

A WINDLASS for a prospect shaft should be made of good, strong material and be so constructed that it may be readily taken down and set up again at another place without injury to the windlass. This can be accomplished by framing the uprights so that they will enter tenons in the cross-sills of the platform, where they may be secured by the use of wedges. This obviates the necessity of spiking the uprights to the frame, to which, however, there is no objection if the windlass is never to be used elsewhere.

MONAZITE is a mineral mined for its value in thoria content, which is used in the manufacture of incandescent gas mantles commonly known as the Welsbach mantle. The mineral monazite is mined chiefly in South Carolina and North Carolina at present, but large amounts are known to exist in the sands of granitic regions elsewhere in the United States. Brazil and Norway also produce monazite in considerable quantity. It was worth in 1903 about $140 per ton. This is from the latest available official report.

THERE are several minerals which resemble molybdenite. That approaching it most nearly in appearance is micaceous hematite, a foliated, mica-like variety of specular iron, but this may be readily distinguished from molybdenite. Micaceous iron has a dark red streak, while the streak of molybdenite is metallic lead gray, with no trace of red. Graphite is also much like molybdenite in appearance. Both leave a trace on paper, but the molybdenite leaves a more bluish trace on paper, and on heating gives off sulphurous fumes, which graphite does not.

HEAVY BINDERS of timbers may be useful in a stamp mill to hold the mortar blocks firmly, if the blocks be made of two or more large timbers, but if the blocks be built up of planks solidly spiked together, the binders may be dispensed with. The battery posts, too, should be given a very firm foundation, and not placed on a timber or sill which is supported by mud sills several feet apart, as this will cause the cam shaft to become very unstable and to vibrate to such an extent as to require the bearings to be capped and held in place by bolts, thus increasing the friction and consumption of power.

A PIECE of silver-plated copper plate placed on the spreader box of a concentrating machine of the belt type, and fixed immediately under the pipe carrying the pulp from the launders down to the spreader box, often collects quite a quantity of amalgam that has escaped from the apron plates. Mercury becomes very finely divided, and concentrating machines do not always save this with the sulphurets. "Concentrates" has known of considerable quicksilver accumulating in the settling boxes underneath the machine, which had apparently floated from the wash box, and finally settled in the still water of these settling boxes.

AN arrangement frequently seen at large shafts for handling skips quickly, when it is necessary to change from one kind to another, for instance, from ore skip to water skip, is a traveler running on a track passing near the shaft, the traveler being provided with a means for attaching to skip. When the skips are to be changed, the hook on the traveler is made fast by chains or other means to the skip and it is swung out from the shaft and pushed to one side, suspended above the floor. The other skip is then made fast to the cable and placed in the shaft. The upper section of guides is so arranged as to swing to one side on a hinge to permit the skip to be readily taken from the shaft, and replaced when necessary.

MICROSCOPES for the examination of rock slides are of special construction, made specially for this purpose. The instrument must not only be fitted with a readily adjustable set of Nicol prisms, but must have a number of other accessories—a wedge-shaped slip of perfectly clear quartz, set in glass, a selenite plate, mica plate, etc., beside which the instrument must be provided with a mechanical stage, by means of which the object to be examined may be shifted forward or backward, or to the right or left, and the entire stage must revolve about a central point, and be accurately graduated into degrees. There are other movements and attachments to the petrographical microscope, but the above mentioned are the most important.

WHERE a quartz mill is situated on an unpatented quartz lode location, any substantial improvements or extension of the mill, or work on the mine roads, flumes, tramways, etc., may be applied to assessment work. In fact, any work, improvements or installation for the betterment of the mine is legitimately applicable to annual assessment account. The placing of movable tools, etc., on the property, or the wages paid a watchman, are not applicable to assessment. The same kind of work and improvements as above mentioned, made on a patented claim, one of a group of which some are unpatented, may apply as assessment on the unpatented claims. In this case the several claims of the group must adjoin, and the work or improvements made must clearly be for the benefit of all the claims constituting the claims of the group. One hundred dollars worth of work must be done or improvements made for each unpatented claim of the group.

THE East Lode of California, as it is generally described, is that mineral belt extending in a northwest direction, and about 8 to 10 miles east of the so-called Mother Lode, and approximately parallel with the latter. The wall rocks of the mines of the Mother Lode are clay slates, amphibolite schist, serpentine, diorite, diabase, and at a few localities gabbro and rocks of granitic type, though south of Placerville, El Dorado county, so far as known, no granite. The slates have been assigned to the Jurassic, and are known as the Mariposa beds. The East Lode occurs in association with clay slates, mica schists, quartzites, limestones, dikes of felsite, diorite and diabase, and much of it in grano-diorite. The metamorphic rocks are much older than the slates of the Mother Lode, and are known in California as the Calaveras formation. This so-called East Lode is not the most easterly lode in California, for there are two or more belts or lodes still east of the East Lode, and between it and the crest of the Sierra Nevada, and other lodes on the east slope of the Sierra. West of the Mother Lode is also a gold belt and a copper belt. The latter is the more sharply defined and extends for many miles, though not continuously, along the low foothills bordering the eastern edge of the San Joaquin and Sacramento valleys.

SOLID iron sulphide in gold-bearing veins is usually but not always auriferous. In some very good mines this mineral occurs in a semi-granular condition with little gangue mineral, and containing very little gold. This is a notable feature of some of the fissure veins of the San Juan country, and it is also known to occur in Yavapai county, Arizona, and elsewhere. Heavy sulphide ore is occasionally crushed in a stamp battery and amalgamated, but it is rarely that over 60% of the values in free gold can be thus extracted at one operation. Occasionally the greater part of the gold in such ore is coarse, when a high percentage of the gold values may be thus saved, but to obtain the fine gold the ore must be crushed very fine and agitated for some time in contact with the quicksilver. Numerous attempts have been made at various places to do this, but usually such efforts are of an experimental nature, and "Concentrates" knows of no place where this is the regular practice. The nearest approach to it is the slow-drop Gilpin county, Colorado, mill method, where the ore is crushed in a mortar with high discharge and the ore given abundant opportunity to come into direct contact with the mercury before it escapes through the screen. In some of these mills no concentrates are made as they are not considered sufficiently high grade to yield a profit.

AS to the discharge capacity of a siphon, the enquirer having neglected to give the length of his siphon, it is impossible to answer his question as to the amount it will discharge. The following information may be of some service: For a straight iron pipe, the formula for head required for a given discharge is

$$H = \frac{v^2(1+54d)}{m^2 d}$$

So

$$v = \sqrt{\frac{H(m^2 d}{(1+54d)}}$$

Where,

H = m and head in feet.
l = length of pipe in feet.
d = diameter of pipe in feet.
v = velocity of flow in feet per second.
m = a constant varying for different diameters of pipe and values of

$$\sqrt{\frac{d\ H}{(1+54d)}}$$

From the above, assuming in this case that the length of the siphon pipe is 100 feet and head 5 feet, the discharge should be approximately 33 cubic feet per minute, or 247½ gallons. By applying the above formula, the probable flow for other heads may be computed, but inasmuch as the constant (m) changes with the condition of head and length, these factors must be known before an accurate determination can be made. One of the points in connection with this matter is of the utmost importance, and that is the fact that any results obtained by the use of such formula as given above apply only to the condition of a siphon in which no air is allowed to collect at its crest, for as soon as such a condition begins to exist the flow is necessarily reduced.

IN the issue of Nov. 25, "Concentrates" stated that "where a vein crosses one end of a location and then swerves and crosses a side line, it is restricted in the extralateral right to that portion of the vein between the crossed end line and the point where the vein crosses the side line where the plane is projected downward in the direction of the dip, and parallel with the crossed end line." This is good law (Argonaut Con. M. Co. v. Turner, 23 Colo., 400; 58 Am. St. Rep., 245; 48 Pac., 685; Beik v. Nickerson, 29 L. D., 662). A locator of a new mine is not always able to trace out definitely the exact strike of his location, and he may mistake its true direction to such an extent that the vein may pass outside of one, or even both, side lines. In such event the extralateral right is limited to that portion of the vein between the points where the vein crosses the side line or lines, and this right is defined by drawing planes parallel with the end lines, downward in the direction of the dip, as stated in the "concentrate" above referred to. Should this claim be designated "A," and another claim "B," through which the vein passed, after leaving the side line of "A," should be located upon this extension of "A's" vein, then the extralateral right would be determined by priority of location, which in this case would be "A." "A" would take his extralateral right as indicated, and "B" would be entitled to all of the vein within his claim and the extralateral right as usual until it reached that section of the vein belonging to "A." "B" would then take up his right beyond "A's" zone and pursue it on its downward course, until he intercepted the right of a second senior location, should any such exist. In the Cœur d'Alene, Idaho, cases there are several such instances of interrupted extralateral rights, due to curving strike and other causes.

The Relation of Geology to the Mining Industry.

At the recent convention of the California Miners' Association, held at Nevada City, Cal., A. C. Lawson, professor of geology at the University of California, delivered the following address on the relation of geology to the mining industry:

Mining is one of the most ancient of the arts. The relics of the most ancient civilization afford abundant evidence of the existence of mining operations.

Long before the gold of Ophir embellished the temple of Solomon, gold and precious stones, silver, copper and other metals were known to the older civilizations of Assyria, Egypt and Mycenæ.

The bricks of Babylon were cemented with asphalt mined on the shores of the Caspian.

The fire worshipers of Persia burned natural gas. The Greeks mined silver-lead ores of Laurium to the extent of 51,000,000 cubic yards 600 years B. C. The tin mines of Cornwall and the copper mines of Spain were well known to the Romans. The mines at Freiberg have been mined continuously since the eleventh century and those at the Hartz mountains since the ninth century.

With this long experience mining has gradually improved its methods of extracting the metals and other useful substances from the rocks of the earth's crust.

Like other arts, its methods and its conclusions are empirical. As an art it has been unconcerned with the genesis of the deposits which it exploited. It sought but rarely to comprehend the laws governing their occurrence, or the conditions which determine their variation of character. It concerned itself with the matter-of-fact search for and exploitation of valuable deposits.

Its most sweeping generalization even to this day is, "gold is where you find it."

In contrast with the antiquity of the art of mining, geology is one of the newest of the sciences, the product of the last century. The sciences of mathematics, astronomy, botany, zoology, physics and chemistry were well advanced before the science of geology came into being.

It is in the nature of things an inexact science. Its data are often vague—its hypotheses shifting. It deals with the genesis and evolution of the earth's crust, of which metalliferous deposits form an exceedingly small part.

It is as to the relationship between this hoary art, extending back into the mists of antiquity with its ages of accumulated experience and this up-start science of the century, juvenile to a degree, tottering along like a child in the maze of world mystery, grasping at stray facts for support, that I am requested to address you this morning.

Whatever may be that relationship, it would be very natural to suppose that geology was founded on mining. The revelation of the rocks, their structures, relationships and history, as afforded by mining operations, might well be supposed to have stimulated that healthy curiosity into the causes of things which is the basis of all science, and thus bring about the beginnings of the science of geology. This assumption, however, would not be true. Geology historically is not an outcome of mining. The rocks which first awakened inquiry were not studied underground. Its first principles were not discovered by candle light, but in the open daylight along the seashores, in the stream gorge, and on the mountain peak.

It was entirely unconcerned with economic questions. The earliest controversies of the sciences were about rocks. You will all recall the famous controversy of the Neptunian hypothesis versus the Plutonic, carried on by Werner and by Hutton, the representatives of two different schools of geology, which arose at the beginning of the science. William Smith of England was concerned with the principles of stratigraphy. With the study of the strata, the discovery of fossils created widespread interest, and the paleontological side of geology has remained to this day one of its most interesting phases. The study of stratigraphy has also led to the recognition in England of the occurrence of coal in the form of strata. Gradually, and incidental to its main purpose, geology took cognizance of metalliferous deposits, their character, form, size, mineralogy, origin, etc., along with other earth phenomena. In later years, particularly in Germany, Scandinavia and the United States, the body of facts and theories arising from these observations became so large that a special branch of geology, known to-day as economic geology, has grown up to care for them. This is particularly seen in Government service. All the nationalities of the earth, and in the case of Germany, for example, the various subdivisions of the nation, have established State survey for the purpose of mapping the geological formations of the countries and so delimiting those formations which are liable to carry valuable ores and other substances from those which are in all probability barren.

In our own country we have a national geological survey maintained by the United States Government at an annual cost of approximately $1,000,000, but besides this the great majority of the States maintain their own individual geological surveys. California alone of the larger States, having rich mineral resources, maintains no geological survey and is making no systematic effort to map its geological formations in the way that other States are doing.

But this activity on the part of economic geology is not confined to State established institutions. There is a growing body of men who are devoting their lives to what may be fairly called the profession of economic geology. They have their own literature and their regular periodicals, dealing solely with economic problems.

During the first forty or fifty years of geology in the United States we followed, as in many other things, British traditions and were engrossed in pure geology, ignoring economic considerations. But with the winning of the West and the opening up of the great mining camps, geology was drawn irresistibly into the study of ore deposits, and we have to-day a literature and a body of men devoted to geological problems of this kind standing second to none.

But these studies, while undertaken primarily for the economic interest that inheres in them, have frequently yielded generalizations of a purely scientific import. In this connection, speaking of the profession of economic geology, it may be well to discriminate between the economic geologists proper and the mining engineer, and both of these from the "expert" whose name is legion. The economic geologist is not concerned with the winning of the precious metals or any other substances from their native deposits. He is concerned primarily with the understanding of their geological relations. It is the function of the mining engineer to see to their economic exploitation.

In any consideration of the relation of geology to mining, the first idea that becomes uppermost is the deep obligation of the science to the art. In this branch of inquiry geology has been very greatly indebted to mining operations. The study of ore deposits was only possible underground. Geology, in itself, could never have undertaken the necessary operations to reveal the relationships necessary for its inductions.

The sequence of ores in depths as illustrated in the copper and tin mines of Cornwall; the relation of ore to wall rock as illustrated in the metasomatic replacement in the Mother Lode; the relation of gossan to original deposits; the general association of ore deposits with igneous rocks; the theories of ascending and descending solutions and of lateral secretions; the distinction of deposits due to dissolution from those due to crustification, and from impregnations so ably discussed by Posepmy; the principle of secondary enrichment now so generally recognized, particularly in our copper deposits; the distinction between aqueous deposits and magmatic segregations illustrated in the nickel mines of Sudbury; all of these valuable ideas, principles and facts are due primarily to the facilities offered to geologists by mine operations, so that they might have access to the underground conditions for the purpose of study. They are not merely contributions to the lore of mining, they are important additions to geological science. I say, therefore, that the most important fact in the relationship of geology to mining is the indebtedness of the former to the latter. But, while geology is deeply indebted to mining, the service has been well repaid. Geology to-day is contributing much to mining in various ways. Let me mention some of these: First, in the matter of prospecting. The mapping of geological formations as conducted by geological surveys is one of the preliminary steps in the systematic prospecting of any region rich in mineral resources. The prospecting for the precious metals by the aid of geological mapping and instruction is well illustrated in the conditions which prevail at Tonopah to-day. There the miners and mine owners are deeply concerned with the results of geological investigation. For, in the greater part of the camp the ore bodies do not outcrop at the surface, but are buried by lava flows and these lava flows must be pierced by shafts to reach the formations in which these lodes occur; and it requires geological skill to determine whether or not the so-called lode bearing porphyry has been reached in such sinking. The prospecting for zinc in the upper Mississippi valley has been greatly benefited by geological guidance. In the Lake Superior region the great iron mining companies concerned in the finding of new iron deposits systematically employ geologists to do their prospecting in new districts on geological lines. Coal is usually prospected for on stratigraphic principles. And you are all familiar with the fact that in search for mineral oil or petroleum the theory of the anticline is now generally recognized, but the recognition of the anticline in the field can be safely made only by the skilled geologist. Another way in which geology subserves the purposes of mining is the substitution of world-wide experience for the local experience of any particular mining camp. In particular camps miners who have been engaged for years in exploitation of mineral substances become keen and expert in the recognition of the indications of ore, and their experience, growing upon them naturally, leads them to apply that experience to new conditions in remote or neighboring districts, where, perhaps, the geological conditions are totally different, and it requires a man who is familiar with mining experience as regards the occurrence of ore deposits, at least, to interpret a new field.

Another way in which geology is of service to mining is in the pursuit of ore bodies already known. Ore bodies are troubled in various ways, particularly by the faulting of the region. Lodes and deposits of all kinds are very commonly interrupted by faults, so that the extension of the ore body may be a matter of grave doubt, and in these cases it is the advice of the skilled geologist which will prove most efficacious in bringing a solution of the problem. The famous Saddle reefs of Bendigo and the similar structures in Nova Scotia and in the Broken Hill region are instances of the occurrence of lodes with structures with which the miner is usually unfamiliar, but with which the field geologist is at home.

Next, as regards the genesis of ore deposits.

It may be urged that theoretical questions as to the genesis of deposits do not concern the practical miner. But I have generally observed that whether or not it is a matter of practical concern, the miner is usually much interested in the inquiry as to what the genesis of his ore may be. Whether they be veins or segregations from igneous magmas, or the products of contact metamorphisms, are questions which fall within the domain of the geologist and not the miner, and he alone can satisfy the very laudable curiosity of the miner in this respect.

As regards the history of deposits, the geologist must be called in. These deposits are often complex, and there are many stages in their deposition, and the interpretation of this complicated history is not a matter which the miner is usually able to deal with.

In litigation, also, geology is very frequently of service to mining. The courts and opposing counsel are generally desirous of knowing the opinion, at least, of geological experts in the matters in dispute.

In the matter of legislation, too, the abundance of geological terms in the statutes governing mining operations shows the large influence which geology has exercised in this direction, and this influence, if I may be pardoned for saying it, might be still farther extended to the simplification of our existing mining laws.

Another way in which the influence of geology in mining is seen is the growing tendency of large mining corporations to employ geological experts, not only in the direction of exploratory work, but in the actual direction of mining operations. This is well exemplified in the great Anaconda mine at Butte, Mont., where the planning of new underground operations is directed from the office of the consulting geologist of the company.

Large concerns, like the Guggenheims, are employing the best geological expert advice that they can get in the advancement of their projects. The Southern Pacific railway maintains on its staff not simply a geologist, but a corps of geologists, to enable them to discriminate valuable mineral lands from agricultural lands. And if a private corporation like the Southern Pacific railway finds it profitable to follow such a policy, it would seem at least expedient for the State of California to follow suit, and to establish and maintain a geological survey for a similar purpose.

But one of the finest illustrations of the co-operative helpfulness of geology towards mining is seen in the investigation which is being conducted at the present time by the United States Geological Survey under the direction of G. K. Gilbert, into the vexed problem of the reconciliation of hydraulic mining and agricultural interests. Mr. Gilbert is one of the most eminent geologists at the present time living. He has been concerned throughout his life in the investigation of problems in pure geology. Yet, at the call of the miners of California, he gives his great talents to the study of this most important problem.

One of the most curious things in the relationship between miners and geologists is the "odium geologicum." The cause of this is difficult to fathom. In many camps geologists are ridiculed, not as experts, but as inexperts. The probable reason for this is two-fold. In the first instance, there are, beside the real geologists who understand their science, a vast number of so-called experts who impose upon mining communities, and who, by their ignorance and mistakes, bring the science of geology into disrepute. The second probable cause of this prejudice against geologists on the part of miners is to be found in the natural and wholesome suspicion of theories, but theories are a symptom of thinking. Some thinking is weak and ineffective, so some theories are pernicious in their tendencies. Science makes headway only by the erecting of hypotheses and their critical examination. Theories are not an evil in scientific hands. There they are understood. The trouble is that many miners take them for gospel. Miners themselves are not wholly free from theories. Such theories as "iron is the mother of all the metals" is a theory which is pretty commonly entertained in Cornwall and among Cornish miners, is a theory which it would be difficult to parallel in the science of geology; the theory that "values always increase with depth" is almost universally entertained by the prospectors. When a miner runs a crosscut tunnel he indulges in a theory. The mine owner in putting up money to develop a mine indulges in a theory. How often his theory is in error I leave you to judge. There are 20,000 mining claims in this State. Every one represents a theory. How true they are I leave you to judge.

From what I have said it is apparent that the chief feature of relationship between geology and mining is one of mutual benefit. This should be the keynote of all efforts in the development of the mining resources of the country. There should be a spirit of co-operative helpfulness on the part of the art of mining and on the part of the science of geology. The miners should not be suspicious of the natural ambition of geology to do as much as it possibly can in its own way to bring about the full development of the country's resources. And geology, on the other hand, should remember its deep obligations to mining, and pursue with still more enthusiasm and with greater energy the problems of economic geology with which the mining industry is concerned.

Measures We Carry About With Us.

Written for the MINING AND SCIENTIFIC PRESS by MATT. W. ALDERSON.

If a mining man were called upon to judge of a distance on the surface of a mining claim he would form a close estimate by pacing it off. Yet, when one has had experience with numbers of estimates made in this way, he will be surprised at the difference in results. Most men will pace off the ground, calling each step a yard. It may, or it may not be. If one takes such a step as he would ordinarily, it is more likely to be 28 or 30 inches. Knowing that his step is less than a yard, he is apt to make a longer step when measuring; and, almost invariably, he will make steps of more than a yard in length.

There are many measures we are accustomed to make by one part or another of the body. Thus we say of a horse he is so many hands high—a hand measuring in this sense 4 inches. But many palms are not so wide. It is probable more would measure 3½ inches than 4. Then we have the cubit—the measure handed down from the pyramids of Gizeh, 3500 B. C., 20.64 English inches, and the Roman cubit of 17.4 English inches. The cubit is the measure from the elbow to the end of the middle finger and its variation in the past was due to the variation in its length in different individuals.

It is oftentimes of very great convenience to make measurements with various parts of the body and with a little intelligent forethought one may make these with accuracy. One should consider those he

might have occasion to use, find out what they are on his body and commit them to memory. First of all we take the pace. This is preferably made in the step one usually makes. Let one pace off a number of steps, measure the distance and strike an average.

Then one may wish to know how far he may reach with his arm outward from the body, how great the distance when his arms are outstretched their full length. One should know his height and it is often well to know the height from the ground to the level of one's eyes. One should make a table similar to the following and commit it to memory:

Pace	28 inches
Thumb joint	1¼ inch
Palm	3½ inches
Thumb and palm	6 inches
Hand span	8½ inches
Forearm	18 inches
Reach of arm	26 inches
Stretch of arms	5 feet 8 inches
Height	5 feet 6 inches
Height of eyes	5 feet 3 inches
Length of foot	11 inches

The Great American Desert.—I.

Written by GEORGE J. BANCROFT.

A very large part of ten States and three Territories is generally known as the Great American Desert. All that region where the rainfall is less than 15 inches per annum may be considered part of the desert.

The word "desert" is such a harsh one and carries to many hearers an idea of such a hopeless waste that it has been customary to speak of this territory as the "arid regions." I prefer to use the word desert because of its brevity, but it must be understood that I use it very broadly and apply it to that territory which is only just a little too dry to raise ordinary crops without irrigation, as well as to that country where conditions are more severe.

Using the word in this way, the desert is one of the most productive areas in the Union in proportion to its population. About 2,300,000 people have found good homes and profitable employment on the desert up to date and the day of the desert is only just beginning. In this wonderful stretch of country, blessed with the finest climate on earth and with uniformly rich soil, with water sufficient to reclaim a large acreage of it, with mineral deposits surpassing the treasures of Solomon, and with grazing potentialities sufficient to feed the herds of a nation, the desert is one of the most valuable and the least generally appreciated possession of the American people. It is an empire within itself.

I have heard sincere but untraveled men say that the United States must soon be looking abroad for additional territory to meet the growing demands of an increasing and ambitious people, while right here within our borders we have the best field imaginable in which to expend our surplus energies for the next two or three generations. The Steppes of Russia, which not only supply the fatherland with grain, but export 400,000,000 bushels yearly, have a climate more arid than two-thirds the land known as the Great American Desert. Vast areas in China and India, which teem with millions of people, are much the same in general characteristics as that which our census report shows have an average of seven-eighths of a man to the square mile.

Our desert differs from the stereotyped impression of a desert, in that the whole area is broken and and beautified by mountain ranges of all sizes, heights and kinds of contour. Many of these ranges are high enough to receive a very generous precipitation of rain and snow on their summits and some of the most beautiful little garden patches in the world are to be found clustered at the bases of such mountains where the little streams run out upon the thirsty land. Near the main ranges and larger streams there are very large areas under cultivation, as, for instance, the beautiful stretch of irrigated farms extending along the eastern slope of the Rockies and extending down the valleys of the Arkansas and Platte rivers.

The desert-grown fruits and melons are among the best known. The combination of damp soil and dry air gives a crispness to peaches, pears and melons which can not be duplicated elsewhere; moreover, the desert gardener is relieved of the eternal fight against worms, moths and disease which besets him who gardens in less isolated localities. The desert is the natural home of the sugar beet. To produce a high percentage of sugar, an abundance of sunshine is necessary, and to produce a large tonnage per acre, rich damp soil is necessary, while the beets are growing. The irrigated desert supplies these conditions. The desert produced $20,000,000 of sugar last year.

The driest country in the United States is the southwest desert surrounding Death Valley, Cal., and it has 2⅛ inches of rainfall per annum. From 2⅛ to 15 inches of precipitation, the land must be irrigated more or less to produce the ordinary crops, but even our driest land is used for grazing, and there are places in Nevada and Utah where the rainfall is only 5½ inches annually, that are so favorable to equine existence that the wild horses are a pest.

The topography of the desert country is admirably adapted to agriculture. It is a country of broad, gentle sloping valleys and picturesque little ranges. The soil of the valleys is deep and rich. The mountains relieve the monotony of the landscape. One can not travel through this vast, arid country in any direction without thinking what a beautiful country it would be if only there were a few more inches of annual rainfall, and one of the tantalizing things about it is that all through the central part of the arid country there is unmistakable evidence that the country was comparatively well watered, and not so many centuries ago either.

To the casual observer, the desert is apt to be uninteresting. The tourist, eager with interest to catch every view from the car window in California, pulls down the shade and reads a novel in Nevada. Yet the desert is as varied in its flora and fauna as any other area of equal size, and in scenic attractions, I think, there are few localities that can surpass it. Certainly, there is nowhere else where such brilliant rock coloring can be seen, and nowhere else where the soft lavender, grays and purples of the desert can be reproduced. I am speaking now of the ordinary every-day sights of the desert, such views as the Colorado canyon, the eastern scarp of the Sierra Nevada, or the view from the Panamint range, where at a glance one may see the lowest national place (Death Valley, 350 feet below sea level) and the highest national place (Mt. Whitney, 14,897 feet above sea level), now recognized as being among the foremost scenic wonders of the world.

Although the flora of the desert presents a gray, barren and uninteresting appearance to the superficial glance, a little closer scrutiny reveals a wonderful variety of species and a great range of utilities. Take the so-called sagebrush country, for instance. There are thirty or forty species of brush which go to make up the gray verdure commonly called sagebrush, and most of them are in no way related to sage at all. Among the commoner varieties may be mentioned the following: Shad scale, which sheep will eat, but which is not very good pasture; white sage, which is the best winter horse feed possible, and which cattle and sheep are also fond of; sheep clover, which, as its name implies, is the finest desert sheep feed; black sage, which is not good for much except that it grows high and strong and is seldom covered by snow; rabbit bush, whose succulent green stalks give nourishment to the jackrabbit when all else is dry and parched, and whose roots contain a gum which is practically the same as the finest South American rubber; greasewood, which makes a good camp fire, and whose roots also contain rubber gum and salt bush, which is an "all around" feed.

As the tourist gazes from the car window he sees a monotonous unchanging sea of grayish green, while the dweller of the desert looking out of the next window sees an ever-shifting panorama, replete with interest to the sheepman or cattleman, horseman or miner, whichever he may be. As a general princi

The Yucca Palm, Common on the American Desert.

A Desert Dry Lake in California.

A Borax Town on the Mojave Desert.

ple, it may be said that stock feed on the desert is far more abundant than water, and that herein lies the great future of the desert as a grazing country. As wells are sunk and reservoirs built, more and more live stock can be profitably raised. It is not that stock die of thirst on the desert, when the range is overstocked, but they eat all the feed close to water, and then as they must walk farther and farther from grass to water and back again, they suffer from thirst and starvation combined. With frequent wells and windmills I venture to say the present number of stock on large parts of the desert could be increased ten times.

The rubber industry mentioned above gives promise of becoming one of importance. There is a practically unlimited supply of raw material and an ever-increasing market. There is one factory already in operation at Buena Vista, Colo., and several others are planned.

Among interesting flora may be mentioned the beautiful everlasting flowers found in the Mohave Desert, and near Death Valley, and probably many other places. They grow in great profusion after an unusually heavy rain, and have the most beautiful colors imaginable. The accompanying picture of flowers is from the Death Valley country.

On the deserts of southern Idaho and Oregon the desert mahogany reaches its maximum growth. The wood resembles the true mahogany in all essential particulars, except that it has a most unfortunate habit of "checking" during the seasoning process. There is an old man near Wells, Nev., who seems to have learned how to season the wood properly, and he makes most beautiful canes, which he sells for a living. These trees make the best firewood I have ever seen, not excepting the ironwood of the Australian desert. One cord of desert mahogany is equal to a ton of good coal.

Another interesting desert tree is the pinon, which produces the most tasty and wholesome nut that grows. The Piute and Gosiute Indians use these nuts as a staple article of diet. In central Nevada they grow to the size of peanuts and could be gathered by hundreds of tons, yet I have never seen any but the small Mexican nut on the Eastern market.

Many parts of the desert are clothed with a heavy growth of timber, and profitable lumber enterprises flourish; in fact there are 120,000,000 acres of woodland on the desert, of which 75,000,000 acres are valuable for lumbering. I only aim to touch here and there on some matter that arrested my attention in traveling through the desert mines, believing that these same subjects may interest others.

One of the noticeable characteristics of the desert flora is, that north of latitude 37° the flora is practically destitute of thorns, except on the eastern slope of the continental divide, while south of latitude 37° thorny plants are in the majority. In southern Arizona and Sonora it is said that there are 400 different varieties of brush, and 399 have thorns, while the remaining one is poisonous to the touch. I cannot vouch for the figures being exact, but the saying gives an impression of the conditions.

The worst of the thorny plants is the Cholla cactus, which is illustrated in an engraving on the front page. These plants have barbed thorns set so closely as to resemble a thistle going to seed. The knowing little desert rats gather pieces of these cacti in great quantities and place them around their burrows. They have tiny secret trails through the mass, and they know full well that no wildcat will follow them nearer than the edge of their abattis, that no coyote will ever undertake to dig them out. One of the most horrible tortures invented by the Apaches was to roll their naked victims in a bed of chollas (pronounced cho-yas).

In this same southern country are found the palo verde, whose bright green trunk and general appearance seem to indicate an abundance of water, yet they grow in the driest places, where the rainfall is only 2 to 5 inches per annum. Then there is the "niggerhead" cactus, whose outer skin is as water-tight as rubber, but whose inner pulp is almost as juicy as a watermelon. The juice is not very pleasant to the taste nor very wholesome, contrary to the popular story, but it beats going dry a whole lot, and I can imagine that one who was about "all in" with thirst might find it sweet and delicious. Some lives have no doubt been saved by the niggerhead cacti, but as a rule the man who knows enough of the desert to pick out a niggerhead knows enough to find the water holes.

One of the oddest, and I presume rarest, bushes I ever noticed on the desert is the screw bean bush, which, so far as I have noticed, grows only in the Saline valley, Inyo county, Cal., and the lower Colorado river. The fruit resembles in form nothing so much as the ordinary carpenter's screw. This valley and the neighboring valleys, such as Death valley, Panamint valley and Racetrack valley, I believe are the hottest places in the United States in summer. They have to shut down the borax works in the Saline valley from July 15 to Sept. 15, because even the Indians cannot work in the heat. For weeks the mercury will stand from 110° to 125° in the shade—and there is no shade.

Of the unusual fauna found on the desert I may mention the Gila monster, the "side winder" rattlesnake, and the hydrophobia skunk. The Gila monster is a hideous spotted lizard about a foot long and stubby in general appearance, which inflicts a poisonous bite. There is a harmless lizard called the chuckawalla, which looks much like the Gila monster and which has a great fondness for living around abandoned mines. It is a startling experience to have one of these hideous lizards poke his head out from between the cribbing just on a level with one's hands or face, when one is climbing down a shaft and can not jump away. The Indians say they are very good to eat, but someone else can have my share.

The hydrophobia skunk lives only in the driest and hottest parts of the desert. It is a pretty little animal, about the size of a kitten, and has a saucy way of coming around camp in broad daylight. I have often wondered how they existed so far from water. I have seen them, during August, 15 miles from any known water. Whether they really impart hydrophobia with their bite or not is a question I can not positively answer, but all the people who live in that section of the country believe they do, and there is no doubt that coyotes, wildcats and dogs occasionally "go mad" in the localities inhabited by the hydrophobia skunk.

I always thought the "side winder" rattlesnake was a good deal like the hoop snake, a creature of the fancy, until I saw one; then I realized that he was simply the result of evolution. For the ordinary snake to travel he must have something to wriggle through, such as grass or brush or rocks. Put a snake on a sidewalk and he can hardly progress at all. In southern Nevada, Arizona and on the Mohave desert of California, there are many areas so barren that the bushes are many feet apart and the intervening ground is a baked claypan as hard and smooth as a sidewalk. It is here that the "side winder" lives. I can not exactly describe his mode of locomotion except that he holds his head up straight, well off the ground, and travels sideways at a good rate. A close inspection of his tracks showed that he lifted first one end and then the other and threw it forward, finally flopping over his middle, but in action his motions were too quick to decipher. The "side winder" is distinguished from the other variety of rattlesnakes on the desert by two horny projections over the eyes. This snake is smaller and more vicious than the so-called Black Diamond rattlesnake (crotalus adamanteus).

It must not be thought that all the denizens of the desert are as disagreeable as the three just mentioned. The commonest creatures on the desert are probably the harmless little lizards, and next the jack rabbit and next the coyote. Among the larger animals, white tail deer are quite plentiful, and antelope and mountain sheep may still be found. Lynx and mountain lions are occasionally found, but bears seem to prefer a moister climate. Wild horses are by far the most numerous of all the larger wild animals.

In Oregon, Idaho, Utah and Nevada one may see wild horses by the thousands. Of late years the packing companies have been buying them and they are getting cleaned up. Five thousand head were shipped from one station on the Central Pacific railroad last year. What the packers do with them is not given out, but rumor has it that they are either converted by mechanical processes into canned corned beef, or are shipped to France and sold as horse meat. Anyway, it is a good thing for the country to clean them up. They sprang originally from small Spanish stock and it seems impractical to breed them up, and, on the other hand, they entice away the gentle horses of the ranchmen. The fact that the desert supports these great

The Cholla—a Desert Cactus.

Greasewood Bush and Desert Flowers.

herds of wild horses, which have no hay or shelter in winter, illustrates the undeveloped grazing resources of the country. The far-famed Arabian horse is a product of the desert, and, I believe, that the desert bred horse of this country is the equal of the Arabian in all respects and will soon be recognized as such.

In the Panamint range there are great droves of wild burros, and anyone who thinks the burro is a stupid, slow-going beast should see those wild jacks bore holes in the atmosphere at the first scent of danger.

Gold Dredging in Colorado.*

Written for the MINING AND SCIENTIFIC PRESS by W. E. THORNE AND E. J. MOORE.

This article is not technical, but is devoted to facts as we know them. Dredging is one of the easiest methods of gravel mining, if all is favorable, but, like all forms of mining, one must use care and business judgment if it is to be a commercial success. A great many investors seem to think all that is required is a lot of gravel, some gold, and water, and then a dredger—and this combination will pay anywhere. This is often found to be not the case. In Colorado six or seven months is the length of the working season. This makes the cost excessive, for the manager and superintendent's salary must be paid for twelve months if you want to keep good men. Also interest, taxes, etc., go on. All fixed charges must be charged up to the short season. The cost sheet would be about as follows for one dredger:

	Cents.
Superintendence, per yard	0.81
General expense, management, etc., per yard	0.62
Taxes, insurance, interest, per yard	0 41
Dredge crew, power and operating supplies, per yard	3.14
Repairs, labor, per yard	1.03
Supplies, repairs, per yard	3 08
Bullion expense, per yard	0.05
Total per yard	9.14

This shows excessive cost for most items on account of this short working season.

In order to run this low, one must be within short distance from Denver.

DREDGING DISTRICTS.—First is Swan river, a branch of the Blue. Here the first dredger was built in Colorado by the North American Dredging Co., who built two Risdon and one Bucyrus dredger. Ground was very tight, some large boulders and rough, hard bedrock. The Bucyrus dredger is of the double-lift type, with continuous bucket, which discharges into a trommel, fines going into a sump and from there raised by a large centrifugal pump into the sluices that are on an auxiliary barge. This makes the cost of operation excessive.

The Lambing plant, 2 miles below Breckenridge, a type of shovel dredger built to work on a track on dry land some years ago, was a failure, as values were too low, with large boulders, etc., which ran the operating expenses so high that it was abandoned.

During 1905 a dredger has been constructed in French gulch, about 1 mile below Breckenridge. This is an up-to-date dredger. It has some new improvements and should be a success. This gulch is not an ideal spot for a dredger by reason of the rough, hard bedrock and spotty distribution of gold. These obstacles have not been successfully overcome as yet by any dredger, and when it is done it will be a decided step in the right direction. Our knowledge of the Blue river points to the opinion that any dredger proposition must be gone into in a very thorough manner, as there is an immense amount of large boulders to contend with; also rough and hard bedrock, with low and spotted values in most places.

On the head of the South Platte, at Fairplay and Alma, is a lot of ground favorable for dredging, but so far as known it is very spotted as to values, also full of large boulders where the best pay lies. In the few places a dredger can be run it will not pay, and the ground is of a cemented nature, with a hard, rough bedrock.

The Tarryall placers furnish some dredging ground, but must first be proven as to values, boulders, etc. The lay of the ground and water supply are favorable.

The Granite placer district is not so favorable for dredging.

In the Durango district on the San Juan river is some ground that may make dredging profitable, but in sampling that district some years ago we could not find anything of high grade.

In northwestern Colorado there has been in operation for a short time a small dredger that has reported pay. Lack of water, shallow ground and low values make this of little worth as a commercial investment. It will be very expensive to obtain a sufficient water supply for even one dredger.

In the sand hills, on the eastern edge of San Luis valley, is a vast quantity of sand that carries small values in gold, reported at 5 cents per cubic yard, but from tests made by us some time back we could not find 1 cent per yard. So this has no commercial value at present.

The most favorable dredging district so far developed is on Clear creek, between Denver and Golden. Here is a large area of gravel suitable for dredgers, if values will warrant. A part has been tested and, although the gold is fine, two dredgers are at work for the National Dredging Co. and report working at a profit. The three engravings appearing on the front page illustrate the style of dredger used there. They are the Bucyrus continuous bucket pattern and are of the latest type. One new feature is the steel head gantry. One engraving shows front struts, etc. This is built of channel and angle iron, showing lowest cross bar in center of gantry to be high. This will allow raising the digging ladder high, so buckets will clear water. This is a good feature, lacking heretofore on some dredgers.

The second engraving shows deck connection. This gives a flexible joint which will allow for expansion and contraction, and also allows stretch of guy cables without any bad results.

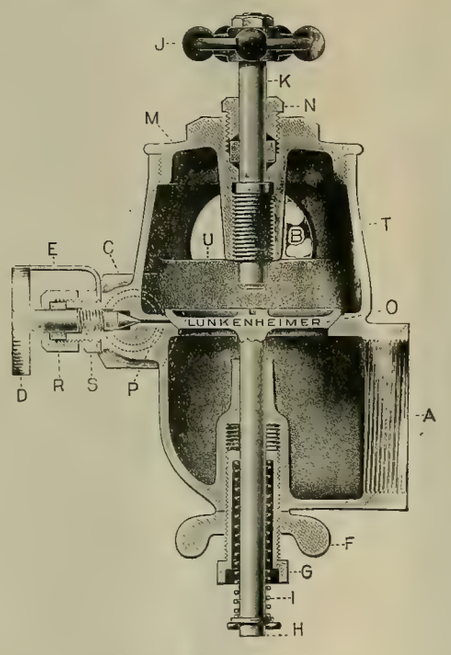
A rear view is shown in the third illustration, which also gives an idea of the size of the gravel. Some new departures in style of gold-saving tables have been tried, but as to their success we do not know. Bedrock here is hard and rough in places, and values in streaks. Up to this year dredging in Colorado has not been a success financially.

There are a few other places in Colorado which possibly may be favorable for dredging, but with these we are not acquainted.

*See illustrations on front page.

An Improved Generator Valve.

An improved form of generator valve has lately been placed on the market, which embodies a number of desirable and important features highly appreciated by users. The sectional view herewith clearly



Improved Generator Valve.

illustrates the construction of the valve. One of its principal features is the easy regulation of the spring which holds the disc to its seat. This regulation can be easily accomplished (while the engine is running), and without in any way interfering with the proper operation of the valve.

It is only necessary to loosen the thumbnut F when the sleeve G can be screwed up or down, to loosen or tighten the tension of the spring, after which the thumbnut F is again tightened.

It has been found that gasoline engines work best with the generator valve disc spring set at some particular tension; but as this particular tension cannot be ascertained except by trial when the engine is in operation, it is necessary that provision be made for the easy adjustment of the spring while the engine is running, which important feature will be found in this improved form of generator valve. The lift of the disc, and consequently the speed of the engine, is regulated by means of the stem K, operated by wheel J.

Another important feature in the design of this valve is the light but strong construction of the disc. One of the troubles experienced in generator valves is the tremendous wear on the seat and the breaking of the disc. To overcome this objection, the seat opening in this improved valve is very large, the area being considerably in excess of that of the inlet A. It is not necessary, therefore, that the disc be raised very far off its seat to permit a full charge of air and gasoline to enter the cylinder. The movement of the disc being but a trifle, the shocks caused by seating are reduced to minimum, and users claim they have had no trouble owing to the valve leaking or discs breaking. The disc can be easily reground when worn, by simply removing the cap M and inserting a screw driver or other flat instrument in the slot in the top of the disc provided therefor.

The valves are made of a very high grade of bronze composition, and the metal is so distributed about the valve that those parts subjected to the greatest strain are made heavier in proportion. Owing to the oxidizing effect of gasoline on iron or steel, these materials are entirely eliminated.

The supply of the gasoline is controlled by the needle valve D, and the end of same is placed as near as possible to the outlet of the gasoline into the valve, very little clearance being allowed. The result is that the gasoline is injected in the form of a spray, thus vaporizing thoroughly with the air admitted through the air inlet A. This needle valve has a long taper bearing and the threads on the stem are of fine pitch, thus very close adjustment can be secured and the amount of gasoline injected can be regulated to a very fine degree.

The wheel handle D is engraved with numbers to show the different degrees of opening. This wheel handle has a flat spot on its periphery with which the spring E engages. The object of this is to enable the operator, after he has properly adjusted the needle valve for the correct mixture, to at any time easily obtain this same adjustment should he close the needle valve or open same beyond the proper setting. No matter where this flat spot may be, after the needle valve has been set, the spring E cannot be brought to bear on same by merely loosening the locknut S, which will permit of the free turning of the spring.

The union C is provided on the gasoline inlet to facilitate its connection.

This improved generator valve is the result of considerable experimenting on the part of the Lunkenheimer Co., the manufacturers. They have recently issued an attractive pamphlet on generator valves, which is sent free to any one requesting a copy.

THE PROSPECTOR.

The metallic mineral from West Tintic district, Utah, is foliated or micaceous iron, a variety of hematite. It may contain gold, and if transportation is cheap would be useful as a flux at the smelters. If finely ground it would also make a good dark red mineral paint.

The single mineral specimen from Wallace, Idaho, marked "T. A. S.," is limonite, brown iron oxide, with some quartz. It may carry gold and silver, as it is apparently derived from oxidation of pyrite.

The rocks from Yale, B. C., are identified as follows: No. 1 is silicified greenstone, carrying iron and copper sulphide and a little hematite. No. 2 is a metamorphic rock, consisting chiefly of amphibole and garnets; epidote and a small amount of pyrrhotite are also present in the specimen. No. 3 is a metamorphic rock. No. 4 is quartz with gray-copper ore. No. 5 is a much decomposed intrusive rock, of granitic type. No. 6 is pyrophyllite. No. 7 is epidote.

The rock specimens from Denver, Colo., marked G. A. D., are: S., mica-diorite; N., a metamorphic rock with slightly schistose structure. It consists principally of quartz grains and small scales of mica.

The samples from Orleans, Cal., are: No. 1, earthy clay; 2, a much decomposed rock, practically clay; 3 and 4 are similar--clay; 5 is a piece of coal.

The white mineral specimen from Baker City, Or., which resembles some varieties of magnesite, is halloysite, and is essentially an aluminous silicate, similar to kaolinite, from which it differs only in having water of hydration. Non-technically it is a species of indurated clay.

The rock samples from Atwater, Cal., are: No. 1. Quartz, showing a small amount of secondary mica. No. 2 is a hornblendic schist with numerous small garnets. No. 3 is a much altered granitic rock, including a small veinlet of quartz. No. 4 is a dark-colored, translucent calcite (calcium carbonate).

The ore from Howe Sound, B. C., is apparently the result of silicification of diorite or amphibolite schist. The larger piece is similar to ores occurring in the gold belt of California in Calaveras, Amador and some other counties of that State. The sulphide is mostly iron with a trace of copper.

The samples from Los Angeles, Cal., are: L. A., "Black," manganese dioxide; L. A., "Green," diopside (calcium magnesium pyroxene).

The mineral from De Lamar, Idaho, marked "W. R. T." is quartz, with manganese and iron oxides.

The mineral from Cleveland, Ohio, marked "C. O. B. & S. Co.," is wolframite, tungstate of iron and manganese. It is slightly magnetic.

The Simplon Tunnel.

The Simplon tunnel, piercing the Alps between Switzerland and Italy, is interesting as the longest of the great Alpine tunnels. It has a total length of about 12½ miles, as against 9¼ miles for the St. Gothard and 8 miles for the Mont Cenis. It is distinguished from the other tunnels in the Alps by the fact that there are really two parallel tunnels, separated by about 55 feet between centers. Each tunnel contains one track. The bore is straight, with a knee at either end, due at the north end to the proximity of the Rhone river at the town of Brigue, and at the southern extremity to the nearness of the Divernia, just below the town of Iselle.

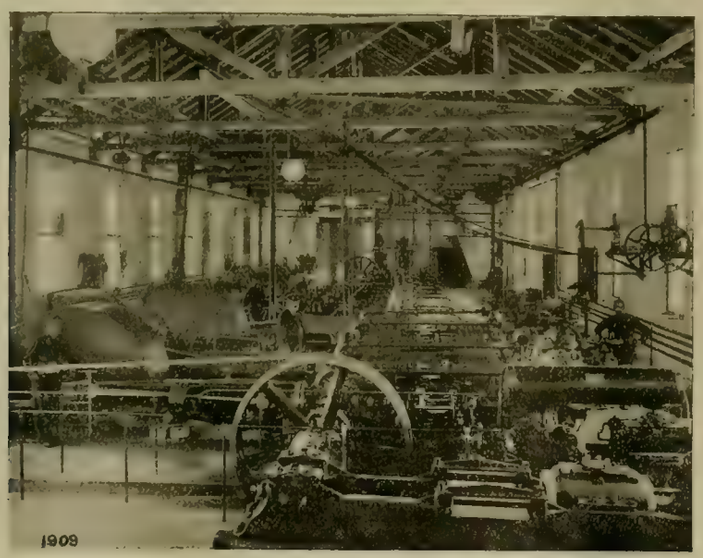
The track at the north portal is about 2250 feet above sea level. From this point the tunnel rises with a 2% grade until the apex is reached, almost exactly beneath the boundary between Swiss and Italian territory. The highest point is about 2325 feet above the sea, and the bore falls thence with a 7% grade to the southern extrance, at an altitude of about 2100 feet. The mountain over the tunnel is 7000 feet in height, and the thickness of the rock above the tunnel at the apex is greater than anything ever before attained.

The method of building provided for the completion of the easterly tunnel as it was driven, while simultaneously only the floor heading of the second or western tunnel was carried along. The two bores are joined at intervals of about 650 feet by cross galleries. When traffic increases so as to demand it, the second bore will be fully completed. An especial advantage of the double tunnel scheme developed in course of construction, in permitting a very effective system of ventilation. A very high temperature was encountered as the work progressed, and, in order to make conditions more tolerable, fresh air was forced in by powerful fans at the rate of about 1250 cubic feet per second, entering heading No. 2, passing through the last traverse and returning outward through heading No. 1. Cross galleries were closed as the work progressed, only the advance opening being kept clear. Even with such a circulation as this, it was found necessary to still further reduce the temperature at the face by sprays of cold water, and for this purpose a great system of refrigeration was installed. The temperature of the rock in the tunnel was 55° C. (132° F.), but the cooling devices maintained the air temperature at from 25° C. to 30° C. (86° F.)

The construction of the tunnel was carried on simultaneously from both ends. The heading starting on the Swiss side at Brigue was pushed beyond the apex to a point on the Italian side about 6½ miles from the Swiss portal. At this time the Italian heading had been advanced to within 800 feet of the other heading, and there remained this thickness of rock to be penetrated before the mountain was pierced. At this point, in September, 1904, unexpected obstacles to further progress were encountered, necessitating the abandonment of work on the Swiss side and seriously impeding operations on the Italian heading. These were springs of hot water at 45° C., opened almost simultaneously in the two headings, those on the Swiss side flowing 489 gallons per minute, those on the Italian side 960 gallons per minute. The volume and temperature of this water in the Swiss heading, together with the destruction of the cooling plant for that section by a landslide, forced complete suspension of operations at that side. The work was completed by driving through the Italian heading, but here, again, operations were seriously impeded and the rate of progress cut down to a mere fraction of that normally maintained. When measurements showed that only a thin wall, which could be removed with one blast, intervened between the two headings, work was suspended until the greater part of the accumulated water on the Swiss side could be pumped out. Then the blast was fired, making an opening through which the remaining water rushed out to the Italian portal. This occurred on February 24, 1905, and this date marks the culmination of the greatest tunneling enterprise ever attempted. The work was started in August, 1898.

Power for the Simplon work has been furnished by two plants of about 2000 H. P. each, driven by water power, one at either end of the tunnel. The method of tunneling was radically different from that familiar to American engineers and so often exemplified in tunnel work in this country. Instead of the compressed air rock drills so common in American practice, the Brandt system of hydraulic rock drills was used. Instead of chipping away the rock by hammer blows, it was ground away by cutters under tremendous pressure. Instead of the familiar air compressor plant, there were immense high pressure pumps driven from water wheels. The ventilating fans also are driven by water power. The tunnel section was enlarged by hand drilling.

But compressed air had its part in the enterprise—in operating the haulage locomotives and handling construction trains in the tunnels. The accompanying illustration shows the interior of the power house at Brigue, Switzerland. In the foreground are seen the two Ingersoll-Sergeant air compressors furnishing air for these motors. One machine is seen complete, as it has been during its successful operation of several years. Its faithful performance led to the installation of its duplicate when the demands grew beyond its capacity. This second compressor is seen in course of erection. Both of these machines are belt driven from water wheels and are of the style known by the makers as "Class BC 3." They are of the three-stage, "straight line" type, with water jackets on the low pressure cylinder, horizontal intercooler, and water box submergence on the high and intermediate pressure cylinders. They deliver air at 1500 pounds pressure and at normal rating of 140 revolutions per minute; each compressor has a free air capacity of 121 cubic feet per minute furnished at this pressure.



Ingersoll-Sergeant Compressors at the Simplon Tunnel

The continuation of this great work under the unexpected difficulties encountered called for the exercise of resource and daring on the part of the engineers in charge. The driving forward of the Italian heading in the steaming, stifling heat from the hot water was in itself a laborious operation without precedent. Much curiosity and apprehension was felt as to the outcome of the piercing of the dividing wall. But this was made without mishap, and since that time efforts have been directed toward enlarging, lining and completion of the tunnel.

While one of the largest and most difficult tunnels, the Simplon was by no means the most expensive. Its cost thus far, exclusive of installation charges, has been about $210 per lineal foot. In driving it 10,000 men were continuously employed—4000 on the Swiss side, 6000 on the Italian section. Its length, as stated, is 12½ miles. The section of the completed tunnel is of horseshoe shape, 13½ feet wide at the bottom, 16½ feet at spring line, and 18 feet high in the clear above the rails. It is lined with concrete and masonry throughout, the enormous pressure in some places calling for a lining 6 feet in thickness. The heading carried forward in the second and uncompleted bore is 6½ feet high and 10 feet wide. Just what power will be used to haul trains through the Simplon tunnel has not yet been made public, but a recent order by the Swiss Government for 160 cars with enclosed platforms would indicate that, for the present at least, steam will be used.

Mine Surveying.—I.*

Written by C. A. S. Andrews.

Instruments.—The instruments actually necessary are a theodolite, steel measuring band with spring balance, prismatic compass, clinometer, 100 feet of metallic box tape, two coils of copper or steel wire, shingling hammer, chisel, one 14-ounce plumb bob for theodolite, two 24-ounce plumb bobs for back and foresight, two 10-pound plumb bobs for weighting the wires, table of sines, cosines, tangents and secants, and a field book.

Theodolite.—The theodolite should be not less than 5 inches diameter, reading to twenty seconds. Both striding level and diagonal eyepiece are essential. The theodolite should admit of being focused to clearly define a plumb line at a distance of 10 feet, as often a longer sight cannot be obtained. A traversing head is absolutely necessary, as without one it is practically impossible to set over a spot with the degree of accuracy required for short sights.

Tripod.—A convenient length for the tripod is 2 feet 8 inches. One leg at least should be telescopic, or, if not, should be jointed about half way. A metal tripod about 3 inches high should also be provided for use in low workings.

Chain.—The steel band or chain should be 500 feet long, divided to feet, with the tens and hundreds numbered. It should be light enough to stretch clear of the ground, and tested with the government standard at the temperature generally ruling underground, say 80°. Any further correction for temperature will not be required. A foot rule divided to tenths and half tenths is required, so that distances may be read to two places of decimals. The handiest way is to have this marked on the tripod leg, as all distances are read at the axis of the theodolite.

Clinometer.—The clinometer should be at least 7 inches in length, the foresight being in such position as to be visible when a light is thrown on the bubble.

Compass.—The prismatic compass should be not less than 4 inches diameter. The use of a mirror for taking bearings up or down slopes is not to be recommended. If used, a cross bubble is necessary on the compass, and to keep this level necessitates the use of a stand. It is preferable to suspend a plumb line a short distance away in line with the next station. The compass can then readily be held precisely in line with the plumb line and the forward station, and the bearing read to a point on the plumb line horizontal with the compass.

Wires.—The coils of copper wire are for lowering down vertical shafts in carrying the surface meridian below. The gauge should be about 20, and the length sufficient to reach to the bottom of the deepest shaft in the district, say 2000 feet.

Surface Meridian.—The first thing necessary in making an underground survey is to pick up the boundaries of the mining property as marked on the surface. Two boundaries should be picked up, and if they agree the original survey may be adopted as correct.

Carrying Surface Meridian Below.—Connections are then to be made to the different shafts on the property in such manner that the surface meridian may be carried below. This can be done either by traverse or triangulation, whichever may be more convenient.

Levels are also to be taken between each shaft and to the shafts on the adjoining mines, so that the vertical depths of all the different workings can be reduced to the same datum.

By Underlie Shaft.—In making a connection to an underlie shaft, a point is chosen at the mouth of the shaft in a convenient position to see down the underlie. A draft mark is made at this point, and is connected to the surface survey.

From this draft mark the survey would be continued down the underlie, in a method to be described later on, thus carrying the surface meridian below. Connections would afterwards be made underground to the vertical shafts, and the survey thus checked.

By Two Vertical Shafts.—If there be no underlie shafts on the mine, and none on any adjoining mine connected with the underground workings, then the meridian must be taken below by the vertical shafts.

If there be more than one vertical shaft, connections are made to one of the winding ropes in each shaft. The direct bearings and distances between the ropes are computed, and form the datum for the underground survey.

Unless for special reasons, it is better to connect to the center compartment rope than to the end ones. Some shafts have been sunk with a twist or wind, which sometimes does not leave room for a bucket to swing clear in an end compartment.

In making the surface connection, the rope should be sighted close to the poppet head, where there is no oscillation.

In the underground survey these two or more ropes are connected by traverse. For this purpose a magnetic or other meridian is adopted, and the direct bearings and distances computed. If the dis-

*Abstract Trans. Queensland Institute of Surveyors.

crepancy between these distances, as computed by the underground and by the surface surveys, be not more than 1 in 500, then the survey may be assumed to be correct. All the bearings of the underground survey are then to be corrected to make the direct bearings between the shafts agree with the surface meridian. If more than two shafts were connected to, the connection in each case should be the same. If the discrepancy be not more than 1 minute per 1000 feet of underground survey, then the mean may be taken.

In connecting to the rope in the underground survey, the rope weighted with a full bucket is lowered into the sump, and the bucket submerged in the water. If cages are used, one cage is to be removed and the rope weighted with a full bucket or other heavy weight. The rope should then be left for an hour or more to settle. Care is to be taken that the bucket is well clear of the sides.

In sighting to the rope, read the bearing at one extreme of the swing and then at the other. There is plenty of time to do this if the shaft be more than 400 feet deep. At this depth the time of oscillation is eleven seconds, while at a depth of 2000 feet the time is twenty-five seconds.

This operation is to be repeated at least three times, and the mean of all the readings taken.

BY ONE VERTICAL SHAFT.—If there be only one shaft on the mine, and that a vertical shaft, and the underground workings be not connected to any other shaft in an adjoining mine, then the meridian must be carried down this one shaft.

For this purpose the two wires are suspended in the shaft, one in each end compartment. They are suspended as far apart as possible, but no closer than 6 inches to the timber, so as to be sure that they do not touch the sides. In lowering the wires small weights are attached to the ends, and the wires kept in the center of the compartment, so as not to catch in splinters, etc. On reaching the bottom the 10-pound plumb-bobs are attached, lowered into the sump and submerged in the water.

The wires at the surface are then moved over to their required position and pressed into saw cuts in two battens nailed across the shaft, and left for an hour or more to settle. The distances between the wires at the surface and at the bottom are measured and if they agree the wires are clear.

The theodolite is then set up on the surface in a convenient position, as nearly in line with the wires as will admit of sighting each wire distinctly. The bearing and distance to each wire is taken and connected to the surface survey.

The length and bearing of the line between the wires is then computed and forms the datum for the underground survey.

The surveyor then proceeds below, traveling by the center compartment, so as not to disturb the wires. If there be less than three compartments, then one of the wires must be fastened into one corner of the shaft to allow the bucket to descend. When this has been done the greatest possible care must be taken that the wire be returned to exactly its original position. For this purpose an assistant must be left at the surface who can be thoroughly trusted.

In connecting the wires below, the procedure is much the same as on the surface. The theodolite is set up as nearly in line with the wires as possible, and as far away as is consistent with obtaining a clear sight of the wires.

One wire is then sighted and followed to the extreme end of its swing, and the bearing read; then to the opposite end of its swing, and the bearing read again. This operation is repeated at least three times, and the means of all the observations is adopted.

He will then take the bearing to the second wire in the same manner.

The horizontal distance from the theodolite to each wire is then measured. This is done by the assistant holding the end of the chain to the wire and following it in its swing. The surveyor reads the distance at each end of the swing and records the mean. This operation is repeated at least three times and the mean of all the measurements taken.

The bearing and length of the datum line is then computed. If the discrepancy between this length as computed and as measured on the surface be not more than .01 foot, then the connection can be taken as satisfactory.

The difference between the magnetic and the surface meridian is thus known, and is to be added or subtracted, as required, by the bearings booked.

This method of carrying the surface meridian below is to be looked upon as approximate, and is only to be used temporarily until another shaft be sunk, or until the workings break through into an adjoining mine, when correct meridian can be obtained by either of the first two methods.

DEPTH OF SHAFT.—In measuring the depth of a vertical shaft, the strain required at the lower end of the chain is the strain used when the chain is wholly supported, less half the weight of the chain used.

When the shaft is more than 500 feet deep, two or more chains may be joined together or the shaft measured in sections.

ASSISTANTS REQUIRED.—The surface meridian having been carried below, the surveyor is ready to proceed with the underground survey. For this work only one regular assistant is required, who should be thoroughly conversant with the surveyor's methods, and if able to check his calculations, so much the better. Any other assistance required can be obtained from the mine. In general cases one other assistant is enough.

CLASS OF MINE TO BE SURVEYED.—In this paper the writer has assumed that the mine to be surveyed is a working lode, dipping more or less, on which underlie shafts have been sunk, either from the outcrop or from some deeper part of the vein, opened up by a vertical shaft. From the underlie shaft levels have been driven each way on the lode, connected by winzes, rises, passes, etc.

The methods of survey described in this paper are applicable to any other class of mine.

DRAFT MARKS.—Assuming that the surface meridian has been carried to the mouth of an underlie shaft, the surveyor will now go below and fix all his draft marks in the shaft before taking the theodolite out of its case.

The draft mark at the mouth of the underlie is probably a nail driven into the ground sill. This should be driven right home to the head, so that it cannot be shifted, and a broad arrow chiseled pointing to it, so that it can be recognized on future occasions.

This draft mark will require an arrow placed plumb behind it to sight on to, but all draft marks underground should be placed in the hanging wall, so that a plumb line may be attached to sight on to. Draft marks are best made by a hole bored at least 3 inches deep into the solid rock. Into this a close-fitting hardwood plug is driven home. Into this plug an inch nail is driven, leaving just sufficient protruding on which to hang a plumb line.

Should the hanging wall be close timbered, the draft marks will have to be put on the timbers. Choose a solid timber, and trim a small vertical face. In this drive the nail, leaving only just sufficient protruding on which to hang the plumb line. All draft marks are to be branded with a distinguishing mark, so as to be always recognizable. A broad arrow chiseled under the nail is the usual way.

Ingenious Mine Timbering.

Timbering underground is familiar to all miners, but the placing of heavy timbers in surface cuts is less usual, and generally calls for ingenuity and a thorough knowledge of timbering—its functions and strength, and also a fairly definite idea of what to anticipate from the rock masses which are supported by the timbers. These masses of rock are subject to changing stresses as the ore is removed from place to place, and the timber boss must so place his system of stulls, posts and braces that they not only support the weight at the time they are placed, but also sustain the ground for some time later when the direction of stresses and pressure changes. The accompanying illustration shows how a caving surface cut was saved in the Mahoney mine at Sutter Creek, Cal., in order that several thousands of tons of payable ore might be extracted before the walls were allowed to collapse. These timbers were placed as shown and the work was attended with extreme danger until it was well advanced, as the walls continued to cave and slip into the cut while the timbers were being placed in position. The work was rendered additionally hazardous owing to the fact that large stopes had been excavated below and the ground was settling over an area 200 by 100 feet, the cut here illustrated being near the center of the subsidence. The caving was stopped and the ore removed, when most of the timber was recovered for use elsewhere about the mine.

Mine Timbering in an Open Cut.

The Little Giant Tape Splice.

This device is intended to aid surveyors and others in making a quick repair of broken measuring tapes without delaying field work and without the aid of extra tools other than the splice itself. The splice is made in the form shown by the above illustration. Should the tape break the ends are inserted in the splice until they are in the proper position as seen through sight hole in middle of the device. The screws are then turned down on the tape with knife blade or any convenient edge, slightly bulging the tape into the holes opposite the screw points, making a tight grip, but not injuring the tape. The splice is small and neatly made and does not catch or obstruct the tape. It may be used for temporary or permanent repair.

The splice is a new and much needed device, often saving engineering parties hours of inconvenient and expensive delay from broken tapes which cannot always be avoided in spite of the greatest care by chainmen. The splice should be of especial value to surveying parties working in out-of-the way locations, and should save the inconvenience of carrying a number of extra tapes in the outfit.

The splice has been adopted for use on United States, Canadian and Australian Government surveys. It is the invention of a civil engineer, Clinton B. Alexander of Clearfield, Pa.

Excavating for the Government.

The United States Reclamation Service has found it advisable to issue a formal letter to prospective bidders on work for that department of the Government, says "The Contractor." This letter is in the nature of a warning to contractors who are about to bid on work, asking them to be careful to imform themselves fully concerning the conditions, terms and details of the work in order that their bid may take all factors into consideration. The letter contains the following:

There seems to be a peculiar fascination about a Government contract and a widespread belief that a person who secures a contract from the Government is certain of large profit and easy work. As a result, there are many inexperienced persons who are continually seeking contracts and who, out of their ignorance, frequently succeed in getting into very embarrassing situations. There is nothing more irritating than the effort of inexperienced persons to try to get a contract, and if by chance it is awarded to them, they seek not to execute the work as required, but to shirk the obligation incurred.

The Reclamation Service, having a new class of work, has been put to much trouble and expense by inexperienced or speculative individuals who have, in some cases, made bids ridicuously low, and have insisted on having the contract awarded to them, in spite of the warning of skilled men that they would incur large losses in carrying out the work specified. These people do not and will not understand that the contracts they enter into are very carefully guarded and that no discretion or leniency is possible after the contract is signed. They seem to forget that an employe of the Government can not modify the contract, no matter how onerous it may be, and that their property and that of their friends who have gone on their bonds must be taken by the Government in default of the work.

There is no desire on the part of any one connected with the Government to let a contract at less than a fair rate, with reasonable profit. It is far better for all concerned that the contractor make fair wages for his men and a small return upon his capital invested The engineers of the Reclamation Service, having spent the best part of their lives in such work, know, as a rule, very nearly what it will cost, and they view with apprehension the incursion into the contracting field of men who have never had experience and who are enamored with the idea of getting a job of this kind.

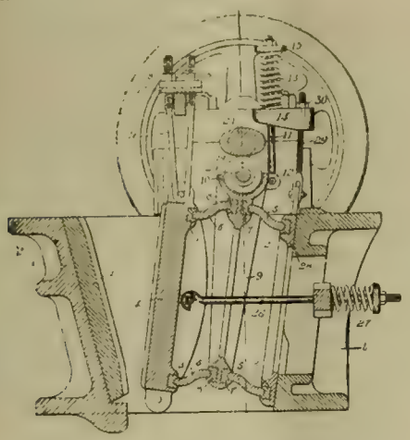
IT is frequently stated that the cause of failure of the cyanide process at some mines is due to absorption of large values by the staves and bottoms of the wooden tanks used, and that the discrepancy between the pulp assay before cyaniding and the bullion recovered by precipitation is represented by this greedy absorption of the gold solution by the wood of the tanks. It would be interesting to know just how much gold is really absorbed by the wood of a cyanide tank.

Mining and Metallurgical Patents.

PATENTS ISSUED NOVEMBER 21, 1905.

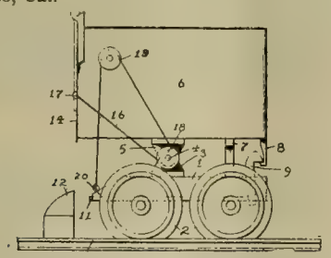
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ROCK CRUSHER.—No. 804,201; H. H. Blake, Pittsburg, Pa.



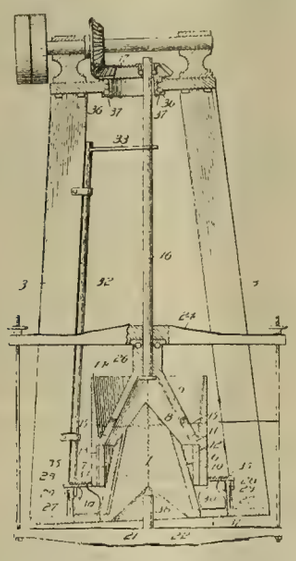
In crusher, combination with machine frame, of movable jaw, operating shaft having cam, vertical having trough or cup, means yieldingly suspending vertical from machine frame, means for operating jaw by vertical, and roller adapted to be moved by cam and slidably mounted on machine frame and received in and bearing against trough or cup.

DUMPING CAR.—No. 804,412; J. H. Kelly, San Francisco, Cal.



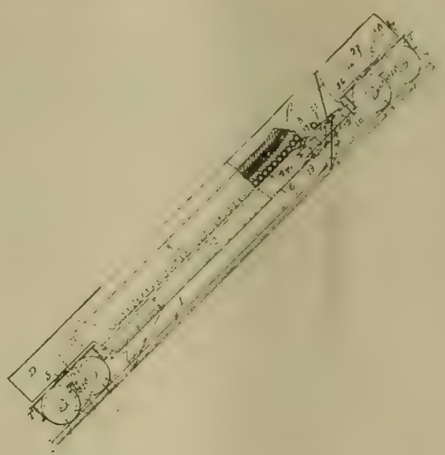
In dumping car, combination of truck, car body tilting thereon, swinging gate closing front end of car body, cable secured at ends to gate and to frame, parts carried by frame and car body around which cable passes, position of parts being such that when car body is tilted cable is relaxed to allow gate to swing open.

ORE CRUSHER AND PULVERIZER MACHINE.—No. 804,780; A. Tetrault, Boulder, Colo.



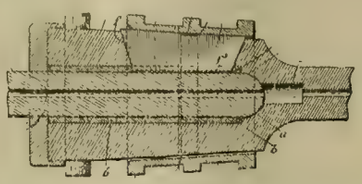
In ore crusher and pulverizer, frame, cone fixed on base thereof and ring shell mounted relatively to cone to cause it to rest with unbroken annular grinding edge contact upon side walls of cone, means for imparting gyrating movements to shell, means for applying pressure upon shell, whereby in gyrating movements grinding edge of shell has uniform pressure at every part of grinding edge upon conical walls, and means for feeding material to crushing surfaces.

ORE DISTRIBUTING CAR.—No. 804,870; R. S. Moore, Portsmouth, Ohio.



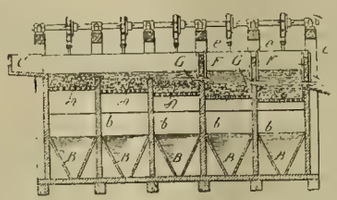
In ore distributing car combination of floor made up of movable segments of sections, and suitable means for automatically separating same, one from other from beneath load, in succession, from one end of floor to other.

CHUCK FOR ROCK DRILLS.—No. 804,904; J. C. H. Vaught, Deadwood, S. D.



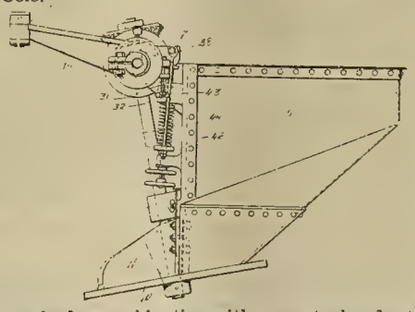
Drill chuck, comprising body having longitudinal socket to receive shank, and longitudinal slot, gib in slot adapted to bear at inner face on shank and having longitudinally tapered outer face projecting beyond face of body and flange projecting from face and sleeve engaging tapered face of gib.

ORE SLIME SEPARATOR.—No. 804,841; E. Hedburg, Joplin, Mo.



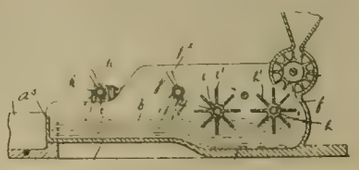
Ore separator provided with plurality of sections, plunger compartment in each section and plunger therein, hutch at bottom of each section, a screen ore bed near top of each of hutches, adjustable deflectors or partitions between sections, walls of sections having grooves in which partitions may slide, partitions adapted to form passages in close proximity to the ore beds, and to deflect the finer ores into the ore beds, whereby said finer ore may work through the screens into hutches.

ORE FEEDER.—No. 805,128.—N. V. Fitts, Denver, Colo.



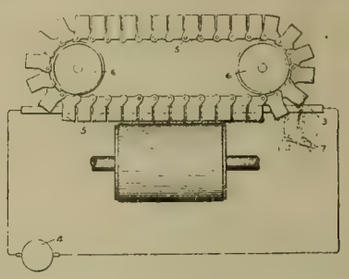
In ore feeder combination with receptacle adapted to hold ore or other material, of feed plate mounted below receptacle, and revoluble shaft connected in operative relation with plate, of two parts mounted on shaft and having wedge-shaped opposing faces capable of independent revoluble movement, one of parts being also axially movable on shaft and having friction face, another friction face connected in operative relation with shaft, and means for imparting rotary movement to one wedge-faced part, whereby opposing part is shifted axially to bring friction faces into operative relation to actuate shaft and feed plate.

AMALGAMATOR.—No. 805,090; C. W. Patten, Lynn, Mass.



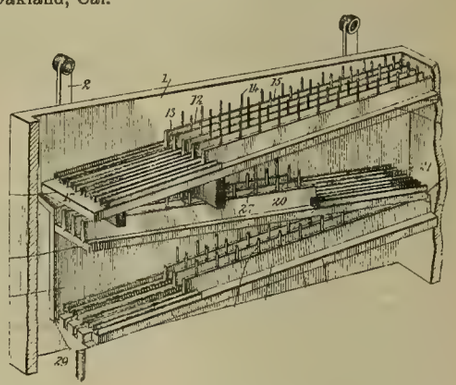
Amalgamator comprising elongated mercury, containing trough having shallow portion of substantially uniform depth, and having weir at discharge end of shallow portion, pit of greater depth at opposite end thereof, one or more submerging drums in pit, and means of discharging series of water jets onto surface of mercury between weir and said drums.

MAGNETIC SEPARATOR.—No. 805,289; H. E. Heath, Windsor, Conn.



In magnetic separator, combination with stationary conductor, of plurality of pole pieces traveling longitudinally thereof and in proximity thereto, and means for conveying material to be treated beneath pole pieces.

ORE CONCENTRATOR.—No. 805,215; M. R. Lyle, Oakland, Cal.



Concentrator of class described, comprising inclined sluice-box having elongated openings at bottom thereof, channels presenting elevated edges at edges of openings, and means for rocking box so as to advance material contained therein progressively by gravitation toward lower extremities of openings.

PROCESS OF CONCENTRATING ORES.—No. 805,382; W. M. Sanders, Iola, Kans.

Method of concentrating ore, which consists in subjecting it to non-acid solution capable of reacting with evolution of gas, and collecting such particles as are sustained by evolved gas.

METALLURGICAL PROCESS.—No. 804,936; W. E. Everette, Tacoma, Wash.

Metallurgical process which consists, first, in preparing suitable preliminary melt and heating it to incandescence; second, in subjecting previously pulverized materials, which are to be treated, to action of liquid oxygen, whereby they are reduced to extremely frigid condition and caused to occlude portion of oxygen; third, forcing frigid mixture into and through incandescent melt whereby metals in mixture are largely freed from sulphur and phosphorus and are rapidly fused; and finally, separately drawing off metal and slag at different levels.

METAL-LEACHING PROCESS.—No. 805,017; T. B. Joseph, San Francisco, Cal.

Herein described process of extracting metals such as gold, silver, copper and nickel from ore containing same when in suitable condition, which consists in subjecting ore to leaching action of solution containing water, sodium cyanide and ammonium carbonate, carbonate being in excess of cyanide, together with compressed air, and precipitating metals from solution by any well known method.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ARIZONA.

Cochise County.

At the Copper Queen smelter, in Douglas, is a body of reserve ore worth $2,500,000. The immense ore dump, kept on hand for emergency, in case an accident to the railroad should prevent shipments to the mines, is 2500 feet long, 40 feet wide and 16 feet thick, which equals 1,600,000 cubic feet, or approximately 123,000 tons of ore. This body of ore is all fluxed and prepared for the furnaces.

Maricopa County.

A call has been issued for a miners' convention to be held in Phœnix during the last six days of December. As the call clearly states, it is not proposed to have the organization one for any particular branch of the mining industry.

Mohave County.

J. C. Noble and E. Brannen are opening up the Climax and the Nightingale mines, near Kingman.—— The shaft on the Rattan mine in the San Francisco district, near Kingman, has been retimbered and the mine unwatered by the Gold Giant M. Co.——The West Flores mine, near Cerbat, is to be worked by W. B. Campbell. ——It is reported that an auto ore wagon will be put on between Yucca and the San Francisco mine. The mine will soon be shipping concentrates. The distance is 48 miles.

Pima County.

At the Helvetia mine, in the Santa Ritas, there are 150 miners at work and this force will be doubled during the month. When the smelter starts up 1000 men will be employed. The 200-ton smelter at Helvetia will be blown in as soon as coke arrives. The company has a large amount of ore blocked out, which will be ample to keep the smelter going all winter. There are twenty-five shafts on the claims of the Helvetia Co., but at present only two of them are being worked. One is the Old Dick, which is down to a depth of 800 feet, and another is the A1 Royale, with surface workings.

Yavapai County.

The Storm Cloud mine, 12 miles south of Prescott, has been sold to H. J. Beemer by F. Williams. The mine is to be unwatered and a 20-stamp mill placed on the property.——New concentrators have been put in at his mill on the Santa Maria river, near Hillside, by John Lawler. A road has been built from the mine to the mill.

Near Turkey Creek, William Theising has started up his new mill and is running ten tons of ore through per day.

G. O. Ford, manager of the Catherine Elizabeth group in the Mineral Point district, has his new shaft down 75 feet. The property is a mile from the United Verde railroad.——The Rincon M. Co., operating near Martinez, has stopped sinking at 1100 feet, having reached the limit of the hoist. Superintendent G. D. E. Mortimer says a larger plant will be secured at once.—— C. O. Goddard, of the Goddard M. Co., near Wickenburg, has gone to New York on business. Two shifts are working at the mine.——At the Baumann mine, 2 miles from the Humboldt smelter, a new hoist has been put in. The shaft is down 500 feet, and it is proposed to sink it 200 feet farther before crosscutting.——Rich copper strikes are reported from near Bill Williams mountain.

CALIFORNIA.

California is still the only State producing any chromite, and in 1904 the quantity was 123 long tons of ore, valued at $1845. As compared with the production of 150 long tons, valued at $2250, in 1903, this is a decrease of 27 tons in quantity and of $405 in value.

In California, for the past two months, one mining plant after another has been obliged to cease operations, owing to a shortage of water, until the number of idle mines has become a matter of some concern, as it has necessitated the idleness of a large number of men, both above and below ground. Some managers have taken advantage of this enforced idleness to overhaul and repair their mining and milling plants and others have simply closed up everything. In some instances water is filling the lower workings, and this will cause some delay in restarting work in the bottom of some mines. In others work can be continued in upper workings, which have not or will not be submerged, as soon as sufficient water is again available. There have been some rains, but in the mountains snow has fallen heavily, with comparatively little rain. The temperature continues so low in the snow zone that but little increased water has resulted as yet. The outlook for abundant water a little later is now very encouraging. The large distributing electric power plants, upon which many mines depend for power, have also felt the water shortage, and find it impossible to furnish the full amount of power usually depended upon.

Amador County.

(Special Correspondence).—The Keystone mine and mill are running regularly. The mine is 1575 feet deep, but until recently no extensive work has been done below the 800-foot level, most of the ore coming from the 400 and 600. Ore is now being stoped from the 1000-foot level. C. R. Downs is superintendent.

Amador City, Dec. 5.

The pile of waste from the Kennedy chlorination works has been sold to the Selby Reduction Works.

El Dorado County.

The following account of the work of the Eureka Slate Co., at Slatington, is condensed from a local paper: The Eureka property is north of the South Eork of the American river, west of Kelsey. A tunnel running through the deposit from west to east has developed the fact that the sedimentary slate deposit at this point is 300 feet in width. There are many dikes of a foreign substance traversing these beds from north to south. The slate beds themselves vary in thickness from 2 inches to 2 feet. These beds are separated by a flinty ribbon, having the same course as the beds themselves, and usually standing in the same vertical position as the beds, varying in thickness from ¼ of an inch to 2 inches. In quarrying the slate the gallery system is employed. A sink is made in the quarry 18 feet in depth and extended along the line of the cleavage of the slate beds for the entire distance the quarry is opened. As there are no foot joints in the vertical deposit, it is necessary to drill the entire length of the opening at the bottom of the gallery. The length of the hole is governed by the natural seams, which are readily determined after a loose end has been made in any part of the gallery, and as there are many vertical joints, they usually drill the blast to a vertical joint, black powder only being used, as the object desired is to simply raise and move the mass of slate with as little breakage as possible. After a portion of the gallery is blasted it is taken from the quarry by means of fall block carriers running on cables, which extend from an anchorage on the bank up over a derrick and down to a lower point in the quarry. Blocks are taken out in all sizes, from 300 to 3000 pounds in weight. The waste is hoisted in the same manner in specially constructed steel cars dropping onto tracks in the quarry, and from the derrick onto waste tracks on the bank. The slate blocks are run on block cars from the derrick to the block making yard and splitting shed. After the slate blocks reach the block making yard they are worked by crews of three. First, the block maker cuts the stone as received from the quarry into the most favorable shape for the various sizes of slate made. The blocks are then taken into the splitting shed, where the splitter takes the prepared block and splits it into sheets of the proper thickness with chisel and mallet, passing them on to the trimmer, who, with rotating power machine, trims them into various sizes. The slate is conveyed down the American river canyon from Slatington to Placerville by an aerial tramway, capable of transporting 300 squares, or 180,000 pounds, of slate from the quarry to Placerville every ten hours. The cable crosses the American river at an elevation of 600 feet, and with a 2400-foot span. The track ropes are 1¼ inches on the loaded side, and ⅞-inch on the empty side; the traction or drawing rope is ⅝ inch in diameter, the whole resting on 33 towers, one double tension station, one anchorage and tension station, one curved rail trestle 150 feet long, and the quarry and discharge terminals. The tramway is operated by water applied direct to a 36-inch Pelton wheel running to a countershaft and from countershaft to main shaft of tramway power sheave, requiring a minimum of 15 and a maximum of 25 H. P. to operate it, the difference of elevation from the quarry terminal to the discharge terminal at Placerville being 240 feet. At present the slate shipments from Placerville average a carload a day. C. H. Dunton is superintendent.

Inyo County.

The Great Western Ore Purchasing & Reduction Co. is building a smelter at Keeler to treat ore from the Cerro Gordo mine, in the Swansea district. F. C. Everett is president. The old 10-stamp mill has been remodeled.

Nevada County.

The Yuba Drift M. Co., which owns the Badger Hill, Malakoff and other gravel properties at Badger Hill, near Grass Valley, have put in a new hoist and started a perpendicular shaft to strike bedrock. The shaft is now down about 140 feet and blue gravel has been reached.——The Maryland shaft, near Grass Valley, has been cleaned out and retimbered to the 800 level and the pumps will be started. It is estimated that it has cost over $50 per foot to reopen the shaft.

Operations have been resumed at the Spanish Ridge mine, near Washington, after a shut down of two months due to shortage of water. Superintendent J. H. English is having the new air compressor put in place. The Spanish Ridge has made arrangements for another water ditch and will not again be hung up on account of a shortage of water.

Placer County.

The Eclipse-Morning Star mines, near Ophir, have been sold to C. L. Wilson of San Francisco. Pumping is to commence at once.——The Valley View mine, near Ophir, has been sold, and the new owners are sinking a shaft.——The Bear Valley Smelting Co. has acquired land between Ophir and Lincoln, and propose to build a smelter.

Plumas County.

It is reported that the Ward Creek M. Co. has completed the grading for a 100-stamp mill for the Gruss mine, near Genesee. W. L. Harper is general manager. The shaft is down 400 feet.——The Genesee Con. Copper Co. have run their 3000-foot tunnel 700 feet. This is intended to cut their ledge at a depth of 1500 feet. An air compressor and machine drills are being put in. J. Phelan is manager.

H. Goering has charge of work at the Last Chance gravel mine at Mohawk Valley.

Santa Barbara County.

An entirely new district in the Santa Barbara county oil fields has been opened by the Los Alamos Oil Co. bringing in the first well, a gusher, producing 600 barrels daily of 32 gravity oil, the highest grade yet found in the territory. The well is about 5 miles southwest of Los Alamos and about 6 miles south from the nearest well of the Western Union Co. and the same distance east of the Purisima wells of the Union Oil Co. The well was brought in at a depth of 4290 feet, which is the record of the county.

Siskiyou County.

It is reported that a cyanide plant is to be added to the Jillson mill, near Hornbrook, by the Hazel G. M. Co.

Trinity County.

The Bonanza King mine, near Trinity Center, has been sold to James and John Treadwell. J. H. Porter will remain as manager.——The Brown Bear mill, at Deadwood, has made its last cleanup for the season.—— Three shifts are working on the Lappin at Deadwood. Frank Hollingsworth has succeeded John Bealham as manager. The main ore working tunnel is in 200 feet, and will be pushed ahead 800 feet farther, to tap the ledge at depth.

Yuba County.

L. Pierce, J. R. Chadbourne and T. H. Woods of Suisun are preparing to develop their gravel mine, near Brownsville. J. R. Chadbourne has charge at the mine.

COLORADO.

(Special Correspondence).—While nothing sensational can be reported in connection with mining in this State, the fact is evident to all observant persons that much activity exists and that the outlook is bright. Without exception, mining men predict a good year during 1906. Machinery houses are making estimates on machinery and supplies for next year's delivery and with the advance in the price of lead and silver and the demand for zinc the mines of Colorado will undoubtedly have one of the best years in the history of the State. Attention is being called to the fact that assayers should be compelled to pass an examination and receive a license the same as a U. S. deputy mineral surveyor before they are allowed to commence business. This is considered advisable by many on account of the crooked work being practiced by some of the assayers throughout the State and also to do away with incompetent men in the business.——The case of J. B. Hindry against the Globe smelter, which has been in the courts for several years, and which resulted in a mis-trial last spring, will soon be brought to trial again. Hindry sues the smelter for damages on account of the smoke injuring his ranch land and livestock.——Word has been received in this city that the U. S. Mint will start operations Jan. 5, 1906. The date has been set a number of times, but has been delayed for various reasons.

Denver, Dec. 4.

(Special Correspondence).—The receipts of gold and silver bullion at the United States Mint in Denver for the month of November are 58% higher than they were in the same month last year. The past eleven months show increase over the preceding year. This increase is evidently due to the fact that the Denver Mint is to be used for coinage in future. In the San Juan country the heavy snows are impeding the progress of the new mills that are being erected, but some of them have gotten under cover, so that work can proceed during the cold weather. The railroads handling the material for that section of the State are having their usual difficulties on account of snowslides. The heavy snowfall so early in the season is rather unusual, yet it will be a great benefit, as the snow coming at this season of the year will pack and freeze and will be better for next season's water supply.

Denver, Dec. 6.

Boulder County.

The Cass P. N. O. Co. is working the Grand View mine at Sunshine under the direction of E. Eby. The shaft is down 700 feet and is approaching the level of the El Dorado tunnel, which is in 1200 feet and is being driven to drain and work the White Crow, Grand View and El Dorado properties.——New machinery has been put in at the Boulder Valley, west of the Grand View, under the direction of H. Fuller.——The Osceola shaft of the White Crow has been retimbered and new machinery has been put in. R. Trevarthan is superintendent.——The shaft on the Inter-Ocean, at Sunshine, is to be sunk from the 500 to the 700-foot level. A cyanide plant is to be put in. A. E. Healey is superintendent.——Work is to be resumed at the American mine, at Sunshine, under the direction of W. B. Hays.

The Five Points G. M. & M. Co. has been formed to work near Gold Hill.——A new hoist and boiler have been put in at the St. Joe mine, above the Cash mine, near Gold Hill.——The American Queen G. M. Co. is putting in a 25-ton mill to handle the ore from the Cash mine. A tramway is to be put in between the mine and mill.——The Grand Republic G. M. Co. has been organized to work claims near Sugar Loaf.

Clear Creek County.

The West Griffith, near Empire, operated by the Independence M. Co., is working full force. The management is thinking of putting in a concentrating plant to handle the lead and zinc ores blocked out in their workings.——The East Griffith, on Griffith mountain, is being worked. W. D. Hoover has just taken a trip East, and it is understood that on his return he will let a contract for a concentrating plant to treat the ores of the property.

It is reported that the Manhattan-Union M. Co. intends to put in a concentrating plant to treat the ore from the Kittie Ousley mine in East Argentine district, near Georgetown. Edw. Wing is manager.

Manager B. J. Martelon of the Silver Leaf tunnel, which is being driven into McClellan mountain, near Silver Plume, has temporarily suspended operations pending arrangements for machinery.

The Blue Bird group, on Republican mountain, near Empire, is to be worked during the winter by D. W. Stewart under lease and bond.

Dolores County.

The United Rico Mines Co. has begun work on the fourth level of its Yellow Jacket mines on the slope of Nigger Baby hill, near Rico. The remodeling of the company's Group Tunnel mill has been completed and will handle ore from the stopes on Enterprise verticals. Each stope is to be milled separately to the extent of 500 tons.

Eagle County.

Scott & Reed have taken a lease on the Combined Discoverer, west of Rock creek, near Red Cliff, and have a shipment of ore ready.

Fremont County.

The Rocky Mountain smelter, at Florence, recently bought by the Colorado S. & R. Co., has finally been

freed from litigation. The works were built five years ago and ran for a few months and have been closed since, owing to litigation brought about by quarrels among the stockholders. J. M. Harsh of Creston, Ia., is president of the new company with C. G. McCarthy of Des Moines vice-president and E. L. Whitney of Colorado Springs as secretary. President Harsh says the smelter will be running not later than February. The ore supply is not yet definitely secured, but the company will either buy mines outright or enter into combination with the big mine owners. The plant has a capacity of 500 tons a day. About 150 men will be employed. The plant is south of this city on 160 acres donated by the city government as a bonus for its erection. The plant is in first-class condition after five years' idleness.

Gilpin County.

W. Barrick, superintendent of the Apex Gold M. & M. Co., has bought the Trio and September lodes, in the Pine Creek mining district, near Apex, and will organize a company to work them. M. Whalen has charge of the work.——The Ingram M. Co., operating the Ingram mine in Apex, have sunk the shaft to a depth of 115 feet from the top and are 70 feet from the tunnel level. The company will commence shipping within the next month. I. Pollard is manager and J. Ingram is superintendent.

W. A. Hopkins of Central City, who is leasing on the 555-foot west level of the East Notaway mine in lower Russell district, has received returns from a carload shipment of smelting ores, netting $198.98 per ton. The ores contained the following values: 10.23 ounces gold, 7.32 ounces silver and 3.96% in copper per ton.——A deed has been placed on record conveying from L. C. Beckwith to T. R. Webb of Argentine the Redemption lode claim, situated in the Lake district.——The Hall mine in Russell district has again been started up by its owner, Isaac Hall, and work is to be carried on by its owner in the 100 and the 200-foot levels.——Local operators are working the Eureka mine in Prosser gulch, owned by J. C. Henkins.

The Pozo mine in Nevada gulch, near Central City, is worked principally for its zinc values, although some of the ore gives values of from two to three ounces gold per cord. The shaft on the Pozo is 165 feet deep. A new plant is to be put on the property. A. W. Rucker is manager.——R. W. Pearce of Nevadaville and County Treasurer Trezise are operating the Ute mine in Nevada district and are shipping to the mills in Black Hawk. The main shaft on the Ute is 650 feet deep, but operations are being confined to the 300-foot east and west levels. They are also sinking a winze on the 300-foot level for prospecting and to afford better ventilation.

The O. K. group on German hill in the Gregory district, near Central City, has been sold to Denver and Eastern parties for $50,000 by A. Anderson. The group consists of the Epizootic, Dean and Casco lodes.

Lake County.

At a depth of 700 feet the President shaft at Leadville was still in wash. G. F. Burtch is manager.

F. J. Hoffer will put in new machinery on the Hoffer No. 1 shaft being sunk on the Bob Ingersoll claim, near Leadville.

The ore output from Leadville during November was 77,500 tons, as against 90,000 tons for October. The decrease is due to the fact that many of the smaller operators, especially in the silver iron mines, were unable to work their claims owing to inclement weather. Many of the shafts are exposed to the elements and the cold weather interferes with the work of hoisting.

La Plata County.

(Special Correspondence).—The lower tunnel on the May Day has cut the vein at a depth of 750 feet and it is said to be larger and richer than above. Heretofore an output of twenty-five tons per day has been the limit, but this may now be increased, since ore may be dumped directly from the mine cars to the bins, from which it will soon be taken by railroad cars, for the owners have let a contract for the building of a spur 2 miles in length to connect the R. G. S. Ry. at Cima, 15 miles west of Durango. It is to be completed in thirty days.——The 50-stamp mill of the Bonnie Girl is completed. The tramway is finished and development of the mines is being pushed. Mr. Allen is to have charge of the property.——The Small Hopes tunnel is in 1500 feet, where it is expected to cut the vein; but a careful survey shows that it will still be necessary to run 50 to 200 feet. As the dip is not constant the distance can only be guessed at.——The Chief M. Co. has had buildings in readiness for some time for their compressor plant.——The Old Kentucky, on the East Mancos, has made a shipment of twenty tons to Denver for test, with a view to putting in a reduction plant in the spring. D. H. Franks, of Mancos, is manager.——The first heavy snow fell on Nov. 22, and the prospecting season in the La Platas is over. A number of new prospects have been opened the past season and the camp has made the best progress in its history.

Mancos, Dec. 2.

Ouray County.

It is reported that the Grecian mine, on Mt. Hayden, near Ouray, is to be opened up and a mill built to separate the zinc and lead. R. W. Clinton is the owner.—The Micky Breen mill of the Tempest Ajax Co. at Ouray has been remodeled, and hereafter the concentrates are to be separated into zinc and lead products. F. M. Jackson is manager.

San Juan County.

The mill of the Hercules Con. M. Co., south of Silverton, is being overhauled and gotten into shape for the resumption of operations after a protracted idleness. To accommodate the new machinery and appliances that are being installed, an addition of 30x65 feet has been built. Ten more stamps will be added to the equipment, making 40 in all. The steam power is to be increased to 275 H. P. During the past summer a big force has been employed in developing the mine, and it is stated that there is already enough ore of good quality in sight to keep the mill running double shift all next year.

San Miguel County.

The Adams property, near Telluride, is under lease to George Lee and M. Weiss of Telluride. The 10-stamp mill on Bear creek has been started.——A. A. Clute, manager of the Goldfield-Rex M. Co., which had a contract for extending the Pennsylvania tunnel to the Smuggler-Union vein and which has a long-term lease on a portion of the Smuggler-Union vein, has closed down prospecting and exploitation work on the Contention mines, in Bear Creek basin, near Telluride.——Work on the Vanadium Alloys Co.'s experimental plant at Newmire, on the San Miguel river, 14 miles below Telluride, has been retarded by inability to secure lumber and brick as rapidly as needed. The mill is being built for the treatment of vanadium ore on Bear and Leopard creeks, the former emptying into the river at Newmire, opposite the mill, and the latter at Placerville, 6 miles below. Vanadium ore has been found on both sides of the San Miguel river between the two creeks. W. T. Rynard has charge of work.

L. Neilson, H. H. Hutton, C. Flodman and F. Williams have a lease on the Morning Star claims on Bilk creek, in the Mount Wilson district, near Telluride.——The Keystone placer, on San Miguel river, 5 miles below Telluride, has been closed down for the winter by the Keystone Hydraulic M. Co.——The low-grade ores on the dumps of various properties in the Sawpit district, 17 miles below Telluride, will soon commence to be worked over. Two small custom mills are being built. One of them, containing five stamps, is being built by H. Revelер, W. Pomeroy and Mr. Weeks, while the other is being put in by Denver parties. There never has been a quartz mill at Sawpit, and the ore that has been shipped from there had to carry values sufficient to pay railroad transportation and smelter treatment, consequently the greater portion of the mineral taken from the mines was thrown on the dump as too low grade to ship. There are said to be thousands of tons of this character on the dumps which, if concentrated, will return profits.

Summit County.

(Special Correspondence).—Near Montezuma the Sarsfield and the Wild Irishman mines are being put in shape for continuous work during the winter. The Fisherman is being worked on lease. The El Dorado group on the Snake river, 2 miles from Montezuma, is being worked on lease.

Montezuma, Dec. 2.

(Special Correspondence).—The Beaver Creek M. Co. is making steady shipments of ore and concentrates. The ore is being taken from the Lucky shaft, which has a 4-foot streak of ore and concentrating matter. The same company is working the Carbonate mine on Mount Baldy.—— The Washington mill was closed down for a few days to put in an electric light plant to light up the mine, mill, boarding and bunk houses and offices.—— Condon & Shrack have opened up gold-bearing sulphide ore in a winze sunk 40 feet below the lowest level in the Pacific Gold Dust mine.

Breckenridge, Dec. 4.

The Old Union M. & M. Co.'s mill, near Breckenridge, is running night and day, and the installing of their new screens has proven a success. The mill is taking the crude ore, which runs 17% zinc, 17% to 20% lead and 17% to 20% iron, with gold and silver values, and is making a lead product of 33% to 40%, zinc product from 35% to 40% and a clean iron product. The tailings assay 2% zinc and 1% lead.

Teller County.

The Oro shaft, on Ironclad hill, near Cripple Creek, is down 120 feet and is to be continued to the 150-foot level by the Oro Leasing Co. C. F. Springer is manager.—— It is reported that ore has been struck in a crosscut from the 350-foot level of the Montrose, on Ironclad hill, being worked by Van Fleet and associates.——The shaft on the South Burns block of the Acacia, near Altman, is down 440 feet.——McClary & Co. have struck ore at a depth of 100 feet in Block 3 of the Ajax, on Battle mountain.——Shaft sinking is to be carried from the 200 to the 500-foot level of the Finn lode claim of the Royal Oak G. M. Co., under the direction of C. B. Wider of Cripple Creek.——Work has been resumed on the North Fork claim of the Empire State M. & T. Co., on Ironclad hill. Sinking is to be continued from the 160 to the 300-foot level.

IDAHO.

Blaine County.

(Special Correspondence).—A discovery is reported west of Hailey by P. Deliny and J. Montgomery near the Crœsus mine. The ore is a sulphide, with brilliant silvery luster. Assays show from 60% to 75% of metallic bismuth in concentrates and the sulphide in the quartz is from 3% to 15%. As a little depth is gained, an increase in the bismuth is noted. Preparations are being made to block out ore and for reducing the ore to metallic bismuth on the ground.——Several old mines in the Wood River section are also starting up again.

Hailey, Dec. 4.

The Wood River Zinc Co. of Hailey has 1000 tons of War Dance ore stock piled at its mill at the mouth of War Dance gulch, on Deer creek. The mill is not running, because it is not adapted to the ore. Changes are intended, such as the addition of jigs and of hydraulic sizers.

Shoshone County.

The German-American claims, near Osburn, are being developed.——Supplies have been delivered to the Polaris mine, near Osburn, for all winter work.——A compressor has been put in at the Central group on Idaho gulch by Walker Bros. of Murray. Work is to be started on the lower tunnel.

MISSOURI.

Jasper County.

J. M. Baulby of Iowa, Norman Scurman and Albert Thomas of Webb City, last spring took a lease on six lots of the McCrosky lease north of the old Nevada land in Webb City. They have now completed their mill and made their first turn-in of zinc ore, amounting to 56,880 pounds.——A contract has been let by Webb City people for the building of a mill on the Burch land, north of the Underwriters' Land Co.'s land, north of Webb City. There will be three or four mills built on this land within the next few months.——The Grace M. Co., operating on the Granby M. & S. Co.'s land in the Chitwood district, has made an exceptionally rich drill strike at a depth of 143 feet. The drill has already shown a 20-foot face of ore.

MONTANA.

Granite County.

The Tussle M. Co., which recently took a bond on the Frank Wahlgren property on Little Gold creek, near Princeton, is shipping ore.

Jefferson County.

The Blackwell-Golden Crown claims, including the Blackwell mine and mill, have been absorbed by the Sunset National M. Co. The new company owns 160 acres, representing nine claims, near Homestake. Improvements on the property consist of a 10-stamp gold mill, cyanide plant, concentrating tables and assay office. Two shafts have been sunk, one 117 feet deep and the other 230 feet deep.

Madison County.

Dredgers near Alder are still at work and will continue into the winter. The Conrey Dredging Co. has begun work on an electric plant at Alder.

Silver Bow County.

(Special Correspondence).—The properties under bond to the East Butte M. Co. have been examined by J. W. Neill of San Francisco. Mr. Neill spent several weeks in the mines and his report will soon be in the hands of New York and Boston parties who are interested in the flotation of the mine. He says the property under option is among the best in the Butte district, and it is expected that his report will be favorable. The company has taken a bond on nearly 300 acres more of mineral ground, and will use a portion of it as a site for a concentrator to be built immediately, and a smelter site, should one become necessary in the future. Without any further development or equipment the mines are capable of producing daily about 200 tons of first-class ore and 500 tons of second-class for concentrating. While Mr. Neill was examining the properties a most fortunate development occurred. In the Yankee Boy mine, one of the properties of the group, a new vein 9 feet wide was opened at a depth of 350 feet, and in the Dutton 3 feet of copper glance was cut in a winze from the 300-foot level. The glance runs 60% copper and the vein in the Yankee Boy about 14%. Mr. Neill, who made the examination, was for some time chief engineer and mine director for F. A. Heinze, and is now consulting engineer for the Pittsburg & Montana Co.——Through economies at the Washoe smelter and the discovery of richer ore bodies the Anaconda Co. has reduced the cost of its copper production nearly 1 cent per pound. Copper is costing the company little more than 9 cents per pound now. The company is working eight mines at present. They are, with their shaft depth, as follows: Anaconda, 2450 feet; Never Sweat, 2440 feet; St. Lawrence, 2000 feet; Bell, 1600 feet; Diamond, 2200 feet; Mountain Con., 2200 feet; High Ore, 2200 feet; Wild Bill, 400 feet.—— The North Butte Co. has acquired the Gem mine and has options on half a dozen others, many of which will be taken up. The new hoisting engine, which was due in Butte December 1, has not yet arrived, owing to delay in transportation, but it will be in place in a few weeks. The company continues to mine its properties through the shaft of the High Ore mine and hoists about 550 tons of ore a day. Only the very highest grade of ore is being mined and it yields from 150 to 155 pounds of copper per ton.—— Development work is still going on in the Raven mine and some good ore has been found in the crosscut at 1200 feet from the Buffalo shaft.

Butte, Dec. 5.

The annual report of the Deputy State Mining Inspector shows the number of men employed by the principal Butte companies, above and below ground, and the present depth of shafts:

	Underground Men.	Top Men.	Shaft, Feet.
Amalgamated—			
Anaconda mine	580	146	2,450
Never Sweat	440	66	2,440
St. Lawrence	420	56	2,600
Bell	220	20	1,600
Diamond	320	10	2,200
Mountain Con	282	54	2,200
High Ore	311	53	2,200
Wild Bill	57	3	400
Sunnyside	15	2	700
Gallatin	25	3	250
Leonard	332	225	1,300
West Colusa	354	37	1,600
Pennsylvania	300	60	1,800
Mountain View	388	59	1,800
East Colusa	112	15	900
Gagnon	340	38	1,950
Grey Rock	180	26	1,600
Parrot	300	20	1,900
Silver Bow No. 1	129	27	1,000
Original No. 6	10	3	1,000
Berkeley	25	9	800
Moscow	6	3	....
Moonlight	150	39	1,300
Clear Grit	13	7	600
Cambers	72	8	200
Montana Ore Purchasing—			
Rarus mine	377	101	1,500
Corra	350	54	1,600
Minnie Healey	282	32	1,100
Lexington	50	10	1,450
Belmont	69	11	900
North Butte Co.—			
Speculator	400	67	1,600
Jessie	..	..	800
Carlisle & Protection	4	2	....
Clark's Mines—			
Original	324	63	2,200
West Stewart	280	20	1,900
Pittsburg & Montana Co	111	87	1,200
Totals	8,884	1,436	

The shaft of the Pennsylvania mine was sunk 300 feet during the past year, that of the West Colusa 200 feet, Never Sweat 406 feet, St. Lawrence 122 feet, Original 200 feet, West Stewart 200 feet. The Pittsburg & Montana Co. has two shafts of 1200 feet each.

The Hanson, Kennedy & Bryant Co., on Silver Bow

creek, near Butte, have put in a copper precipitating plant. The plant is composed of a tower 56 feet long, 16 feet high and 6 feet wide, and is divided into nine floors, which are made of 2x4 lumber, allowing 2-inch spaces for water to fall through onto the next floor below, and so on to the bottom. The bottom floor is made tight, and adjoining this floor are four settling tanks, all in connection with each other, and by such arrangement the water is held until it deposits the precipitates carried from the iron in the tower into the tanks. The tanks are so arranged that during cleanup time one or more can be disconnected from the others. Each floor is covered with scrap iron, requiring about 150 tons for the first filling. The water is obtained from Silver Bow creek by means of a dam with a headgate so arranged that any amount of water desired can be taken into the ponds. The banks of the ponds are made up of tailings washed on the flat from the old Parrot smelter. These tailings carry about 3% copper. When the ponds are filled with water a great amount seeps through these banks, which makes the water valuable for its copper contents.

The Amalgamated Co. has begun sinking the shaft of the J. I. C. mine in the East Butte district, and will put it to a depth of 2000 feet. The J. I. C. has been worked for some years. The J. I. C. adjoins the properties of the East Butte Co. They have started to prospect mines east of Butte and are sinking a shaft on the Greenleaf, owned by the Boston & Montana Co.——The shaft of the North Butte has been reconstructed and the output of the mines will be increased one-third. Next March the new hoist will be put in.——In a suit of F. A. Heinze and the Johnstown Mining Co. against the Boston & Montana Mining Co., known as the Gambetta-Piccolo case, the district court has denied the defendant permission to do some development work in the Minnie Healey mine, one of the Heinze properties, for the purpose of demonstrating the truth or falsity of the plaintiffs' contentions. Heinze claims that the veins of the Minnie Healey dip to the north and under the Piccolo and Gambetta mines of the Boston & Montana, and that the ore the Boston & Montana has taken out in years past really belonged to the Minnie Healey. Heinze obtained an injunction several years ago by which the Boston & Montana has been prevented from mining in that particular portion of the property. The Boston & Montana Co. has always maintained that the claim of the Heinze interests was not sincere, but that the action was brought as a gamble when Heinze had friendly judges on the district bench. The Boston & Montana therefore asked permission to go into the Minnie Healey mine and open the ground to such an extent that it could be determined whether the Minnie Healey veins dip to the north at that point or not. The application, however, was resisted by the Heinze lawyers and Judge Bourquin sustained their objection because the petition as to the necessity of the work was held not to be sufficient. The company was, however, given permission to renew the application.

NEVADA.

Esmeralda County.

The Tonopah-Goldfield Railroad has issued a tariff sheet which probably will result in moving low-grade ore that could not be handled under the old tariff. These rates are in effect Dec. 5, between Goldfield and Tonopah and Mina only, as this is the terminus of that road, although most of the ore has been shipped to Salt Lake, Utah, or Vallejo, Cal. The tariff for 2000 pounds or less follows: From Tonopah to Mina—Ore value not over $30, $1.50; between $30 and $40, $2; $40 and $50, $3; $50 and $60, $3.25; $60 and $70, $3.50; $70 and $80, $3.75; $80 and $90, $4; $90 and $100, $4.25. From Goldfield to Mina—Ore value not over $30, $2.10; between $30 and $40, $2.80; $40 and $50, $4.20; $50 and $60, $4.55; $60 and $70, $4.90; $70 and $80, $5.25; $80 and $90, $5.60; $90 and $100, $5.95.

NEW MEXICO.

In addition to an address upon the mineral resources of New Mexico at the American Mining Congress at El Paso, F. A. Jones of Albuquerque gave out the following resume of mining conditions in a number of active New Mexico mining camps: About Elizabethtown, in Colfax county, the operations of the placers are greater than formerly. The Oro Dredging Co., operating with a dredger at Elizabethtown, will take out $100,000 this season. The season here is seven months long, on account of freezing up in winter. This company has been operating for five years. Several small hydraulic concerns are operating here also with considerable success. ——About Red River, in Taos county, there was recently made a rich strike of petzite ore which is rich in gold and silver.——In the Bromide district, in Rio Arriba county, the 6000-foot tunnel on the Bromide mine is in about 600 feet. It will tap a number of deposits. The Dillon Dev. Co., which is working the Tampa mine, has some machinery on the ground for a 50-ton concentrating plant. The ores are sulphides of copper, carrying gold and silver, and some of the ores are said to carry platinum values. The property is owned by the Tusas Peak M. Co.——Northwest of Bromide is the Headstone district about Hopewell, where the King William M. Co. is operating. The lower flat placers are worked by the hydraulic method. The season is just closed, as the ground is freezing up. The company is building storage reservoirs, and expects to have enough water to run through all next summer.————In Lincoln county about White Oaks the present shaft of the Old Abe gold mine, 1375 feet deep, is to be sunk 250 feet deeper. This is the deepest shaft in New Mexico. The Old Abe coal mine, belonging to the same company, is being operated to supply the local trade.——At Parsons, in Eagle mountains, the Eagle M. Co., J. M. Rice general manager, is putting in new milling machinery. The processes are amalgamating and cyanide, and Huntington mills are used.——In the Jicarilla mountains, in Lincoln county, W. A. McIvers is building a 50-ton concentrating plant to do custom work.

OREGON.

Baker County.

The Valley Queen mine, near Cable Cove, has been consolidated with the adjoining claims of the Ophir Co. T. C. Gray will continue as manager. Work will be continued throughout the winter.——Manager E. I. Field, of the United Elkhorn mines, near Baker City, has removed his air compressor from the camp at the 2000 level, where it has been in operation by water power, to the mine on top of the hill, where he has put a 75 H. P. electric motor. He is also putting in a new movable electric hoist, to be used on the third and fourth levels.

The Gold Coin mine, near Durkee, owned principally by Pendleton capitalists, is to open this winter. It is 20 miles southeast of Baker City.

Jackson County.

Manager H. Foster is adding ten stamps to the Opp mill, near Jacksonville, making a total of twenty.

Josephine County.

A. C. Hoofer of the Mount Pitt mine, near Grants Pass, says that he intends to put in a three-drill compressor.——The Black Channel M. Co. has sold its placer properties on Foots creek, near Grants Pass, to W. P. Bailey, who is getting it ready for a winter run.

The bedrock flume on the Galice Con. Mines Co.'s property has been completed from the mouth of Galice creek to Mill bar, which the company expect to work this winter. There are 15 acres in this bar, bedrock varying from 6 to 10 feet. Four giants are operated and twenty men employed during the working season. The ancient channel, which crosses the Galice country at an elevation of 800 feet above Rogue river, is to be worked under lease by J. R. Harvey. Water is brought 5 miles from the Galice and three giants are used.——The Rand and Almeda properties, 3 miles below Galice, on the opposite side of Rogue river, are to be consolidated.——The Black Jack group on Quartz creek, a tributary of Galice, is being opened up by R. Jackson.

UTAH.

Juab County.

The output from the mines of Tintic for the week ending November 30 was the largest of any week during the present year, amounting to 160 carloads. Ridge Valley, 3 cars; Bullion-Beck, 8; Gemini, 19; Eureka Hill lease, 9; Centennial Eureka, 46; Swansea, 8; Eagle & Blue Bell, 8; Uncle Sam Con., 6; Yankee Con., 7; May Day, 2; Brooklyn Con., 3; Dragon Iron, 6; Carisa, 5; Mammoth, 14; Victoria, 5; Grand Central, 9; Ajax, 2; total, 160 cars.

T. Manion, superintendent of the New Utah property, near Eureka, reports that the new hoist is working well and the sinking of the incline shaft is in progress.——Work has begun on the Logan claims, south of the Bullion-Beck mine, at Eureka.——M. M. Kellogg of Provo has made arrangements to have work commenced on the Ralph and Lilly claims in East Tintic. ——The machinery from the old Martha Washington mine at Silver City has been removed to the Copper Jack mine in West Tintic and installed and development work on that property will be begun immediately by C. C. Griggs, J. C. Jensen, G. Hanson, et al.

Salt Lake County.

The mill of the Shawmut Con. C. Co. at Bingham is to be run on custom ore. A deep tunnel is to be driven to cut the vein. F. A. Darrenougue has charge of work.

Utah County.

P. Adamson of American Fork has stopped work for the winter at the Scotchman mine.——It is reported that good ore has been struck in the Copper King mine of the Silver Flat M. & M. Co. in American Fork canyon. Work is to be continued during the winter.——The Goodsell mine is to be worked during the winter. J. H. Wooten of American Fork is manager.

WASHINGTON.

Ferry County.

A new hoist has been put on the Defender mine, near Orient, and the shaft is to be continued to a depth of 300 feet. J. T. Dolan has charge.

Okanogan County.

The Prize M. Co. has struck a new ore shoot on Mount Elemeham, near Nighthawk.

Stevens County.

It is reported that a concentrator is to be put in at the Daisy mine, south of Kettle Falls.——Work is to be resumed on the Acme mine, near Kettle Falls.

WYOMING.

Natrona County.

J. H. Bury and A. E. Minium, owners of the asbestos deposits southeast of Casper, are making preparations to develop their mines and begin shipping.

FOREIGN.

AFRICA.

Gold Coast.

In a Governor's recent report it is stated that the climate is malarious and not suitable for the prolonged residence of Europeans. European employes, belonging to mining and mercantile communities, are engaged in England. There is little hope of obtaining employment, and Europeans should not come to the Colony on the chance of obtaining employment, where the openings for white labor are few. The rates of wages are high, and the cost of living has considerably increased in recent years, particularly in the Western Province, which is the center of the mining industry. The rate paid by the Government for carriers has been reduced from 1s a day and 3d a day subsistence, to 25s a month with the same amount for subsistence; short journeys to and from the principal coast towns are at a fixed rate. Contractors at Accra and Cape Coast supply the Government with carriers. Native carpenters and masons can earn 1s 6d to 3s a day; bricklayers 1s 6d; to 2s 9d; coopers and painters, 1s to 1s 9d a day. The rates of wages paid to native miners vary from 1s 3d to 1s 6d a day for surface laborers, and 1s 9d for underground work. The Government Transport Department have done valuable work in organizing and regulating the employment of labor for the mines in the Western Province, and it is mainly by the efforts made by this Department that the rate of labor has been reduced to the present figure. The laborers sent to the mines by the Transport Department are hired on contract for six months or a year, and, with the exception of occasional advances, do not drawn their pay until their contract is completed. Laborers receive subsistence money, whether they work or not, until their contract is finished. While there is no doubt as to their being a sufficiency of labor on the Gold Coast, supplemented as it is at present from other Colonies, complaints are made as to its quality. The value of a gang of laborers usually varies with the ability of the European in charge. One overseer will condemn as worthless a gang out of which another will get excellent results. Under efficient supervision, or working on a fair system of daily task work, a fair day's work is generally obtained.

CANADA.

BRITISH COLUMBIA.

Boundary District.

Boundary Falls smelter has been blown in by W. C. Thomas, smelter superintendent for the Dominion Copper Co. One furnace is now in commission, reducing about 350 tons daily from the company's Brooklyn, Stemwinder and Rawhide mines. The second furnace will be blown in later. This makes a total of over 3000 tons of ore daily now being shipped from the mines of Phœnix camp, the Granby output being 2700 tons a day.

Boundary ore shipments for the week ending December 2 were as follows: Granby mines to Granby smelter, 17,633 tons; Mother Lode to British Columbia Copper Co.'s smelter, 3717 tons; Brooklyn and Stemwinder to Dominion Copper Co.'s smelter, 1170 tons; Rawhide to Dominion Copper Co.'s smelter, 480 tons; Sunset to Dominion Copper Co.'s smelter, 360 tons; Providence to Trail smelter, 30 tons; Skylark to Granby smelter, 30 tons. Total for week, 23,420 tons. Total for year to date, 833,744 tons. Boundary's three smelters treated ore as follows this week: Granby smelter, 17,960 tons; British Columbia Copper Co.'s smelter, 3717 tons; Dominion Copper Co.'s smelter, 2010 tons; total for week, 23,687 tons. Total for year to date, 857,184 tons.

Cassiar District.

In a recent report of the Provincial Bureau of Mines, W. F. Robertson reports on mining conditions on Windy Arm, a branch of Tagish lake, the claims being near the boundary line between British Columbia and Yukon Territory. The district is reached from southern British Columbia by steamer to Skagway, Alaska, thence over the White Pass & Yukon railway to Carcross. Steamers from Victoria and Vancouver to Skagway run every week, with additional steamers from Puget Sound ports, on which the first-class fare is $30. From Skagway to Carcross the White Pass railway runs a passenger train every day, except Sunday, the year round. The railway fare is $12.25. From Carcross to Conrad City, the terminus on Windy Arm of the aerial tramway from the Conrad Consolidated mines, is 14 miles by navigable water. During the summer season transportation is provided by the steamer Gleaner, which makes two trips a week, or by rowboat, while after the ice forms travel is by sleigh over the ice. The White Pass railway has made two surveys for a branch to Conrad City. The older mineral locations, together with all the development at present accomplished, is in the Yukon Territory, and, consequently, outside the jurisdiction of the Province of British Columbia. From the shore of Windy Arm the hills rise rapidly, their lower levels being so covered with wash and slide as to have confined all prospecting to the upper levels—that is from 1500 to 4000 feet above lake level. Timber line in this part of the country is found to be at an altitude of from 4500 to 5000 feet above sea level, or about 2500 feet above the lake. The Conrad Consolidated mines, of which J. H. Conrad is president, holds ten claims, at an elevation of from 3000 to 4000 feet above the lake, in a level basin among the higher peaks, 4 miles from the Arm. The surface is covered with heavy wash or slide, in which rich float was found in such a well-defined line as to induce pits and cross-trenches to be dug until the vein was eventually struck in the solid formation upon the Montana, one of the central claims of the group. On this lead a drift has been driven for from 200 to 300 feet, giving a depth of 100 feet. From this level stoping had been carried up in places for about 30 feet. The vein is a quartz fissure vein between distinct walls. The hanging wall is the general country rock, a fine-grained, basic, intrusive rock, and the foot wall is a decomposed, rusty, coarsely crystalline, igneous rock, probably a diabase. The vein, as exposed, had a thickness of from 2 to 5 feet, averaging 3 feet. The strike of the vein was northwest and southeast, with a dip to the southwest into the hill, averaging 25°. On the footwall was found a layer from 3 to 12 inches thick of galena embedded in "carbonates," or iron oxides. Above this is the quartz proper, from 12 to 30 inches thick, mineralized with iron pyrite and silver and antimony sulphides. The manager estimated the entire vein to run $25 to the ton in gold and silver. On the strike of the vein as indicated by the Montana workings, a tunnel was driven on the Mountain Hero, the adjoining claim, through wash for 80 feet, when the solid formation was struck, in which a 50-foot raise was made, when the vein was found containing similar quartz ore. The company has a Riblet aerial tramway, 3¾ miles long, from the Montana group to the shore of Windy Arm at Conrad City, and will continue work all winter. The J. H. Conrad Bonanza has the Venus vein and the Uranus claims. From both of these properties tram lines have been surveyed and the right of way cleared to Windy Arm, at a point 2⅜ miles to the south of Conrad City. There are probably 100 more claims located on this slope, on which slight surface development has been done.

East Kootenay District.

C. A. Mackey, of Nelson, has been granted a permit

by the gold commissioner to prospect for a lode or vein of mineral under Lake Moyie, between the Lake Shore and Aurora mineral claims. The permit granted is for a shaft or tunnel site, and is for three months. A shaft is to be sunk on the Lake Shore ground near high water mark, to a depth of 200 feet and drift run in search of the vein which is supposed to extend below Lake Moyie.

Nelson District.

The Supreme Court of Canada has delivered judgment in the mining case of Docksteader vs. Clark. The highest Canadian tribunal practically decides that in deciding mine lo ation cases technicalities will not prevail. Specifically the court finds in location cases: 1. That 70° is too great a variation to allow as an approximation, though no exact limit was fixed. Ninety-seven degrees was the point involved. 2. That a location may be wholly on one side of location line. 3. That a location line may traverse any number of claims. 4. That a discovery post may be located even upon a crown granted claim. The decision is clear that such ground as may be lawfully covered by the location is to be allowed. From a mining standpoint the finding is one of the most important ever given in the Dominion. By consent the decision governs thirteen other pending actions.

Rossland District.

A reduction of 5 cents a ton has been made by the Canadian Pacific Railroad in the transportation rate on ore from Rossland to Trail. The price was 35 cents a ton and this has been cut to 30 cents. This will make a saving of about $16,000 a year for the mines of the camp. The White Bear at Rossland will resume on December 15 provided the new 400 H. P. electrical motor is ready. Shipments for week ending December 2 were: Le Roi, 2310 tons; Center Star, 1400; War Eagle, 1000; Jumbo, 200; total for week, 5180, and for the year, 303,-183 tons.

Slocan District.

After a trial which has lasted nearly two years, Chief Justice Hunter has given judgment in the suit of the Star M. & M. Co., owned by J. M. Harris of Sandon and others, against the Slocan Star M. Co., owned by Byron N. White of Spokane, Wash., and others. Judgment is in favor of defendants. The Slocan Star M. Co.'s claims are the Slocan Star and Silversmith, south of the Star M. Co.'s properties, the Heber and the Rabbit Paw. All the claims were located under the old mineral law, now abolished, which permitted the pursuit of a vein having its apex on the property into any adjacent lateral property. On the fifth level of the Slocan Star a vein which had its apex on that property was pursued northward into the Heber and followed through a curve which bent to the west and then to the south through a corner of the Heber and of the Rabbit Paw, back into the ground of the Slocan Star M. Co., in the Silversmith claim. It was contended by W. J. Elmendorf of Spokane, Wash., on behalf of the Slocan Star, that the vein pursued was continuous, and that, therefore, the company has a right to all the ore they could extract from it, whether in their ground or in that belonging to the Harrises. To the contrary, John Sizer of Butte, Mont., for J. M. Harris, maintained that a black fissure vein in the Heber cut off the vein, and that the vein pursued on the other side of that alleged fissure through the Rabbit Paw was not the vein originating on the Slocan Star. On the first hearing of the case there was this direct conflict of evidence, and an adjournment was taken for the execution of further work to prove the theory of either party. This was supposed to be done under the direction of S. F. Parrish, then manager of Le Roi mine. Mr. Parrish was taken ill and delay supervened. Finally Chief Justice Hunter, with the rival mining engineers, surveyed the property. On the hearing of the evidence then tendered the owners of the Heber and Rabbit Paw wanted yet more work done, as that already accomplished did not convincingly demonstrate the correctness of the theory advanced by Mr. Sizer. This the chief justice refused. The judgment, therefore, is that the vein is continuous, and that its contents belong to Byron N. White and the other shareholders of the Slocan Star Co.

West Kootenay District.

In a recent bulletin of the Provincial Bureau of Mines H. Carmichael says that Big Bend district is that portion of British Columbia north of the Canadian Pacific Railway and enclosed by the Big Bend of the Columbia river, having an area of approximately 2300 square miles. Crossing the Canadian Pacific Railway at Beaver Mouth, the Columbia river flows northwest for 60 miles, when it takes a sharp turn to the left and flows south, again crossing the railway at Revelstoke, 76 miles south of the Bend. With the exception of a few rapids, the river is navigable for boats or canoes for the entire distance, and the only bar to steamer navigation is at La Porte, 40 miles above Revelstoke, to which point a stern wheel steamer now ascends twice a week from Revelstoke, the return journey being made in one day. The entire region is rugged, the mountains rising rapidly from the Columbia river. The lower hills and benches are covered with a heavy growth of timber, consisting of Douglas fir, cedar and white pine, timber line being reached at an altitude of 6000 feet above the river, or 7500 feet above sea level. Prospecting in the region above timber line is easy, compared with the densely wooded portions of the Province. Communication will undoubtedly be better in the future, so that this section appears to offer a favorable field for the prospector. The J. & L. group is on Goat mountain, at the head of the east fork of Cairns creek. The group consists of five claims—the Eli and J. & L., owned by L. T. George and J. P. Kelly; the Badger, owned by J. P. Kelly, and the Annie M., owned by E. McBean and J. P. Kelly. The foot of Goat mountain is reached by a trail from Cairns creek to the forks, thence following up the east fork to the mine cabin at the base of the mountain, where it is 1050 feet above the Columbia river, the length of the trail being 9 miles. The work done on this property shows that there is a vein or impregnated zone in the schist country rock and along a contact with limestone extending from high up the mountain to the creek below, varying in width and mineralization. In places the ore is solid, carrying good values; in others, concentration would be required. The work which has been already done amply justifies further development. The values are in zinc, copper, gold and silver. The Standard group embraces eleven claims, and is owned by the Prince M. & D. Co. of Revelstoke. The property is on a small divide between two forks of the headwaters of one of the southeast branches of Downie creek, flowing into the Columbia river. The claims are reached from the Columbia river by a trail 12 miles long, following up Five-Mile creek and crossing over the divide into Downie creek. The altitude of the divide is 6000 feet above the Columbia, about 7500 feet above sea level, and is just above timber line. The summit is clear of timber. The country rock is a well marked schist, interbanded with limestone, and outcrops of quartz, often carrying minerals, are numerous. The lowest tunnel crosscuts the formation and was run 315 feet. At 275 feet a mineralized zone was struck and was estimated to be about 45 feet thick. Drifts were run 140 feet. A second tunnel, run at an elevation of 184 feet above the lower tunnel, struck the zone referred to at 140 feet, when drifts were run, parallel with those below, a total distance of 166 feet. At a further elevation of 120 feet above this a third tunnel was driven, cutting this zone at 150 feet, when drifts of 70 feet were run north and south. The last two levels have been connected by an upraise driven on the zone, drifts 70 feet long being run from the upraise midway between the two levels. The mineralization consists largely of arsenical iron and copper pyrites, with a little bornite. Assays of selected samples gave gold, silver and copper. Difficulties of transportation at present militate against the claims, but there is good ground for hoping that further work will prove up a property which, by offering a large tonnage of ore, will overcome this difficulty.

MEXICO.

Jalisco.

D. P. Richardson, president of the Cacoma M. & S. Co., near Autlan, states that the steam pump and steam hoist have been put in at the Vulcancias mine. Work on a 500-foot shaft has reached a depth of 125 feet. It is proposed to run a crosscut tunnel to cut this shaft. A 50-ton concentrating plant is to be put in. —— The Altamira M. Co. is cleaning out three old tunnels on its property near Ahualulco. Thirty men are working under the direction of R. R. Landrum. An air compressor and several drills will be put in and new development work taken up. W. W. Mathews of Etzatlan is president.

Mexico.

The Mexican Government has introduced as a circulating medium a new copper coin with an intermediate value between the 1-centavo copper piece and the 5-centavo nickel piece. On this subject Consul-General Parsons furnishes a synopsis of an address recently delivered by Finance Minister Limantour before the Chamber of Deputies. The Minister, in reviewing the monetary situation, in part said: "In the issue of new coins the proportion of alloy has been altered, putting them on a par in purity with the silver coins of other countries of the world. As under the new regulations the silver 5-centavo piece would have been smaller even than heretofore, a coin of nickel has been substituted, and as the new silver pieces coined—10, 20 and 50 centavos—bear to each other the proportion of 1 to 2 and 2 to 5, it was deemed desirable that a copper piece should be coined intermediate in value between the 1-centavo copper piece and the 5-centavo nickel piece, which would bear to these pieces the same relation. Consequently a 2-centavo copper piece has been coined, which will be of much use in transactions with coins of the smaller denominations. The peso remains, of course, the standard of value, equivalent now, however, to the fixed value of $0.498 gold, such value having been arrived at on the basis of the contents of the peso, 24.4388 grams of pure silver, equal to 75 centigrams of pure gold. The President, according to Mr. Limantour's statement, wishes to retain certain powers, such as the power to demonetize coins which it is desirable to withdraw from circulation, and to change, if found desirable, the design of the silver peso and to make foreign gold coins legal tender for a limited period. Mr. Limantour estimates the loss to the treasury in the reduction of mining taxes at $3,600,000 Mexican currency annually, such reduction being based on an annual production of $105,000,000 Mexican currency of gold and silver. He feels that this reduction, together with the steps taken by the Government to expedite the sale of silver bars, will compensate the miners for losses due to the curtailment of the free coinage of silver. The means through which Mexico is given a stable currency mark the most important step in advance in many years. Their enactment has greatly encouraged the investment of foreign capital in Mexican enterprises."

Sonora.

A. W. Jenks, superintendent of the Transvaal Copper Co. at Cumpas, expects to have the new smelter running within a month.

Obituary.

T. A. BENNETT, a mining engineer of high reputation, died at Lima, Peru, on November 23. It is probable that the cause of death was heart disease, from which he had lately suffered. Mr. Bennett had many friends in the profession and was associated with the Exploration Co. (London) in a copper mining enterprise in Peru.

Dividends.

December 5th the Bunker Hill & Sullivan Mining & Concentrating Co. paid dividend No. 99 of $300,000. This makes total paid since January 1, 1905, $3,255,000, and total to date $5,526,000.

Personal.

H. W. TURNER is in Alaska.

CHARLES JANIN is in Mexico.

JOHN B. FARISH is in London.

WILLIAM S. NOYES is at Chicago.

F. W. BRADLEY has returned from New York.

F. C. ROBERTS is in Mexico, with Charles Butters.

A. S. HOLLY is in Denver, Colo., from Mexico City.

G. E. ALEXANDER is in Denver, Colo., from California.

E. M. HAMILTON is at Copala, near Mazatlan, in Mexico.

PHILIP ARGALL has returned from British Columbia to Denver.

R. K. HUMPHREY has returned to Denver, Colo., from Chicago, Ill.

WILLIAM R. BARBOUR of New York is at the St. Francis Hotel.

MARTIN J. HELLER has returned to San Francisco, Cal., from Nevada.

HOWARD D. SMITH has returned from examining mines at Nevada City, Cal.

J. LINDSTROM has charge Dover & Brighton mill, Idaho Springs, Colo.

M. M. JOHNSON has returned to Salt Lake, Utah, from Greenwood, B. C.

H. L. DAY has been made manager Humming Bird M. Co. at Burke, Idaho.

CHARLES W. ABBOTT has arrived in San Francisco, from Blueridge, Oregon.

WM. BALL has resigned as superintendent Lower Mammoth mine, Eureka, Utah.

W. G. PAGE has resigned as superintendent of the Alturas M. Co., of Hailey, Idaho.

FRANK W. OLDFIELD is at Dresden, Germany. He will be in New York about Dec. 16.

J. LARSEN has been made manager X-Ray Gold & Silver M. Co. at Idaho Springs, Colo.

F. R. LYON, manager United States M. Co., at Kennett, Cal., has been in San Francisco.

C. W. MERRILL has returned to Lead, South Dakota, from a business trip to New York City.

G. W. MYERS, representing Chrome Steel Co., has returned to San Francisco from Australasia.

JOHN C. MONTGOMERY has been appointed manager in America for the Venture Corporation, Ltd.

J. M. HARPER has returned to San Francisco from the Columbia gravel mine at Forest City, Cal.

GEORGE J. MCCARTY, manager of the Creston-Colorado mine, at Torres, Mexico, is visiting San Francisco.

M. J. LIDSTONE has gone to Searchlight, Nev., to construct a 10-stamp mill for the Searchlight M. & M. Co.

F. C. GREGORY has returned to Denver, Colo., from Old Mexico, where he has been examining mining property.

REES C. VIDLER, manager Transcontinental Transportation & Tunnel Co., has returned to Georgetown, Colo., from Europe.

A. D. GASSAWAY, superintendent Union Blue gravel mine at North Bloomfield, Cal., has returned from a visit to New Mexico.

F. C. CARSTARPHEN has returned to Denver, Colo., from an examination of the power plants at Fort Collins and Boulder, Colo.

HOMER WILSON, of San Francisco, Cal., and president Wildman Syndicate mines of Sutter Creek, Cal., has gone to New York City.

D. H. LAWRANCE of Breckenridge, Colo., has been appointed consulting engineer to the Square Deal M. & D. Co., operating at Frisco, Colo.

F. M. TAYLOR is in San Francisco, Cal. The firm of Taylor & Brunton has established a branch of their ore sampling business at Tonopah, Nev.

C. F. GODDARD of the Goddard M. Co. of Wickenburg, Ariz., is in New York City. D. E. Huncsinger has charge of the mine during his absence.

A. F. HEWITT of the firm of Hewitt, Carstarphen & Co., mining and construction engineers, Denver, Colo., has returned there from Kansas City, Mo.

L. L. HUBBARD is at the Palace Hotel, San Francisco, Cal. Dr. Hubbard has been appointed consulting geologist to the Tamarack and Osceola mines, Michigan.

WM. FLICK of Garden Valley, Idaho, is superintendent in charge of Ox Bow tunnel of the Golden Treasure M. Co., on the Payette river, 20 miles north of Idaho City.

EDWIN O. DANE has severed his connection with the Imperial Copper Co. of Bell, Arizona, and is now with Cia Metalurgica Nacional, Matehuala, San Luis Potosi, Mexico.

GEO. RUGGLES has been made superintendent of all mills of the Federal S. & M. Co. He will continue to have personal charge of Standard-Mammoth mills at Wallace, Idaho.

O. Q. BECKWORTH, for several years with Fairbanks, Morse & Co., Denver, Colo., has resigned to accept a position with Cary & Fielding, at 1711 Tremont street, Denver, to have charge of the machinery department.

Commercial Paragraphs.

THE Hewitt-Carstarphen Co., 221 McPhee Building, Denver, Colo., announce that they are equipped to manage all classes of engineering. They call attention to metallurgical and mill construction, mine management, civil and hydraulic engineering and electrical installations.

THE Blake M. & M. Co., W. G. Swart superintendent, 1936 Curtis street, Denver, Colo., manufacturers of the Blake-Mosher electric separator, have been obliged to enlarge their plant on account of increasing business. The testing plant will be retained at the old place, 1936 Curtis street.

THE Union Gas Engine Co. is building eight Union engines on an order from the United States Navy Department: One 30 H. P., 3 cylinder; two 20 H. P., 2 cylinder; three 10 H. P., 2 cylinder; two 8 H. P., 2 cylinder. These engines will be direct connected to generators for wireless telegraphy stations.

THE Bedford Quarries Co. of Bedford, Ind., and the Ohio Quarries Co. of North Amherst, Ohio, have ordered eighteen Sullivan stone channeling machines of the class "Y" rigid head type, with boiler. This channeler has been developed especially for the needs of the building stone districts, and for several years has been the standard machine in use.

JOHN A. ROEBLING'S SONS CO., the wire and iron manufacturers, will build at Kinkora, 10 miles south of Trenton, N. J., a private city for the housing of its employes. Arrangements were completed recently for the erection of three workingmen's hotels and nearly a hundred private dwellings, in addition to the big hotel and the half hundred houses already erected. The building of the mill and the completion of the city will represent an outlay of more than a million dollars. All of the work is to be done in less than a year. Provision will be made within the limits of the Roeblings' city for the housing of 1000 workingmen and their families at the start, and more houses and additional hotels will be erected as the demands of the place may require. For the married men of the bosses and skilled mechanics class model homes of various sizes will be erected. These houses will be substantially built of brick and stone. They will be equipped with all modern improvements. The hotels and other public buildings will be lighted by electricity, which will also be used on the streets. Electricity will be produced on the place and gas may be manufactured there. Each of the streets will be 100 feet in width, with ample sidewalks. All houses will be erected well back from the curb lines, with grass plots in front. Trees will be planted on each side of every street and each house will have its own flower beds and shrubbery. Each house will stand alone, with plenty of air space all around it. The new town will be provided with a complete system of fire protection, including pressure mains, water to be supplied from a stand pipe 80 feet high. This is already built and is in the very center of the city. Another important feature of the town will be a street cleaning department. Great care will be taken in the sewering of the place, and no mosquito and malaria breeding pools will be allowed to exist. The whole city will be governed by a code of rules yet to be formulated by the corporation, and persons who refuse to abide by them will be excluded.

Books Received.

"Proceedings of the American Institute of Electrical Engineers" for November, 1905, contains a paper on "Performance of Lightning Arresters on Transmission Lines," by N. J. Neall, and a discussion on "Air Gap Flux in Induction Motors."

As Water Supply and Irrigation Papers 137, 138 and 139, the U. S. Geological Survey has issued bulletins by W. C. Mendenhall on "The Development of Underground Waters on the Coastal Plain Region of Southern California." Each is largely made up of a list of wells, together with details as to their condition.

"Bi-Monthly Bulletin of the American Institute of Mining Engineers" for November, 1905, contains the following technical papers: "Genesis of the Ore Deposits at Bingham, Utah," J. M. Boutwell; "The Constitution of Mattes Produced in Copper Smelting," A. Gibb and R. C. Philp; "The Origin of Vein-Filled Openings in Southeastern Alaska," A. C. Spencer; "The Limestone-Granite Contact Deposits of Washington Camp, Arizona," W. O Crosby; "The Electrolytic Assay of Lead and Copper," G. A. Guess; "The Origin of Clinton Red Fossil Ore in Lookout Mountain, Alabama," W. M. Bowron; "Anthracite Washeries," G. W. Harris; "Notes on Southern Nevada and Inyo County, Cal.," H. H. Taft; "Cost Accounts of Gold Mining Operations," T. H. Sheldon; "Manufacture of Coke in North China," Y. T. Woo; "Proceedings of the British Columbia Meeting, July, 1905, Including a Description of the Yukon Excursion," R. W. Raymond.

Trade Treatises.

The Southern Pacific Co. has issued an attractive and profusely illustrated booklet on the Yosemite Valley.

The Allis-Chalmers Co. of Milwaukee, Wis., devote Catalogue No. 128 to a detailed description of their crushing rolls. The catalogue is profusely illustrated.

The G. W. Price Pump Co. of San Francisco, Cal., have just issued an attractive catalogue entitled "Centrifugal Pumps," which describes their high-duty pumping machinery.

Latest Market Reports.

SAN FRANCISCO, December 8, 1905.

METALS.

SILVER.—Per oz., Troy: London, 29 5/8d (standard ounce, 925 fine); New York, bar silver, 64c, refined (1000 fine); San Francisco, 64c; Mexican dollars, 53c, San Francisco; 50½c, New York.

COPPER.—New York: Standard, $17.87½; Lake and Electrolytic, $17.87½ @ 18.00; Casting, $17.62½@17.87½; San Francisco: $17.75; Mill copper plates, $20.00; bars, 20@24c. London: £77 17s 6d spot per ton.

Copper remains at about the same price as that quoted last week. Lake and Electrolytic are selling at $17.87½ to $18.00 in the New York market. There are indications that this price will be maintained for a time at least, but those who anticipate a higher price will probably be disappointed.

LEAD.—New York, $5.85; St. Louis, $5.15; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £17 ℔ long ton.

SPELTER.—New York, $6.50; St. Louis, $6.20; London, £28 12s 6d ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $35.02½@35.15; San Francisco, ton lots, 37c; 500 lbs., 38c; 200 lbs., 40c; less, 41½c; bar tin, ℔ lb., 42c. London, £160 15s.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 22.00c; San Francisco, Plumbers', 100-lb. lots 19.15c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $17.35; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11½c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12½c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10½c; 10 oz. stearic, 40s, 9½c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3½c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2¼@2½c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5½c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

OILS.—Linseed, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 339 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING NOV. 21, 1905.

805,406.—WRENCH—Bolsinger & Bowen, Brockway, Or.
805,116.—DISTILLATION—G. H. Bradford, Stockton, Cal.
805,118.—DISH WASHER—C. S. Chamberlain, Emeryville, Cal.
805,008.—ROCK DRILL—W. J. Ertle, Knowles, Cal.
804,956.—PROCESS—W. E. Everette, Tacoma, Wash.
805,009.—PROCESS—W. E. Everette, Tacoma, Wash.
804,939.—RETAINING WALL—W. H. Ferguson, San Francisco.
805,419.—RAILROAD BLOCK SYSTEM—Gallagher & Gillett, San Francisco.
804,840.—GATE—C. Harris, Lower Lake, Cal.
805,015.—INSECT TRAP—Rosa Haselrigg, Eureka, Cal.
805,017.—LEACHING—T. B. Joseph, San Francisco.
805,201.—BICYCLE LOCK—E. F. Kaiser, Fresno, Cal.
804,865.—BASIN CLEANER—J. E. Keyt, San Francisco.
805,080.—FLY TRAP—J. Kress, Bisbee, Ariz.
805,019.—PUMP—F. W. Krogh, San Francisco.
805,215.—CONCENTRATOR—M. R. Lyle, Oakland, Cal.
805,216.—SQUARE—D. R. Lynch, Reno, Nev.
805,023.—HOSE SUPPORT—J. McBoyle, Oakland, Cal.
805,313.—PUMP—C. W. McGonigle, Walla Walla, Wash.
805,218.—WATCH GUARD—F. E. Mead, Represa, Cal.
805,091.—GAS MACHINE—J. F. Philpott, Windsor, Cal.
804,974.—FRUIT HARVESTER—M. E. Porter, Redding, Cal.
805,028.—ADVERTISING DEVICE—H. C. Quick, Los Angeles, Cal.
805,094.—SHINGLE GAUGE—G. Reed, Fort Bragg, Cal.
805,164.—ROTARY ENGINE—N. R. Smith, Seattle, Wash.
805,162.—ROTARY ENGINE—N. R. Smith, Seattle, Wash.
805,163.—ROTARY ENGINE—N. R. Smith, Seattle, Wash.
805 033.—OAR—Smyth & Goodwin, San Francisco.
805,327.—CLOCK—G. F. A. Sturts, San Francisco.
805,171.—FOOD—E. I. Townsend, Los Angeles, Cal.
805,106.—BRIQUET MACHINE—J. Treadwell, San Francisco.
805,398.—OIL CAN—T. B. Wilkinson, Rivera, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency the following are worthy of special mention:

WINDOW SHADE AND CURTAIN POLE ROLLER.—No. 805,676. Nov 28, 1905. F. Shoo, Oakland, Cal. The object of this invention is to provide a device for the convenient adjustment of curtain shades and their retention at any point between the top and the bottom of the window, so that light may be admitted from above or below the shade to any desired degree, and in conjunction with this device is shown a means for supporting curtain poles in proper relation with the above named devices. With this device it is also possible to open the window from either top or bottom, and to allow an unobstructed movement of air for ventilating purposes. The device comprises the various and necessary details of construction adapted to bring about the desired result.

CRACKER CONVEYOR AND DISTRIBUTER.—No. 805,625. Nov. 28, 1905. C. C. Blank, San Francisco, Cal. This invention relates to an apparatus which is designed for the distributing of crackers so as to be convenient to the packers. It comprises in a conveying and distributing apparatus, an endless belt traveling in one direction, a superposed chain belt having its contiguous surface traveling in the opposite direction, a diagonally disposed plow or scraper whereby articles carried by the lower belt are successively brushed off at one side of said belt, said plow having a flexible brush upon its lower edge; and other details of construction making a new and useful machine for the purpose required.

ADVERTISING AND DISPLAY APPARATUS.—No. 805,682. Nov. 28, 1905. Karl Stencil, San Francisco, Cal. The object of this invention is to provide an apparatus for the display of pictures, cards, advertising, or any desired matter in such form that it may be employed in places where ordinary display apparatus would be out of place or objectionable. It consists in a book-shaped casing having a display aperture formed vertically in one side of the casing, vertically journaled rollers having an endless display band fitted thereto, pulleys and an endless cord and means exterior to the casing by which the parts may be turned to advance the band, a hinged door forming one side of the casing and to allow access to the interior, said door having a trough or conductor in line with and below the joint of closure substantially as described.

BALANCED FLOOR FOR SHIPS' CABINS.—No. 805,718. Nov. 28, 1905. R. P. Dewey, San Francisco, Cal. This invention relates to improvements in ship building construction, and especially in a means for balancing the floors of saloons, cabins and state rooms so that they will be maintained substantially level irrespective of the rolling of the vessel. The invention consists in the combination of a movable floor or deck section, a shaft to which the floor section is fixed, a weighted pendulum detached from the floor so as to be independent thereof, and a crosshead or bearing on the shaft and extending beyond opposite sides thereof, said pendulum engaging the crosshead to effect the oscillation of the shaft and floor section and thereby maintain the floor section in horizontal position irrespective of the movements of the ship, and other details of construction.

MINING AND SCIENTIFIC PRESS.

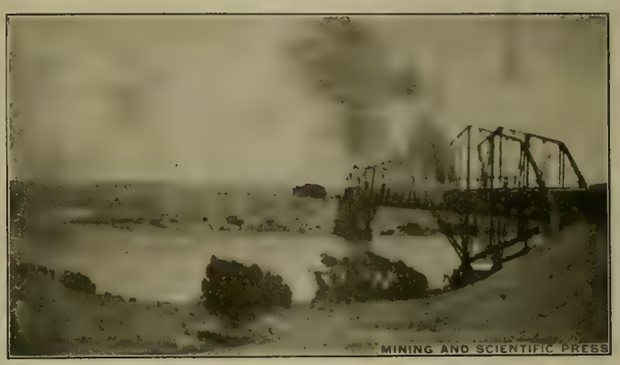
Whole No. 2369.— VOLUME XCI. Number 25. SAN FRANCISCO, CAL., SATURDAY, DECEMBER 16, 1905. THREE DOLLARS PER ANNUM. Single Copies, Ten Cents.

Virginia City, Nevada.

At one time—in the early '70s—Virginia City, Nev., was the leading mining town of the West. The "Big Bonanza" had recently been found and was being developed as rapidly as money and skill could accomplish so large a task under the most adverse conditions—high temperature and floods of scalding hot water. Never in the history of the West were scenes enacted in connection with mines such as were witnessed in Virginia City. During the '70s this great activity continued, but the tremendous energy resultant upon the discovery, development and extraction of that phenomenal ore body known as the "Big Bonanza," found in the Consolidated Virginia & California mines, began to spend itself, and the early '80s saw Virginia City on the wane. It continued to attract less and less attention, as the fall in the price of silver sent the miners into other regions, until the lower levels were abandoned, the pumps were withdrawn, and for years Virginia City was almost deserted, only a few mines in the town and at Gold Hill, joining it on the south, making any pretense of working. In 1899, however, it was decided to attempt the unwatering of the long flooded levels by improved methods. The attempt was a success, and since then a vast amount of work has been accomplished, and, although it has created comparatively little stir, several millions have been produced by the Comstock mines within the past five years. The accompanying illustration is a new picture of Virginia City, showing the famous "Point A," on the east slope of Mount Davidson, the datum of all scientific and other responsible measurements on the Comstock Lode. "Point A" is shown in the central foreground, and is a mass of siliceous rock—the outcrop of the Comstock lode at that point. The light colored spots beyond the buildings of the town are the great dumps of the Ophir and Consolidated Virginia mines. Those familiar with the city and its surroundings will distinguish many other interesting features in the picture. Virginia City of to-day is a very different city from that of the '70s, notwithstanding that there is at present more activity on the lode than at any time since the decadence of mining after the exhaustion of the bonanzas, which made the lode and the city world-famous.

On every side may be seen the evidences of former greatness. One of the interesting things which attract the attention of a stranger is the huge cast-iron shells formerly used in retorting the bullion from the mills, which, having outlived their usefulness, are now found half buried, and standing erect on the street corners, as fenders to protect sidewalks and other structures from the too close encroachment of careless teamsters who were inclined to make short turns. Another interesting and perhaps more impressive feature is found in the huge walls of masonry and the ponderous pumping machinery of the early days on the lode. The early engineers certainly built for endurance and regardless of expense.

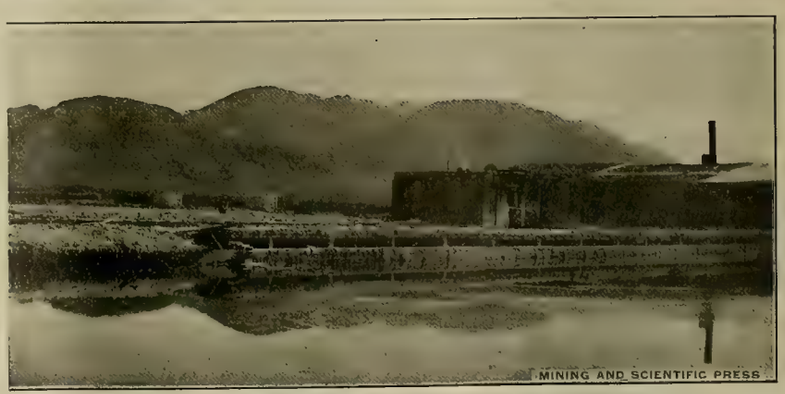
The Clover Range, Nevada, Covered With Snow.



Santa Fe Bridge Spanning the Colorado River, 15 Miles Below The Needles, Cal.

Virginia City, Nev., Showing "Point A" on the Outcrop of the Comstock Lode.

The Colorado River Near The Needles, Cal.



Bartell's Borax Works on Dry Lake, South of Calico, Cal.

(See Page 412.)

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THAT all of the oil bearing territory has not been developed, and probably not discovered, in California, is evidenced by the striking of profitable flows in new wells situated in various portions of the State, particularly in Santa Barbara county, where several good wells have recently been proven.

THE ingenuity of men who are unfamiliar with the dangers of nitro powder in thawing that explosive is worthy a better fate. The latest novelty in this direction was the disastrous experiment of a man in Fresno county, Cal., a few days since, who undertook to thaw out nitro powder by digging a hole in the ground, placing the powder therein and covering it with hot earth and a few coals. He was instantly killed by the explosion which followed. From now on accidents from powder thawing, occurring in various ways, may be anticipated.

A CORRESPONDENT elsewhere herein makes a plea for the discussion of methods of accomplishing fine grinding at minimum cost. This subject is a live one and is of increasing importance. Thus far the principal machines for accomplishing the fine comminution of ores are the grinding pans of various types and the tube or pebble mills of several designs. Chile mills are also employed as well as several other styles of rotary mills. It is desired to ascertain the best device that can be employed for the purpose, and without doubt a discussion along the line, suggested by the correspondent, would result in much valuable information, both from a recitation of facts and from suggestions.

The Western Empire.

The reclamation of desert lands by irrigation is one of the most important matters now attracting the attention of the Government. The making of millions of acres of these arid lands fruitful will mean much to the West in the coming years, and, without doubt, large areas, which in years gone by have been given over to solitude and desolation, will become the home of a numerous and prosperous people. The impression that prevails among a large class, unfamiliar with the desert, its peculiar topographical and climatic conditions, imagine it to be a vast, nearly level plain, trackless and sand-strewn, with nothing to invite the interest, or rest the weary eye of the traveler. In fact, no land shows greater diversity of landscape—changing every hour with the passage of the sun across the heavens, and with every drifting clouds. The almost limitless distances appear shortened, the rock coloring is amazing, and whether by contrast or not, the stream valleys usually present pictures of beauty seldom excelled elsewhere.

The mineral wealth of this vast domain—the Great American Desert—has never been called into question, for hundreds of millions of dollars worth of gold, silver, copper, lead, zinc, iron and salines have already been drawn from its mountains and plains. Such districts as Virginia City, White Pine, Pioche, Tonopah, Tuscarora, De Lamar, Eureka, Austin and Goldfield, in Nevada; Bingham Canyon, Frisco, Park City, Eureka, Little Cottonwood, and numerous others in Utah; Congress, Tombstone, Bisbee and Globe, Arizona; Calico, Randsburg, Cargo Muchacho, Ivanpah and Vanderbilt, in California—all these, and others, are on the desert, and it is known that there remain possibilities in mineral development in these desert regions almost unequaled. There are copper, lead, gold, silver and iron mines to be developed. Salt, and soda, and borax marshes to explore and exploit, beside many other mineral substances, at present attracting little attention by reason of their remoteness from transportation. This latter difficulty is being rapidly solved by the building of railroads in various directions across the desert valleys and around and through its mountains. The Great American Desert is a vast empire, still in its infancy, so far as the development of its material resources goes, and the next decade will witness an output from that region of which the present gives forth only a suggestion. In the last and present issue of the MINING AND SCIENTIFIC PRESS appears an article by Geo. Bancroft on the Great American Desert, in which are given facts of much interest to mining men, and to others as well. This illustrated description of the desert of the great Southwest will give those unfamiliar with it a very fair idea of what the desert region is really like. As compared with the desert region of northern Africa, it possesses many advantages, in climate, transportation facilities and water supply, and in accessibility and richness of its mineral resources.

The Unplausible Promoter.

A short time since a report was in circulation in a Western city which purported to state the conditions obtaining at a gold mine, the name of which was given in this report, written by a person signing "E. M." after his name. The "report" was chiefly noticeable for poor spelling and misapplication of geological and other terms, which clearly indicated also the misuse of the "E. M.;" but, aside from this, the several statements contained in the report were somewhat singular, as one would expect a mine possessing the advantages, and particularly the ore, stated to exist on this property to be in operation. It was a matter of constant surprise that so evidently valuable a mine should remain so long idle. Among other statements was one to the effect that there were several thousand tons—two or three thousand—which would mill $18 per ton in free gold, lying on the dump, with a 10-stamp mill standing on the ground near at hand, and a 4-foot vein of $30 rock standing in the mine ready for stoping. Ostensibly money was wanted for development and the building of a larger mill. A miner would naturally inquire why the several thousand tons of $18 rock lying on the dump was not run through the mill to secure the needed funds for further development and extension of plant. To the experienced this prospectus was plainly a tissue of deliberate lies—to many of the uninitiated and unsophisticated it seemed a magnificent opportunity to make large profit from moderate investment. It is almost useless to speak of these frauds in technical journals, as the people whom it is intended to protect against such imposition seldom see that class of papers. It is almost needless to say that this alleged report was not being circulated in the region where the mine was said to be located, but in a distant State, where a smooth-voiced grafter was successfully obtaining money on the presentation of his palpable fraud.

Had any man such a property as was described in this circular, he need go no farther than the nearest merchant and prove that he possessed what he claimed, and he would be provided with all the necessary funds for turning all this wealth into bullion bars.

Prompt Assay Returns.

Most mine superintendents realize the necessity of accurate and prompt assaying of samples, but methods employed are often such that there is much delay in arriving at the desired results. There is an evident tendency to simplify methods and to make determinations more quickly than has been done heretofore. Students in chemical laboratories have done a great deal in this direction, and some of the newly devised methods are an improvement over former schemes, and usually sufficiently accurate for all practical purposes. As there has been improvement in the past, further improvement in the future may be anticipated. In most instances where absolutely accurate results—and not approximate results—are required a quick determination is less reliable than one involving more work and a greater length of time for its complete accomplishment. Naturally, it is to the wet methods that one turns for prompt results in analysis, for all methods requiring the fusion of the charge necessarily take considerable time.

In stamp mills treating gold and silver ores it is the ordinary practice to take daily samples of headings, tailings, sulphurets, etc., at various stages of the reduction operations. In many mills the first samples of the day are taken during the morning shift, after the plates have been dressed, and these samples taken to the assayer, who is sometimes employed in assaying the samples taken by the night shift. In other instances—the more common ones—the samples of both night and day shift, and those of the previous afternoon, are assayed at one time. Several hours are taken in the preparation of the samples, crushing, bucking, mixing, etc., and finally, after noon, the fusion and cupellation is completed and the weighing done, so that by 3 or 4 o'clock the results of the previous day's work, and up to the early morning, are available. The latest information is obtainable about seven to eight hours after the samples are taken, when it is practically impossible to correct any losses from defective amalgamation or concentration. If the samples could be turned over to the assay department promptly after they were taken, and the assays made as quickly as consistent with safely approximate results, then the sampling would have a value which, under the conditions previously outlined, they cannot possess.

STOCKHOLDERS of mining companies, corporate or otherwise, look to the directors of the companies for a proper conduct of the affairs of the concern, and while the directors may be held responsible for misappropriation of funds, whether these be derived from assessments on the stock or from the operation of the property is not material. It would be impossible, however, to hold them for neglect to pursue the development of the mine, or for failure to carry it on at all, the ultimate result of which might be the loss of the property through relocation by another, because of non-performance of assessment work. The relocator might develop a very valuable property; but this would be the misfortune of the stockholders, for the directors might claim a lack of funds to carry on development, or any one of a number of excuses, through which the property was lost to the company. Ordinarily directors of mining companies are blamed for doing too much, rather than too little, in their official capacity.

CONCENTRATES.

ONLY fifteen days remain within which to do annual assessment work on unpatented claims.

MINING and other corporation stock organized under the laws of California is not unassessable.

NO SURVEY is required of placer locations which conform to the legal subdivisions of the Government land survey.

TAILINGS which are permitted to accumulate on the land of another become the property of the land owner should he choose to claim them.

PETZITE is a telluride of silver, occasionally associated with gold. It is found in a number of pocket mines in Tuolumne county, Cal.

IT is safer to secure guides in shafts with two lag screws in place of a single one, as is sometimes done where the ends of the guides overlap.

ONE of the highest mines in America is at Garland, 14,400 feet above sea level, in the Sierra Blanca of Colorado. It is about a mile above timber line.

THE "right of eminent domain" is not recognized in mining for the reason that mining is not a public utility, but generally conducted as a private or corporate enterprise.

THE peculiar crackling noise made by a bar of tin when bent, or when bitten by the teeth, is known as the "cry of tin," and is a property possessed by no other metal.

WHAT are sometimes referred to as "chicken ladders" in mines are notched poles used in Mexican and other Spanish-American mines in the same manner as ladders.

IT is always a good idea to have at least one 5-stamp battery in a mill so arranged that it may be operated independently of the others, for the purpose of making experiments.

THE flinty concretions (chert) often found in limestones occasionally contain gold. The occurrence in Ragged Top district, in the Black Hills, South Dakota, is a notable instance.

ARSENICAL gold ores have been successfully treated at several places by roasting and then leaching with a solution of bromo-cyanide. A notable instance is at the Del Oro mine, Ontario, Canada.

VERY little pyrrhotite is used in America in the manufacture of sulphuric acid, pyrite or sulphur being employed almost exclusively for that purpose. Pyrrhotite is too low grade in sulphur contents.

WATER may be appropriated from a stream by the owner of a tract of land through which it flows, if he can make such appropriation without interfering with the previously acquired rights of others.

ORE bins at shaft stations may always be provided, either in the hanging or foot wall or at the ends of the shaft, although the latter practice is unusual. In inclined shafts they are usually cut in the hanging wall.

WHEN a new shaft is to be sunk near old, flooded mine workings, the water should be removed from such workings, for safety, as the working in proximity of a large body of water, particularly if under high head, is usually extremely dangerous.

IT is often difficult to distinguish between pyrite and marcasite. This may be done, however, by treating the two samples with dilute hydrochloric acid, and examining at once with a strong magnifying glass. The pyrite is brass yellow and the marcasite tin white.

HYDRAULICKING as practiced in gravel mining is also employed for other purposes, such as grading for mills or other structures, moving filling for dams or railway embankments, etc., and also in washing out manganese, iron and other ores from superficial deposits where they occur.

WHERE there are a large number of men at work in a mine and a great quantity of powder is daily handled, it is the best plan to have as few men to handle it as possible—one or two on each level—and not each man for himself. This latter leads to carelessness and often to disaster.

WHEN the presence of calcium sulphate is suspected in water, it may be tested by filling a test tube about one-third full of the water and then adding a few drops of barium chloride. If calcium sulphate (gypsum) is present, a white precipitate will be formed—barium sulphate.

DYNAMITE usually burns quietly when it comes in contact with flames, but it occasionally explodes while thus burning. It is dangerous to set sticks of dynamite up against a board before an open fire for the purpose of thawing. The warm water thawer is the safest method of thawing dynamite known.

THE term "rawhiding" as used in British Columbia refers to the transportation of ore wrapped in large rawhides and drawn by horses on the snow along the mountain trails. The mountains are steep and the trails narrow and rawhiding is the least expensive method of handling the ore under existing conditions.

CYANIDE OF POTASSIUM is a powerful reducing and desulphurizing agent, and as such is useful in the assay office and laboratory. It is used as a flux in the reduction of tin ores, and also of lead. The use of cyanide is always attended with danger to the operator, who must take precautions to avoid fumes from the charge.

ORE dressing or concentrating consists of two steps—first, crushing the ore to a fineness sufficient to separate the valuable ore particles from the waste material to which it is attached; second, the separation of the ore from the waste particles by some one of the various devices for concentration.

INQUIRIES continue to be made regarding the "miner's inch." Formerly this term signified different quantities of water in different mining districts, but California and Montana have each passed legislation defining a miner's inch as a flow of 1½ cubic foot of water per minute. This definition of the miner's inch has been generally adopted.

WHEN making application for a mineral patent the applicant must furnish specific proof that at least $500 worth of work has been done or improvements made for each claim sought to be patented. This $500 worth of work or improvements may have all been made within a month of the date of location. A patent may cover both a quartz and placer claim jointly.

THE argument that a rock is not of igneous origin because it contains pyrite is not sound. Nearly all igneous intrusive rocks, and even some volcanic rocks, contain pyrite, which has been deposited in the mass after it has become cold. Very few rocks contain pyrite as an original constituent, but almost all rocks are found to contain it subsequently, as a mineral of infiltration.

FULLER'S EARTH resembles clay, but is not plastic when moistened with water. The water test is one of the best for this mineral. A quantity of the dry earth is placed in a saucer and a little water added. If the mineral cracks, crumbles and falls into a loose, incoherent mass, it is, in all probability, fuller's earth. Analysis should also be made.

THE United States now produces a large number of gem stones and semi-precious stones, among them being a few small diamonds, sapphires, tourmalines, beryls, chrysoprase, opal, turquoise, quartz (such as rock crystal, rose quartz, gold quartz and crystals containing rutile and chlorite, copper, etc.), moss agate, petrified and agatized wood, garnets, amazon stone, and a few others of less importance.

GRANITE has been determined by the United States Supreme Court to be mineral—technically as well as actually. This decision was rendered in the case of the Northern Pacific Railroad v. J. A. Soderberg. The defendant had quarried granite from a tract of land claimed by the railroad as non-mineral. This the court denied, holding that granite was mineral within the meaning of the law.

THE principal gold deposits of the world occur in connection with diabase, diorite, granite, andesite, clay slate, and hornblende schist. The gold deposits of the Rand, in the Transvaal, S. A., occur in conglomerate. Gold is found in other rocks, but the above are the most noted. Copper ores occur most abundantly in granite, greenstone and limestone, and lead-silver ores in limestone and quartzite.

THE rare element gallium was discovered by a French chemist in a sample of zinc blende. The discovery was made by means of spectroscopic examination. It is a hard and tough metal of bluish-white color, but melts at a very low temperature as compared with other metals—31° C. or about 87° F., hence it will melt from the heat of the hand. It occurs most commonly in the black varieties of zinc blende.

WHERE the gouge occurs on one side of a vein for some distance and then crosses to the opposite side, this may be due to the fact that the walls have had a sort of axial movement in that vicinity, the wall on one side of the point of crossing moving upward, for instance, while the same wall on the opposite side of the crossing moved downward. Or possibly this condition may be due to a pre-existing fracture, or plane of movement.

THE geological structure of a hill has usually an important influence on the slope angle of the hill. Few hillside slopes exceed 30° to 35°. Where the rock strata dip into the hill, the hillside may be steeper than this, but where the rocks dip in the direction of the hill slope it is usually less than 30°, as at higher angles landslides usually occur until the slope is reduced to about this angle, or even less. The steepest hills are usually in the region of rocks, the stratification or cleavage of which is nearly vertical.

ON a ridge extending northward from the Black Hawk mountains, in San Bernardino county, Cal., are found gray, white and blue limestones which in spots are rich in chloride and bromide of silver, and in some places, where slightly silicified, gold occurs also. Some of this ore will assay $250 per ton in gold and silver. There are no known eruptive or intrusive dikes in these limestones—at least, not in the vicinity of the richer ores.

PURE zinc blende contains zinc 67%, sulphur 33%. Most zinc ore contains other substances beside these which reduces the zinc contents proportionally. It is sometimes rich in gold and silver. It presents more physical differences than almost any other sulphide ore. In color it ranges from white through shades of yellow and brown to black, and is occasionally green or red; luster bright metallic to dull, adamantine to resinous.

THERE are numerous causes for the flouring of quicksilver. It may be due to some mineral in the ore, such as arsenic, graphite, molybdenite, etc., or it may be caused by some mineral in solution in the battery water. Too high a discharge, resulting in sliming, may also cause "quick" to become so finely divided as to make it difficult for the globules to reunite. Sodium amalgam usually will effect a reunion of finely divided mercury.

AN ore shoot appearing at the surface and at some distance from an end line of the claim, and which in depth passes beyond this end line into the adjoining claim, cannot be followed by the owner of the apex beyond his end line. The ore shoot then passes to the owner of this adjoining claim, even though the apex of the vein is unknown at the surface in his claim. The end line bounds and terminates all rights in that direction.

MINERS indiscriminately call many kinds of yellow, buff and gray rocks, in more or less decomposed state, porphyry. With them any intrusive rock which has been altered by weathering is "porphyry." Sometimes altered sedimentary rocks are also called "porphyry." Under such circumstances the term is chiefly valuable as distinguishing between two kinds of rock—"porphyry" and another kind—possibly limestone or quartzite, slate, etc.

COAL and metal mining differs principally in the different conditions in the two classes of mines and in the great difference in the material produced. Moreover, coal mines are rendered additionally dangerous by reason of the occurrence of explosive gases and dust, which most metal mines are free from. An explosion of dust in a metal mine is unknown to "Concentrates," while only a few metal mines have explosive gases, having more commonly the "choke damp" (carbonic acid gas) of the coal mines.

TO ETCH on steel or other metals, cover the portion to be etched with melted beeswax, and then sketch with a needle or other suitable tool the design required, being careful that the lines pass entirely through the coating of wax to the metal beneath. Then mix one part nitric acid with two parts muriatic acid and apply to the prepared surface. Allow it to remain for five or ten minutes, according to the depth of etching desired, then wash with water. The wax may then be removed, either by scraping or by hot water.

A NUMBER of minerals possess the property of magnetism—that is, are attractable by the magnet. The most notable of these are magnetite, some pyrrhotite, some nickel ores (particularly josephinite); wolframite (slightly magnetic); some varieties of native platinum; and franklinite. Some minerals having slight magnetism are supposed to owe this property to the presence of a small amount of magnetite. Many minerals, particularly those containing iron, become magnetic upon heating. Among these latter are zinc blende, iron carbonate, etc.

WHEN it is desired to secure a uniform temper of a number of pieces of the working parts of a machine, as of a rock drill, the various pieces—nuts, bolts, etc.—are placed in bone ash in a steel box provided with a cover which is carefully luted on, and the box with its contents is placed in a furnace, where it is brought to a bright red heat. After being subjected to this heat the proper length of time, the box is removed from the furnace, the cover taken off and the several pieces of steel thrown into a tank of cold water as rapidly as they can be taken from the box, which gives the several pieces a uniform temper.

THE mines of Olancho, Honduras, are mostly placer, as far as developed, though quartz veins, which contain gold, are known to exist in a number of localities. The Department of Olancho is several hundred miles inland and there are only trails—no roads—from the sea ports into the interior. There is abundant water for power and milling purposes when properly applied. The altitude in the gold region varies from 2500 feet in the valleys to 8000 feet in the Guymaca range. There is an abundance of fine pine timber, but a scarcity of labor of any kind, and no skilled labor at all. There are extensive beds of conglomerate in Olancho, in the gold district, which may be auriferous.

Some Types of Head Frames.

Head frame construction is always an interesting feature of mining equipment. Various sections have different ideas of how head frames should be built, so that frames of the several types come to be known as representative of certain districts or States. Thus the two-post frame was largely employed in Montana before it became popular elsewhere, because of its simplicity and economy of construction. It can be adapted to either vertical or inclined shaft. The two types are shown in the accompanying illustrations. Another engraving shows the four-post head frame so commonly seen. It is built for strength, and has few engineering features to recommend it. Frames of this type are very often seen in California, though the one illustrated is at Leadville, Colo. Another illustration is that of a two-post frame built on scientific lines. It is at an inclined shaft and built of timber. Loads of four tons are hoisted 1500 feet with this frame.

The unusual construction shown in the high and narrow rectangular frame is interesting. It will be noticed that this frame is guyed by cables reaching from the top to "deadmen" set in the ground. An improved type of California four-post frame is shown, wherein the main back braces, being a portion of the four-post frame, are set just without the resultant line of compression. This frame is of wood and scientifically designed. The steel frame built at a Rhodesian mine shows that topographical difficulties may be ingeniously overcome. This frame is at an inclined shaft, where the skips dump automatically into the bin in the head frame.

The wooden frame at the Empire mine, Grass Valley, Cal., also illustrated, is very similar to the Rhodesian frame, but owing to better surface situation is able to dispense with the long back braces, the resultant strain falling within the structure.

The steel frame at a French mine is of scientific design and built of a minimum of materials. Frames of this class are known as the "A" type, and are becoming common throughout the mining regions of the West where engineering skill is employed, and it has resulted in giving us better frames at lower cost.

Improved Type California Four-Post Frame.

Rectangular Four-Post Frame.

Simple Two-Post Frame, Montana Type.

Steel Head Frame at a French Mine, Built on Scientific Lines.

GARNETS embrace a group of minerals which are closely related in chemical and physical properties. They are complex silicates of alumina, with varying amounts of lime, iron, magnesia, manganese and other oxides of the metals, the presence of which gives to the mineral its various colors and tints. Garnets of every description crystallize in the isometric (cubic) system. When of good color and transparent they form semi-precious stones, which have a certain but not great value. The garnets used for gem stones are the varieties known as almandine, Bohemian garnet or pyrope, and manganese garnet or spessartite. The two former kinds have beautiful, deep crimson shades, and the latter orange-red or light brown-red color. The most of the garnets mined in the United States are from Arizona, New Mexico and North Carolina. The latter State produces a fine light purple-red garnet, known as rhodolite.

Fine Grinding in Metallurgy.

TO THE EDITOR:—During a long and somewhat varied experience in the mining and reduction of ores (gold, silver, copper and lead), I have been one of those whose motto is "Stick to the things you know are good," and who, in all matters pertaining to their particular line of business, never even consider the advisability of adopting improved methods or new ideas until after they have been fully indorsed by those whom we have accustomed ourselves to look up to as authorities on the subject. It has begun to dawn on my mind, however, that I have been worshipping "idols of clay," for, as my hairs begin to whiten, I discover I am fast gravitating toward the tail end of the procession, and, though it may be too late in the day for me to even expect to regain the lost ground, altogether, I still have the ambition to try, and to do so in a way that may be instrumental in bringing about the solution of a question that has become paramount with all owners and handlers of low grade gold ores, viz., a cheaper and better method to treat finely pulverized ores, or slimes. And it has occurred to me that the quickest and easiest settlement of this vexed question might come from its discussion, by the best thought engaged in the business of ore reduction by milling process, through a reputable mining journal.

There is a rapidly growing conviction among many of the best gold mill managers that the old idea of endeavoring to prevent the production of slimes by the crushing machinery is fundamentally wrong, and

that, only by reducing, so far as practicable, every particle of ore to a size equalling that of the most minute particle of gold contained, can the highest possible extraction be made.

In theory, this seems plain enough if one will but give it serious thought, but is it susceptible of proof in a practical, commercial sense, and applicable to the most, if not all, cases? I think so, and, although I am still a follower, and not a leader, in such matters, my past experience in them has taught me to accept good evidence in support of a statement or a condition in default of better to the contrary.

As is well known, some gold ores do not respond at all to the amalgamation treatment, but do to the cyanide. Why is this so? Is the gold chemically held in the ore? Who knows this to be so? Is it not possible that the particles of gold, in such a case, are coated simply, by some other metal, mineral or

Four-Post Frame at Inclined Shaft, Empire Mine, Grass Valley, Cal.

Unusual Construction of Two-Post Frame at Vertical Shaft.

Steel Frame in Rhodesia, S. A., at Inclined Shaft.

Construction of Head Frame at Leadville, Colo.

An Unusual Type of Head Frame—Two Posts with Back Braces, and Sheaves at the Top of Frame.

The term "free milling" used to apply only to those ores from which a fair percentage (60% to 80%) of the gold or silver content was extractable by amalgamation with quicksilver, but within quite recent years, and since the introduction of cyanide leaching, a gold ore is called free milling even when it requires both the amalgamation and cyanide processes to extract the values.

chemical combination, or that those particles are so finely divided (floured) as to reject quicksilver?

While the questions are asked for information on these points, they simply lead up to the main point, with which, as will appear further on, they have no relation worth consideration in the discussion of the subject at hand.

Lixiviation or leaching, particularly that of the cyanide persuasion, seems to have become the final arbiter—the court of last resort—in the treatment of low grade or the milling grade of gold ores the world over, and, as the ores from no two gold mines can be said to be identical in every respect, many difficulties are encountered in the adaptation of the leaching process to all conditions. With rare exceptions, the most serious difficulty heretofore, leaving aside the question of desulphurization and the preliminary wash to free the pulp from all objectionable mineral salts that are soluble in warm water, has been that experienced in nearly every attempt, thus far made, to render the most finely pulverized portion of the ore, called "slimes," as quickly,

cheaply and profitably treated by the leaching process as is the coarser portion.

In most instances the ore to be leached is dumped into the vats or tanks just as it comes from the battery or roll screens—coarsest and finest, altogether. In others, the pulp or crushed ore is classified—that is, the very finest, or slimes, is separated by hydraulic or other classifying devices from the mass and leached by itself. And I have heard that it is the practice of some to separate into three or four classes.

In either case, however, the slimes are a trouble maker and an "unruly member."

Generally speaking, ores that are to be subjected to a leaching treatment are, usually, so low in grade (values) that a large tonnage must be handled in order to make it a profitable operation, and to do this expeditiously and at the least cost, the tank must be charged with as much pulp as it will hold, in addition to the necessary quantity of leaching solution and, at the same time, permit what is called "free percolation" of the solvent through the mass of ore and the filter mat underneath the ore.

In present practice this free percolation is only possible through the coarser portion of the ore. If the coarse and fine go into the tank together the finer particles run together and become so closely imbedded in strata, layers or bunches as to be almost impenetrable by the solvent, despite all the stirring or agitating devices resorted to, thus necessitating a greater length of time than is required to leach the coarser stuff, and a consequent greater cost to be charged to operating expenses.

A recent improvement or innovation in cyanide leaching is that of forcing percolation of the solvent through slimes by both air pressure and by utilizing the precipitate filter press idea. Aside from the results from the experiments of Mr. C. W. Merrill at the Homestake mills in South Dakota, I have heard of no remarkable achievements with either device.

Probably, the longest stride yet made toward a fuller understanding of the still undeveloped possibilities of the milling treatment of gold ores, with special reference to the combined process of amalgamating and cyaniding, resulted from the extensive experiments made in Australia, during the past year and a half, to determine to what degree of fineness their ores (gold bearing, and carrying both coarse and fine gold) should be crushed (maximum size) in order to yield, by the combined process, the highest possible extraction with the least possible cost. Those experiments demonstrated, beyond any possible doubt, that, with their ores, fine grinding (pulverization) to a maximum screen size of 150 meshes to 1 lineal inch renders them susceptible of a much higher per cent of extraction than is at all possible with coarser sized material. The principal increase in saving occurs in the amalgamating department and is, no doubt, due to the finer separation of the metal from the gangue and more thoroughly freeing the metallic particles from any coating it may have had, by attrition in the grinding process.

An increased saving is also made in the cyanide department, for, it goes without saying, that any solvent will dissolve a metal that is finely pulverized in less time than is required when not so finely pulverized, but the leaching difficulties have increased in the same ratio as the screen sizing has been changed from forty or fifty meshes to the lineal inch to 150 meshes, because the proportion of slimes has increased in like ratio. In fact, the crushed product from ore sized through a 150 mesh screen may all, reasonably, be called slimes, as its average is many times finer than the average of a product from a thirty, forty, or even fifty mesh screen, so, if the experiments quoted have any significance whatever, they have sounded the death knell to all amalgamating and leaching methods or systems based on coarse crushing—and the avoidance of slimes.

From the statements published concerning those experiments, and the description of the ores experimented with, there is no apparent reason why the average character of gold ores of any country, if amalgamable or leachable at all, is not amenable to the same laws which have defined the proper standard of ore sizing in West Australia, to wit: to reduce the average size of the metallic particles to as fine a condition as practicable and consistent with the most profitable results. Consequently, I insist that fine pulverization sliming has come to stay; and that just what we and our predecessors have fought against for fifty years—the production of slimes—is what we need most in milling ores, viz., complete freedom of metal from gangue or waste, so that either quicksilver or leaching solvent can have proper contact with the metallic particle.

Fine grinding has become an essential feature of the best mill practice of the present day, as is evidenced by the efforts being made toward the development of a better fine-grinding machine (regrinding) than either the tube or pebble mill or the old-fashioned amalgamating and grinding pan, which are the present standards of excellence in that line, as well as toward the development of a better plan to accelerate the percolation of a leaching solution through fine slimes.

Briefly put, the situation is this: Fine grinding having been proven a pre-requisite for the highest extraction by amalgamation and cyanide leaching of gold ores, it behooves all interested in that method of ore reduction to contribute from their knowledge, or opinions, that some of us may be able to pick a morsel that will form the basis for (1) a plan to successfully, i. e., quickly and economically, leach the large quantity of slimes that are the inevitable result of re-grinding or fine sizing; (2) a plan for the construction of a re-grinding device, superior in all respects, to those mentioned as being the highest types at present, and it is for the purpose of inviting concerted action, by discussion of these questions through and by aid of the MINING AND SCIENTIFIC PRESS, that this article is written.

In any event, nothing but good could result from such an expression of knowledge or opinions.

There being neither chemical nor metallurgical points involved in the subject—only mechanical ones—there is no reason why anybody, who has some knowledge of this branch of ore reduction, whether gained by practical experience or observation, either in the laboratory, or in the mill, should not contribute his ideas and participate in the discussion. The subject is too big to permit any "grand stand plays" in technical phraseology. A good idea expressed in a sentence of plain, every-day English conveys more information than a chapter of the other kind. It is the meat that is wanted—not the skin.

I hope there will be a general and ready response to this invitation and that those who do respond will speak freely regardless of what so-called "authorities" may think of their opinions. The real "authority" is the man who "does" things.

San Francisco, Cal., Nov. 27. E. E. WANN.

The Great American Desert.—II.*

Written by GEORGE J. BANCROFT.

In my foregoing remarks I have confined myself to that part of the desert which has not as yet been brought under cultivation. The passing of the Reclamation Act has renewed public interest in the cultivation of the desert. The recent government publications for the first time permit a fairly accurate estimate to be made as to what may ultimately be accomplished by the Reclamation Service, acting together with private enterprise.

The Reclamation Act was passed June 17, 1902. Within a very few months the desert began to blossom with the tri-cornered monuments of the hydrographic survey and the hill tops to twinkle with their little white flags. From Yuma, Ariz., to Rapid City, S. D., parties of strong-limbed, khaki-clad, young men might be met on any trail, carrying about the queer looking instruments of their calling and going about Uncle Sam's investigations in the accurate, painstaking, scientific way that has characterized all the operations of the Geological Survey department. The sub-department that has this work in charge is called the hydrographic survey, and recent bulletins issued by this department permit one who knows something of the desert to figure out a few general conclusions which are reasonably accurate.

In the first place, it is necessary to emphasize the fact that only a very small percentage of the arid territory is reclaimable by direct irrigation. I think this is a matter that is not generally understood; but indirectly the whole arid region will be benefited by increased irrigation, and I will try to show, later on, what the indirect possibilities are.

Viewing the subject in a broad way, there are six main drainage systems in which additional irrigation is possible by the expenditure of large sums of money. Practically all the "cheap water" has already been used.

By this I mean that where a man or group of men can build a ditch of reasonable length without overcoming any serious obstacles it has been done. The Reclamation Act will make possible the utilization of water in those localities where large areas of good land can be brought under irrigation only by the expenditure of large sums of money. Most of the main opportunities may be divided into two classes, viz., the diversion of large streams, which, of course, requires the construction of expensive diversion dams, and the construction of large reservoirs. Such undertakings require large capital and, in the past, few of them have been undertaken.

The main drainage areas where irrigation schemes are practical are the Columbia river basin, the Colorado river basin, the Rio Grande river basin, the western part of the Mississippi river basin, a little of the southern part of the basin of the Red River of the North, and the drainage area of the western slope of the Sierras. In these six main drainage areas there is a total "map area" of 892,000,000 acres.

The following table gives the total acreage already under irrigation in the several States and Territories of the arid region, together with the cost of the irrigation works. In the States given in this list there is a total map area of 749,000,000 acres, so it will be noticed that only about 1% of the land is now under irrigation:

	Acres.	Cost.
Arizona	185,396	$4,438,352
California	1,445,872	19,181,610
Colorado	1,611,271	11,758,703
Idaho	602,568	5,120,399
Montana	951,154	4,683,073
Nevada	504,168	1,537,559
New Mexico	203,893	4,165,312
Oregon	388,310	1,843,757
Utah	629,293	5,865,302
Washington	135,470	1,722,369
Wyoming	605,878	3,973,165
Totals	7,263,273	$64,289,601

It will be noticed from the above table that the total cost of putting all the present irrigated ground under water has been on the average $8.85 per acre. Nearly all the schemes that the Reclamation Service is considering will cost about $28 per acre. These figures illustrate what I mentioned above, that the energetic Western farmer has got all the cheap water already.

Orators at the irrigation congresses have figured all the way from 60,000,000 acres to 100,000,000 acres as the amount of ground that will eventually be reclaimed by the Reclamation Act. It is, of course, absolutely impossible to make an estimate that will be at all accurate until each stream in the irrigable region has been considered separately and the possible chances for diverting and storing water carefully considered and measured, but from the stream measurements of the hydrographic survey it can be computed that in the six main drainage areas mentioned above, there is water sufficient to irrigate 78,000,000 acres, and this agrees very closely with the estimate made in 1902 by F. H. Newell, the chief of the division of hydrography of the United States Geological Survey. Mr. Newell's estimate was 74,000,000 acres in practically the same area. Both estimates are based on the assumption that some way will be found to use all the available water. This is not likely, but it would seem reasonable that 75% of the available water might be used, particularly when it is considered that owing to the return of part of the water to the stream beds by seepage there will be a certain amount available several times. Figured in this way,

An Irrigated Farm in the Desert.

* See illustrations on front page.

we may reasonably expect 58,000,000 acres to be reclaimed.

The United States withdrew 40,000,000 acres from entry in view of proposed reclamation schemes, but after completing a large number of surveys all but about 1,045,000 acres was restored to entry and the following schemes undertaken:

State.	Name of Scheme.	Number of Acres Reclaimed.	Available Cash.
Arizona	Salt River	160,000	$240,849 25
California	Yuma	85,000	2,186,127 19
Colorado	Gunnison	100,000	1,921,218 00
Idaho	Minidoka	130 000	2,021,750 68
Kansas			139,929 14
Montana	Huntley	35,000	2,147,189 00
Nebraska	North Platte	100,000	550,500 00
Nevada	Truckee	200,000	65,919 35
New Mexico	Hondo	10,000	473,708 31
North Dakota	Fort Buford	60,000	4,503,089 47
Oklahoma			3,209 507 13
South Dakota	Bellefourche	60,000	979,932 75
Utah	Utah Lake	60 000	335,130 40
*Washington	Palouse River	100,000	3,121,863 15
Wyoming	Shoshone	160,000	1,231,718 87
Total		1,045,000	

*Construction postponed.

PROJECTS APPROVED BY SECRETARY OF INTERIOR.

State	Projects.	Estimated Cost.	Acres Irrigable.
Oregon & California	Klamath Falls	$1,000,000	236,000
Oregon	Malheur	2,250,000	100,000
Montana	Milk River	1,000,000	200,000
N. Dakota, pumping.	Bismark	55,000	33,000
	Buford-Trenton		
Idaho	Payette-Boise	1,300,000	250,000

The reason that Kansas and Oklahoma have cash on hand for irrigation projects, but no projects under way, is because the country is so flat and the fall of the streams so slight that as yet the Reclamation Department has found no feasible way to get water out of the streams. The idea of installing pumping plants is now being considered.

In addition to the schemes mentioned in the above table there have been several large private schemes completed within the last year or so, and there are several others in process of construction. Prominent among the completed ones may be mentioned the Imperial Land Co. scheme, which has put 50,000 acres of land suitable for semi-tropical fruits in southern California under cultivation with water taken from the Colorado river, and the Twin Falls scheme of Idaho, which places under cultivation 270,000 acres of fine fruit and grain land.

We can see from what has already been done, and what it is possible yet to do, that some 7% or 8% of the Great American Desert may be put under cultivation, that only 1% was under cultivation before the passage of the Reclamation Act, and that the first series of enterprises will increase the irrigable land by 1,045,000 acres.

POSSIBLE CHANGE OF CLIMATE ON THE GREAT AMERICAN DESERT.—I wish now to call attention to that most interesting question: "Will the reclamation work change the climate of the desert?" Of course, this question can not be definitely answered, or it would not be a question; but my travels on that part of the desert embraced by Inyo county, Cal., and southern Nevada have shown me that comparatively rapid changes have taken place in the climate of that locality; and if a climate may suddenly change for the worse, owing to evident causes, I see no reason why it should not change for the better if original conditions are restored. For instance, there are countless lake beds, some entirely dry and some with a little salt water in the bottom, and all of them showing successive beach marks in the perishable soil of the basin sides, registering the gradual drying up of the country. On one of the beach marks in the Salton Basin, San Diego county, Cal., may be seen stone fish traps, showing that the Salton desert was a fish-bearing lake within the time of human occupation of this continent. Near Osceola, Nev., one can see a crescent-shaped dike across the lower end of a large basin. This was evidently a reservoir built by the ancients. Faint traces of the old ditches may also be distinguished below the dam. There is no water to reserve nowadays.

Walker lake, in Esmeralda county, Nev., is fresh water at the upper end and brackish water at the lower end. Successive beach marks show that at one time it had an outlet to the south. and the fact that it is part salt and part fresh would indicate that the process of the concentration of the small amounts of salt, which all water contains, through the medium of evaporation, has not been in operation for a very great length of time.

One can not help picturing in one's imagination what a beautiful section of country this must have been when all these dry lake beds were filled with clear blue water and running streams, connected one with another. Then the hills were covered with tall cedars and the valleys with waving grass, and the elk, deer and buffalo wandered in herds through a land blessed with the finest climate imaginable, rich in verdure and beautiful with sparkling waters. I venture to say that if this wide area could be returned to its former state by the hand of man, it would be the greatest deed ever done by the human race. The accomplishments of the world's greatest conquerors are not to be compared to an achievement of this kind. It is comparatively easy to kill, destroy and conquer. It is very hard to originate, vivify and create. The greatest engineering feats of the past sink into utter insignificance in comparison. What do the pyramids of Egypt, the bridge of Brooklyn or the tower of Paris amount to in comparison with reclaiming an empire from the desert?

That this stupendous achievement may result from the work which the Reclamation Service has already started seems to me to be well within the realms of the possible, and, strange to relate, the first man to advance the theory and explain the conditions to me was an old Nevada prospector. If I could do so without betraying his confidence, I would like to give his name, for he is an unusual character and his brother was a prominent United States Senator, and his clear-cut features and bright, searching eye show that it was not lack of brains that drove him to adopt the life of a recluse and a placer miner.

I was sitting at "Uncle John's" camp fire, discussing gold veins and things, when he showed me a bit of pottery he had washed out that day from the gravel 20 feet below the surface. I remarked that there must have been people living in that section for a long time.

"Yes, sir," he replied, "and lots of them. There are places where the ground seems like it is half made of fragments of pottery and things. This country used to be a very fertile country and lots of people lived here.

"Why I know a place down towards the Colorado river where there was an ancient city. The houses were adobe, and nothing is left of them, but they had the streets paved with flagstones and you can follow out miles of streets. There ain't water enough in that country nowadays to keep a pair of jackrabbits. There ain't a man that has prospected this country that ain't seen them signs of ancient peoples and lots of them." "How do you account for the country drying up, Uncle?" said I. "Well I'll tell you," and he put a greasewood coal in his pipe to keep it lit awhile, "you probably have noticed that every day you've been in this country the wind has blown from the west or southwest." I recalled that I had. "Well," he said, "if you was ever down in the Altar district near the Gulf of California or along the coast by San Diego, you probably have noted that the prevalent wind is a land breeze. Once in a while we do get a sea' breeze here, but the Sierras suck it dry before it gets here." I had to take his word for that, never having investigated. "Well," he continued, "'taint but a short time ago that the Colorado river used to flow into the Salton desert, and the water backed up into the Death valley and parts of the Mojave desert. There is a whole lot of that country below sea level and it is all on the east side of the Sierras. At that time there was quite a chain of large inland fresh water lakes." I knew the Colorado river does, even nowadays, sometimes flood the Salton desert (it is doing it now), and I knew the basins he mentioned were all below sea level. "You see there is a change in the winds between here and the sea coast, but when them inland lakes was spread out in the hot southern sun, our southwest winds picked up a lot of moisture, and when they got up here on this high, cool ground, they could not hold it all and it come down in rain. But the river flowed into the lake and out again at almost the same place and finally the current cut a channel down so deep that the river and the lakes became separated, and about that time some eruptions came along and made 'malapai' ridges between some of the lakes so they all dried up, and the country dried up, too."

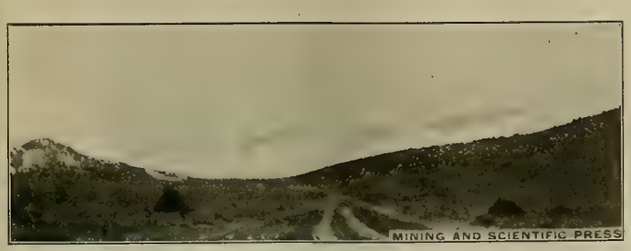
I have never been over the country that "Uncle John" mentioned, bu the had, with his burro and his gold pan and his bright keen eyes, noting many things besides gold veins. As I said above, the old prospector's theory appeals to me. No one who has traveled on the Nevada desert can doubt that only a few centuries ago the country was a great deal more fertile than it is to-day. I saw a cedar butt 2½ feet in diameter in a well in the Saline basin, Inyo county, California, myself. There are no such cedars in the country nowadays, and while cedar is a very durable wood, I doubt if it had lain buried over 500 years. The slow climatic changes which result from the gradual tilting of the poles of the earth or from the rise or subsidence of large areas of the earth's crust, are altogether too slow to account for the comparatively sudden change that is recorded in the soils and rocks of Nevada. That the conditions that once prevailed in that section may be eventually reinstated by the reclamation work that has already been started, seems to me well within the limits of the possible.

Near Denver, Colo., we have had an unquestionable demonstration of the effect of irrigation on the rainfall. Around Denver there are about 200,000 acres of irrigated land. During the heat of the summer the evaporation is very great from this area and one can see the clouds form over the irrigated section. If the wind carries the clouds away from the mountains there is no result, but if they are carried over the mountains into cooler air, heavy showers almost always result. Of course there always were summer showers in the mountains, but that these showers have been heavier since irrigation began is proven by the fact that nearly every mountain meadow close to Denver has been badly cut to pieces by summer cloudbursts since irrigation became general.

It took thousands of years for the silt of these meadows to accumulate, and in twenty years a large part of it has gone; but while the mountain ranches have suffered the prairie ranches have had more water.

To return to the Colorado river basin, I believe that using the water to irrigate the deserts of Arizona and southern California will mean more rain higher up the river, and more rain will mean more

Transportation in Death Valley, Cal.



The Ruby Range, Nevada.

water for irrigation, and this again will mean increased evaporation, so that by a constantly increasing yearly increment the climatic conditions will improve.

I think the same thing will take place wherever topographic and eolian conditions are right for precipitating from the air the moisture freshly acquired from the irrigated fields so that in time to come the 7% or 8% of land which it is possible to reclaim from the district may be the "little leaven that leaveneth the whole loaf."

Water Supply in Mountain Regions.

The mining regions of the West are mostly in mountainous or hilly regions, and the streams in these mountains are mostly of torrential character. The run-off is very large during the spring months and often destructive in its effects. The mines depend upon the mountain streams for their water supply, both for power (with a few exceptions) and for metallurgical operations. To insure permanency of water supply, large reservoirs have been built in favorable places and large amounts of water conserved for summer use. The permanency of the summer supply, however, depends largely upon a heavy snowfall in the early winter. The late snows vanish quickly under warm winds and rains, but the early snows are compacted to beds of ice and endure long into the summer. Among other and more lasting sources of water supply in the mountains are the numerous natural lakes found scattered through the high Sierra region.

There are no more beautiful lakes in any lacustrine region of the world than those of the high Sierra Nevada mountains, which are part of the American-Cosumnes water courses now being discussed as a probable source from which to secure the domestic water supply of San Francisco, Cal. These lakes lie among the highest peaks of the range, being from 5000 to upwards of 7000 feet above the sea. They are practically the meltings of snows descending from snow fields upon the bare and often polished granite, and caught on their way out of the range in receptacles naturally excavated in the same granite. The basins or bowls in which these waters lie have been cleansed by the scourings of untold ages and the waters are as pure as the skies, and the higher reaching mountains from which they are drawn. The water when held in a goblet presents a beautiful crystalline clearness; its color in the lakes varies from a light green, where shallow, to a dark rich cobalt where depth is attained. This marvelous blue setting is like a sapphire in a surrounding band of terra cotta, with here and there patches of white marking the fields of "old snow" among the rugged points of the high mountains. The magnificent distances, the massiveness, silence, solitude and purity of it all are enduring memories with one who has visited the locality.

The most interesting of the lakes are the Echoes, Big and Little, which are connected by a narrow channel in the solid granite, their combined length being about 3 miles and their area about 480 acres. This beauteous pair lie at an elevation of 7450 feet above the sea, close to the very summit of the range; indeed, Lake Tahoe, which can be plainly seen from their banks, lies 1224 feet below them on the eastern slope of the range. In the clear, cold atmosphere which rests upon these lakes the voice reverberates from hill to hill of the surrounding wall and dies away in the distance, rebounding and re-echoing as the sound recedes. The stroke of the oars in the locks, the splash of the blades in the water, will in the silence and the still air find their counterpart amongst the ravines of the shore and come back to the oarsman like messages by wireless telegraph. It is from this phenomenon that the lakes are named.

Farther over to the north and at an elevation even higher than the Echo lakes, lies Lake Harry, presenting its beautiful breast of water so clear and deep that it looks like a lake of indigo fringed with a border of tamaracks. Above and about it is the wildest of alpine scenery; bare rocks, glaciated and glistening, strewn with innumerable flints, with sides so steep that a goat could scarce find footing. Occasionally there rises from some break or crevice a stunted juniper, gnarled and twisted, bereft of foliage on its north and west, where the sharp boreal hurricanes have cut away its limbs, every fiber of its form displaying a terrible struggle for life amidst warring elements. It is a picture not alone of desolation, but abounding in evidences of intense atmospheric action; a region of maximum storms, where the wild gales blow with the utmost velocity.

Advancing farther to the north extends a district most remarkable; it is a vast field of granite-bedded lakes connected one with another, but spreading over many square miles. From an eminence above Lake George the field breaks in sight, and suddenly a great basin of naked rocks interlaced with water presents itself to view. Beyond, the reddish ochre of the bare hills splotched with snow, and to the left, the broad lake of dark blue, surrounded by tamaracks, presents a picture to which the brush of the artist or the camera alone can pay a proper tribute. Farther west is Lake Marguerite, and then there is an array of nameless lakes and mountain pools with splashing cataracts between. This is the "Devil's Basin," "Desolation Valley" or the "Medleys," as it is sometimes called—a wonderful network of water, threading the rocks, leaping from pool to pool, and finally passing out of the region through a great fall which drops in foaming mass more than 150 feet.

The State highway between Lake Tahoe and Placerville traverses the Echo Lakes country, and on past the basin of Lake Audrain. This, too, is almost at the summit and is a typical alpine lake. If, as proposed, these beautiful lakes should become the property of San Francisco, and are utilized for a system of water supply, a dam at Audrain will raise the water to a considerable height, and it will become the peer of the most beautiful of them all.

The waters from this great chain of mountain lakes now flow into the South Fork of the American, from which, some miles below, a canal conducts them, clea

Lake Harry—Indigo Depths Fringed With Verdure.

Lake of the Woods, in the Sierra Region.

Little Echo Lake, One Thousand Feet Higher Than Lake Tahoe.

and pure, to users farther down. But the proposed San Francisco, Cal., system provides that the water shall be carried by a tunnel through a range of mountains into the watershed of the Cosumnes; dams will be built in deep, rocky gorges and broad valleys transformed into still other great lakes of pure mountain water; and the whole region, now so little known, will become famous, not alone for its beauty, but, also, because of the vast quantities of pure mountain waters available to promote the health and prosperity of the metropolis of the Pacific.

Mine Surveying.—II.*

Written by C. A. S. Andrews.

Surveying Underlie Shaft.—In fixing the position for the draft marks in an underlie shaft, one assistant is left at the surface draft mark, and the surveyor descends to No. 1 level, if he can see that far. The other assistant is sent down to No. 2 level, and the surveyor picks the best place on No. 1 plat, so that he can see both to the surface and to No. 2 level, and also see into the levels on each side. A draft mark is made at this point, and also one in each level, so that all the required bearings can be taken at the one setting up. This operation is repeated to the bottom of the shaft.

The surveyor then returns to the surface, sets up over the draft mark at the mouth of the underlie, and picks up the meridian of the surface survey.

The forward assistant hangs the plumb-line on station (2) and gets it steady. At a point on the string that can be seen from the theodolite he attaches a small ball of clay, about the size of a pea. The surveyor sights to the line immediately above the clay, and reads the bearing and dip. Reversing the instrument he reads them again, and books the mean of the two observations.

To enable the surveyor to see the plumb-line, the assistant holds with one hand two candles, one on either side of the line and about 2 inches in front of it. The other hand is held behind the line as a shield for the candles and a background for the line. If only one candle is used, the line is illuminated on one side more than the other, and the center of the illuminated portion is sighted to instead of the center of the line.

As soon as the bearings and dips are booked the back assistant takes the end of the chain forward to the forward assistant and returns to the instrument, seeing that the chain is clear on his way back. The forward assistant holds the end of the chain to the plumb-line immediately above the clay, and the surveyor puts on the necessary strain, using the spring balance, and reads the distance, at the axis of the theodolite, to two places of decimals.

The height of the axis of the instrument above the ground sill, and of the clay above the plat, are then read and booked. The vertical depth measured plus or minus the difference between these heights is the vertical depth of No. 1 level.

Should the dip of the underlie shaft exceed 65°, the plate of the theodolite will prevent the forward draft mark being sighted. In this case, before the bearing can be taken, a point must be laid off in line with station (2) with a dip of less than 65°. To do this the theodolite is tilted with the leveling screws until the forward draft mark can be sighted. It may be necessary to remove the brass button on the standard to allow the striding level to be kept plumb.

A temporary mark in line with the forward station is then made, either on the surface or on the hanging wall of the shaft, which can be sighted when the theodolite is level.

During the operation the plumb-bob attached to the spindle of the theodolite is kept over the draft mark. The axis has been tipped forward out of plumb, but the line of sight is still in the same vertical plane as the two draft marks. The temporary mark is therefore in the true line with the stations. The theodolite is then leveled, and the bearing taken to the temporary mark.

The dip and distance are left to be measured upward from station No. 2, when the dip can be read with the diagonal eyepiece. If the theodolite has a bubble attached to the telescope the dip can be read from the top station when the instrument is tilted.

The bearing, dip and distance having been booked, the theodolite is put back in its case, the chain rolled up, and the surveyor proceeds to station No. 2, leaving the back assistant at station No 1.

While the surveyor has been coming forward from station No. 1, the forward assistant has lifted the plat-sheet, placed a plank across the opening, and has marked on the plank a spot, plumb under the draft mark. This is most conveniently done by placing a small clay daub on the plank, and pressing the point of the plumb-bob into the clay at the correct point. The surveyor examines this spot, and, if he is satisfied, the plumb-line is removed.

The forward assistant stays with the surveyor until the theodolite is set up, holding the candle or otherwise helping. One or two more planks are now put across the opening in the plat for the tripod legs to rest upon.

If at any time the theodolite is set up on the plat-sheet, two planks are to be put across the plat and supported at each end so as to be clear of the plat-sheet. The surveyor stands on these when taking his sights.

After sighting and chaining to the next station in the shaft, the bearings and distances are taken to the first station in each of the levels. This operation is repeated at each level to the bottom of the shaft.

The dips of the sights along levels are not taken, as the chain can always be held horizontal. Should the exact rise of the level be required, it is more readily measured at another time by using the theodolite as a level and the metallic tape as a staff, or else by using a level and staff brought down for that purpose.

Survey of Levels.—The surveyor having completed the survey of the underlie shaft, now proceeds with the survey of the different levels.

As in the shaft, he will fix all his draft marks before taking the theodolite out of its case.

The level is then traversed in the usual manner, the bearing and total length of lines only being booked for the present. If the level has been driven to the boundary, plugs are to be put in parallel to and about 2 feet inside the boundary. The approximate position of the boundary will be known from the distance given to drive at the last survey.

The surveyor will compute at his leisure the distance these plugs are off the boundary and will embody same in his report.

Should any rises or winzes be approaching a boundary, or should it be desired to break through from them into any particular point in the next level, or in a rise or winze from the next level, or should the surveyor wish to connect his survey of two levels for a check, it will be necessary to survey such rises or winzes with the theodolite. In ordinary cases they will be surveyed by compass and clinometer with the rest of the detail work.

Where levels are more than 500 feet long, the surveys should be connected from level to level, via rises or winzes, as a check.

If any rises, winzes or passes are to be surveyed, a draft mark is fixed at a suitable point at the foot of the rise or top of the winze, as the case may be, and connected with the survey of the level from one of the draft marks. Generally it is better to keep these draft marks separate from the survey of the level, as it may necessitate a short shot, or in any case will increase the number of shots in the level.

The theodolite work in this level being finished, the instrument is put away in its case until wanted for the next level.

Survey of Detail.—The detail work is then proceeded with. This is done with the compass, clinometer and metallic tape. While doing this the surveyor must be accompanied by the underground manager, so that nothing may be omitted.

The usual details to fill in are: Rises, winzes, passes, stopes, cross reefs, faults, changes of country, flow of water, etc.

It is not necessary to take offsets to the sides of levels, underlies, rises or winzes. They may be sketched in on the plan an even width, so as to include the traverse lines.

Starting from the shaft, the distance is measured to the first pass and booked to the nearest foot. The bearing, dip and length of pass to the top of the stope is booked, and also the distance up the underlie to the top of the stope.

In succeeding surveys only the distance up the passes are taken, as the direction and dip remain practically the same.

The distance is then taken from the first to the second pass, and so on to the next draft mark. The distance between the draft marks is thus checked, and any grave error, say of 10 feet, would be disclosed.

The face of the stope is sketched in from top of pass to top of pass, it not being necessary to traverse the intermediate irregularities.

Any rises or winzes not surveyed with the theodolite are taken in the same way.

The tops of the passes broken through from the level below are not noted, only the end of the worked ground being booked.

All solid blocks left in the stopes as too poor to work are to be noted. The habit of showing all unpayable blocks as worked ground is bad. These blocks at some future time, under improved treatment, may become payable, and knowledge of their

Big Echo Lake, Amid the Summits of the Sierra Nevada.

Audrain Lake, Amid the Alpine Summits of the Sierra.

*Abstract Trans. Queensland Institute of Surveyors.

position and metallic contents will then be of value.

The position, strike and dips of all faults should be noted, and also the direction and extent of downthrow, if it can be ascertained.

The strike and dip of any reef, leader or formation branching off either in the level or stopes should be noted, as also any change of country, increase in the water or any other detail which will assist the surveyor in drawing up his report.

FIELD NOTES.—The field notes should be kept with a hard pencil, so that no amount of wetting will obliterate the writing.

The notes of every level and underlie shaft should be kept separate, sufficient blank leaves being left at the first survey, so that the notes may be continued at each successive survey until the level reaches the boundary.

Levels being driven each way from the underlie are to be treated as separate levels, being called Level No. 1 North and Level No. 1 South, or any other suitable names.

An index is to be kept at the end of the field book, giving reference to every level, underlie shaft, surface notes or any other survey noted separately in the field book.

Stations are all to be numbered. A good system is to number all stations in underlies 1, 2, 3, etc., and in each level or crosscut, a, b, c, etc. Start afresh in each case for every new underlie, level or crosscut.

PLAN.—The working plan is generally on a scale of 40 feet to an inch, any section being on the same scale both vertical and horizontal.

A tracing of this plan is used by the underground manager and is plotted up with the main plan at each survey.

The adjacent workings on all adjoining mines are to be shown and plotted up to date at each survey, the vertical depths reduced to the datum of the survey being shown on each level.

Levels on the same reef should be colored alike, another color being used for rises, underlies or winzes and another for crosscuts.

Each level or crosscut is to have its name and number printed on it with its vertical depth. Underlies, rises and winzes are to be numbered.

It is a good custom to give all straight shafts, underlies and main winzes or rises a distinguishing name. Names are more readily remembered than numbers and save endless reference to the plan when reports are being read.

The stopes on the main reef may be washed in with a light wash of India ink, the stopes on other reefs being shaded with parallel bars of the distinguishing colors of the levels on the same reef.

In giving distances to drive, rise or sink to connect from any one point to another, the surveyor should always quote from a draft mark, the approximate amount of solid ground between being also given.

TRAVERSE BOOKS.—Traverse tables should be kept in an exercise book, one for each mine. The traverse of each level and underlie is kept separate, and at each survey is added to, and the reduced latitude and departure of each station shown. A surround of the boundaries is also made, showing the reduced latitude and departure of each course.

By subtracting the reduced latitude and departure of any underground station from the reduced latitude and departure of the nearest corner, the bearing and length of the connecting horizontal line can be readily computed and from this the distance from the station to the boundary is known.

DISCREPANCY BETWEEN SURVEYS OF ADJOINING MINES.—As soon as the workings break through into an adjoining mine, a connection should be made at once to the survey of the latter. If the discrepancy in chainage be less than decimal one (.1) per 500, and in the bearings less than one minute (1′) per 1000 feet of underground survey, the mean may be adopted and the boundary lines adjusted to agree.

When an adjustment has been made between the survey of adjoining mines, the reduced latitude and departure of the last station in the level from which the connection was made is altered in the traverse book to agree. The last station in the other levels approaching the same boundary should be corrected, but those approaching other boundaries are better left till another connection is made.

Where connections are made to the surveys of the three or four adjoining mines, the surveyor may find the discrepancies between his survey and other surveys on the same boundary of his mine are in different directions. In this case the adjustment he makes for each connection will necessitate him having to lay off his boundary slightly different on the frontage of each of the adjoining mines.

There are many other difficulties, too numerous to enumerate in this paper, that the surveyor will meet with; but with thought and patience they can all be overcome. Should the surveyor not feel confident of any part of his survey, made under adverse conditions, he should take the first opportunity of checking his work by a different route. His mind will then be at ease and he will enjoy his work.

THE latest fake gold saving machine is an electrically connected, non-mechanical affair which, it is claimed, saves $10 where by ordinary and well-tried methods only 10 cents can be saved.

Mining and Metallurgical Patents.

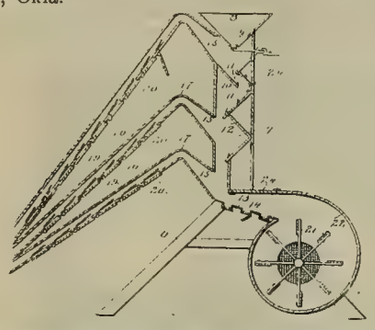
PATENTS ISSUED NOVEMBER 28, 1905.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

TREATMENT OF ORES AND THE LIKE.—No. 805,577; J. Nicholas, Waterloo, England.

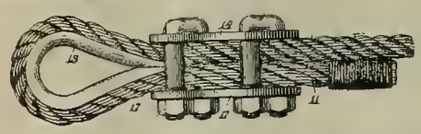
Treatment of materials containing zinc, lead and precious metal, by mixing pulverized materials with water, and with chloride, and then heating mixture, leaching this so-treated mixture with water, reducing metallic compounds contained in leached residue to metallic state, agitating molten lead and precious metal with aluminum, cooling, then separating alloy of precious metal with aluminum from lead.

ORE SEPARATOR.—No. 805,599; L. J. Vandervoort, Guthrie, Okla.



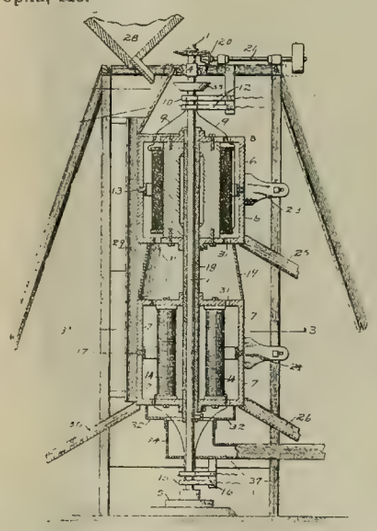
In ore separator, in combination, upright chute down through which ore is fed, series of riffle boards therein, over which ore flows, collecting pan under lower end of chute, upwardly inclined pipes leading from one side of chute.

WIRE ROPE CLAMP.—No. 805,705; C. H. Billman, Boston, Mass.



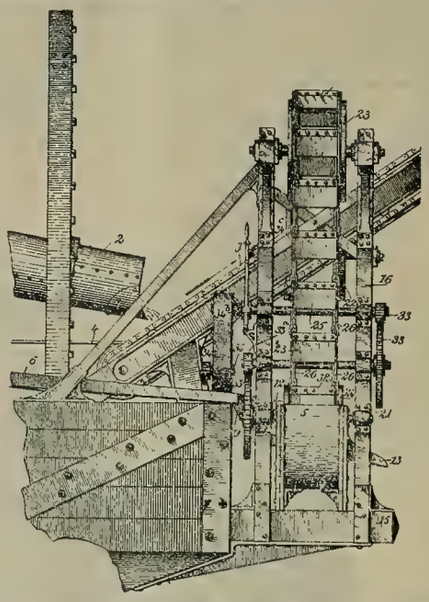
Clamp for wire ropes consisting of two plates, each provided with plurality of openings in two lines, distance apart equal to diameter of rope to be clamped, openings in lines being staggered, plurality of bails adapted to pass through plates and straddle rope, and clamping means therefor.

MAGNETIC ORE SEPARATOR.—No. 805,854; E. Hedburg, Joplin, Mo.



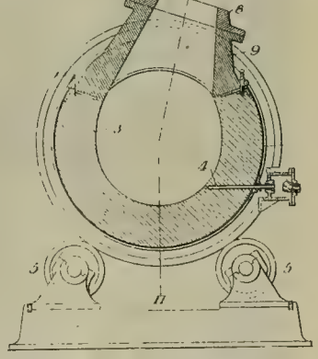
In compound magnetic ore separator, and in combination vertical shaft, upper electromagnet mounted axially thereon, magnet including two pole pieces forming shell which incloses windings of magnet, ring of non-magnetic material separating proximate edges of pole pieces, spreader apron above upper electromagnet, lower electromagnet mounted axially on shaft, lower magnet having two pole pieces which inclose its windings, non-magnetic ring separating proximate edges of pole pieces, outer surfaces of respective rings being in line with and forming continuations of outer surfaces of pole pieces, means for rotating magnets, and flat-surfaced scraper arranged adjacent to outer surface of magnets and overlapping contiguous portions of pole pieces for removing adhering ores from rotating pole pieces.

ATTACHMENT FOR DREDGERS.—No. 805,906; H. P. Francis, Oroville, Cal.



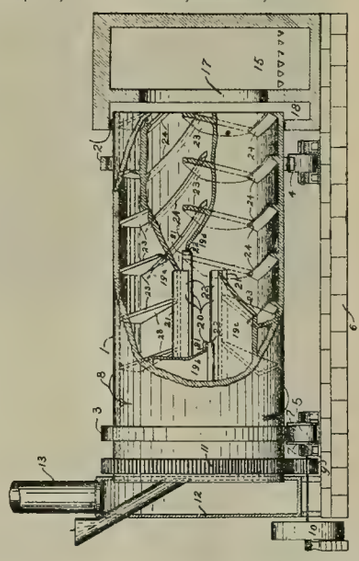
In dredging machine, combination of stacker, means for supplying material thereto, sand box, sluice emptying into sand box, endless conveyor for removing sand and water from sand box and discharging same, means for directing sand from conveyor to stacker, and means for directing water from conveyor away from stacker.

FINISHING CONVERTER.—No. 805,896; C. M. Allen, Lolo, Mont.



Converter having refractory lining and top composed of thick metal of sufficient bulk to withstand heat produced by converting process.

RABBLING DEVICE FOR ORE ROASTING FURNACES.—No. 805,939; C. C. Wilson, Denver, Colo.



In ore roasting furnace or like, longitudinally revoluble cylinder provided upon interior surface with longitudinal shelves projecting inwardly tangential to imaginary cylinder whose axis coincides with that of cylinder and whose diameter is less than that of cylinder, and equally distant apart, and partition plates extending from lifting surface of shelves having longitudinal inclination forward in direction of travel of ore from circumference of cylinder to projecting edge of shelves.

Mining in Trinity County, Cal.

TO THE EDITOR:—In some respects this has been a good year in discovery and development in Trinity county—one of the earliest placer mining fields in the State, but one which can not be assigned a place in the "petered out" class.

Trinity has always been a "pocket" county in both placer and quartz mining. In the early history of New river, in the northwest corner of this county, a bedrock pocket near the source of that stream produced nearly five pounds of gold, chiefly in nuggets almost free from quartz. A similar find was made in a mountain-top mine at what was known as Kellogg Diggings, in upper Hay Fork valley.

Less than twenty years ago the Mountain Boomer mine, on New river, was a large producer for a time and then pinched out next to nothing. At various times the Brown Bear mine, at Deadwood, has produced very rich ore and then dwindled down. In the northeast portion of the county, in the '90s, a host of people flocked to the headwaters of Trinity river, among them many who did not expect to fill their pockets with surface nuggets, but who were bent on research, and went hopefully at work to satisfy themselves whether golden wealth was hidden in the gravel deposits and rocks bordering Trinity valley, and some found what they sought.

The mining world is aware that many valuable placer and quartz properties are being operated in Trinity county. I am one of the few old-timers who believe that as rich gravel and quartz deposits yet remain as those being operated to-day.

The greatest need of Trinity county now is a showing of the energy that characterized the fortune hunters of forty or fifty years ago, when, almost moneyless and creditless, ditch, flume and water wheel enterprises were carried to success at much greater expense than would be required now.

Trinity is yet an open field for the placer or quartz prospector. The output of Digger creek and East Fork placers in the early days warrants the belief that a nest-egg remains, and that the Fairview mine may be a pointer that leads to it. Some day Buckeye mountain will be prospected and the sequel to the old-time placer yield of the creek so named and of Bolt's hill will be manifest. I believe that in years to come the Lappin mine will prove a good property and that there are more of the same sort on the north slope of the Trinity-French Gulch divide, and also that there are duplicates of the Yellow Rose and Dorleska and a half dozen other promising mines yet hidden in the western Trinity river watershed, from Scott mountain to the headwaters of Swift creek. Mineral marks the Trinity summit's course thence to Dedrick, lower East Fork, Rattlesnake and New river. But all can not be said in a single chapter.

OLD TOM.

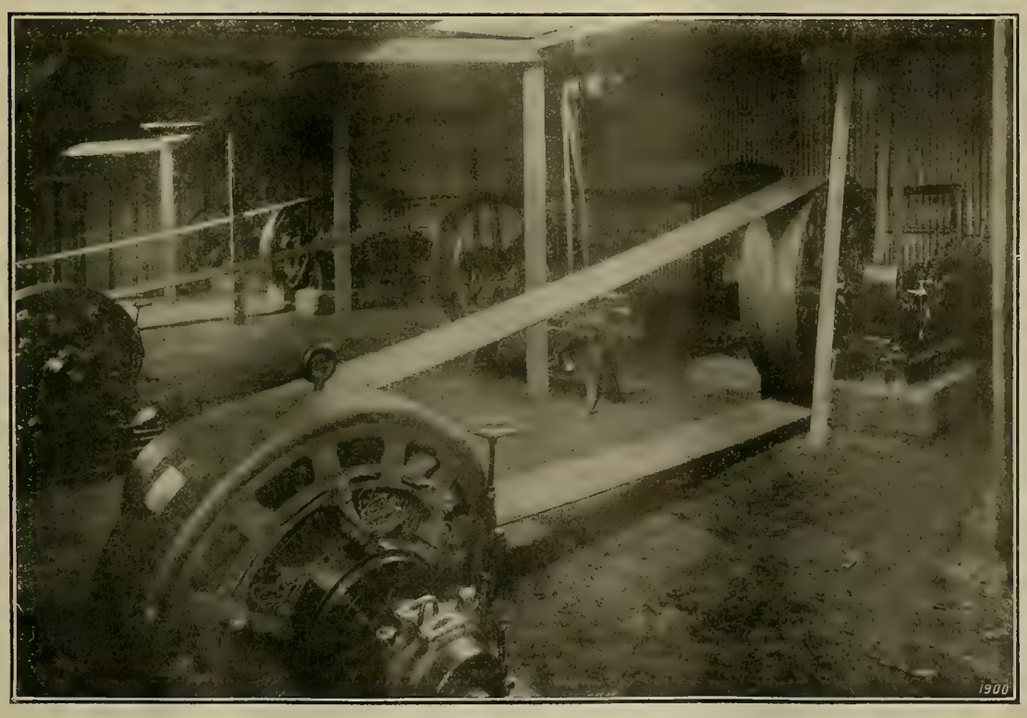
Trinity Center, Dec. 2.

Air Power Plant for Pneumatic Tool Service.

There were 100 steel cars to be built for the London Metropolitan railway when it was decided to convert the system to electric power. The contract for these cars was secured by the American Car & Foundry Co., under conditions demanding almost immediate construction, and called for a great number of pneumatic tools; and since the contract covered only a short period, the plant installed was necessarily temporary in character. The order for the pneumatic equipment was placed with the Ingersoll-Sergeant Drill Co. The tool equipment included eighteen 8-inch and twenty-five 5-inch Haeseler riveting hammers, and sixteen No. 7 and twenty-four No. 12 Haeseler rotary drills—eighty-three in all.

The illustration shows the four air compressors which furnish power for these tools. They are of the builders' "class 'JC'" duplex two-stage machines of balanced type, with a heavy inside fly-wheel, solid sub-base, and semi-tangye frames. The air cylinders are water-jacketed on heads and barrels; an intercooler in the sub base beneath the cylinders provides inter-stage cooling at high efficiency. The Sergeant piston inlet air valve is applied on both cylinders and discharge valves are of vertical lift direct-discharge pattern. At rated speed of 150 R. P. M., each compressor is stated to have a displacement of 526 cubic feet, which would give a total free air capacity to the plant of 2104 cubic feet per minute, delivered at a pressure of 80 pounds. Each unit is belted to a direct current British Westinghouse motor, rated at 110 H. P. on 550 R. P. M.

The picture shows the temporary nature of the plant—a cheap, shell-like building, unfinished foundations, rough earth floors. But it is stated that every detail has been provided for in the machinery equipment which would assure economy of operation and reliability in service.

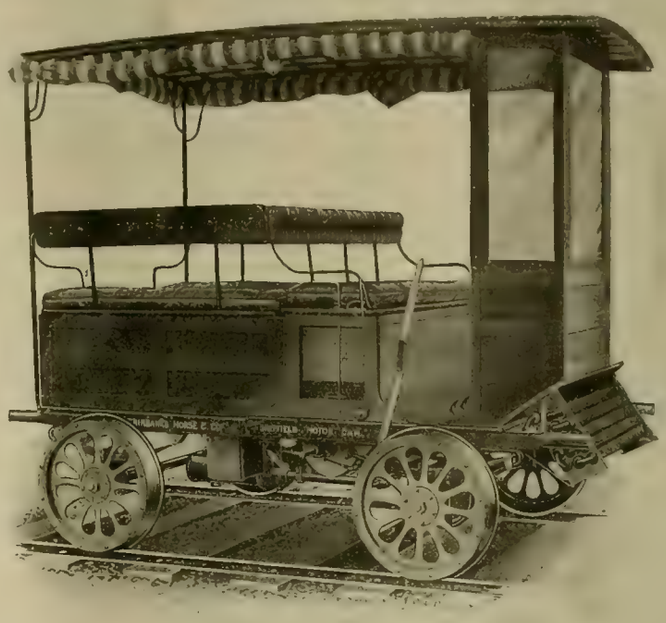


Ingersoll-Sergeant Compressors Run by Electric Motors, and Driving Machine Tools.

New Gasoline Motor Car.

The accompanying cut shows a No. 16 gasoline motor car manufactured by Fairbanks, Morse & Co., Chicago, Ill., and is one of several different styles of cars of this class they are at present building.

Early in the summer of this year George H. Webb, chief engineer Michigan Central R. R., made an inspection trip over the system with one of these cars. The total distance traveled by the car was 4347 miles and the total amount of gasoline used was 231 gallons, or an average of 19.7 miles per gallon of gasoline. The records show that on the run from Jackson to Allegan, a distance of 175 miles round trip, only 7½ gallons of gasoline were used, or 23.3 miles per gallon. The total cost per mile, including lubricating oil, battery cells and everything excepting wages of man in charge, was $\frac{9}{10}$ of a cent. Most any railroad man can figure out that this is quite a saving, as compared with a steam locomotive pulling a private car.



New Gasoline Motor Car.

This gasoline car has its advantages, also, because of its ability to attain a high rate of speed and maintain it on a long run. From Marshall to Allegan, 66.4 miles distance, was made in one hour and forty minutes, or at the rate of 40 miles per hour, and they report they never stopped the engine once. The distance from Tekonsha to Harris—29 miles—was made in forty-five minutes, and the best run of the entire trip was made from South Haven to Kalamazoo, a distance of 39.6 miles, in forty-five minutes, or at the rate of 52.94 miles per hour.

The manufacturers report that there is a large demand for cars of this class, now that they have demonstrated that they are a complete success, and their factory, with the present facilities, is not able to keep up with the orders which are received from all sections of the country.

THERE are few mining camps in the world where water has been more troublesome and expensive in carrying on mining operations than in that group of mines at Leadville, Colorado, situated on the west slope of Carbonate hill, and in these mines lying under the city itself. The deepest mines and those farthest out from the hill have found an increasingly greater amount of water as they have continued to work westward and outward from the hill. The Penrose has had its share of trouble of this sort, but is now equipped with a pumping plant which will easily control the heavy flow of water. The lowest mines drain those opened at higher levels, so that the lowest operators always get the worst of it. The mines are so deep that they cannot be drained by adits. This is a great disadvantage, as it increases the cost of drainage very materially. Although the altitude of Leadville is about 10,200 feet above sea level, and most of the mines are from 100 to nearly 1000 feet higher, comparatively few of the mines of the old lead-silver district can be effectually drained by tunnel. The most extensive tunnel enterprise in the district is the Yak, starting in California gulch and running easterly over 2 miles under Iron and Breece hills. For a time a tunnel starting at Malta, 4 miles distant, in Arkansas valley, was talked of, but the deep mines of Leadville are now below that point.

Notes on Southern Nevada and Inyo County, California.—I.*

Written by H. H. TAFT.

It has long been known that the volcanic area south of Belmont, Nye county, Nev., had mining possibilities. Some of the old time prospectors knew that gold existed there. Its remoteness from any source of supplies, its long distances from any water, the absence of game, and more, perhaps, the lack of grass for animals to subsist upon, have made this an unattractive region in which to search for mines.

The decline of the Comstock mines, the exhaustion of sundry large and rich ore bodies, the high cost of mining, marketing, and particularly the ruinously high freight charges upon refractory ore that had to be shipped to distant smelters, have kept investors out of Nevada for the last few years, and mining people have hardly yet awakened to the importance of Tonopah, Goldfield and perhaps the newer and less developed districts.

The discovery of Tonopah by J. L. Butler, who located the Mizpah claim in May, 1900, and the fortunes soon realized there, attracted many people. As the boom declined many people went away, some scattering out into the surrounding country, and the population is now about 7000. In the fall of 1902 a discovery of gold was made 23 miles south, in what is now known as the Sandstorm group, 4 miles northwest of Goldfield. In the winter of 1903–4 the Combination, January and Florence mines were discovered, and shipments of high-grade ore soon followed.

In January, 1905, there were 10,000 people in Goldfield. In June, 1904, rich gold ore was found 85 miles southeast, at the foot of the south end of the Kawich mountains, but this discovery was kept quiet until a relocation could be made.

On August 10, 1904, the Bullfrog claims, and a month later the Ladd mountain and neighboring claims, were located. The Shoshone group was located September 24. This district is from 60 to 80 miles southeast of Goldfield. In September, 1904, there was a stampede for Bullfrog and Gold Crater —the latter a small area 21 miles east of Goldfield. Two mining districts, called Beatty and Bullfrog, were organized under the laws of Nevada. Later, overflow migrations poured in the old and abandoned districts of Lida (or Allida), Tule Canyon, State Line and Silver Peak, and others more remote.

During the winter of 1904–5 the desert seemed full of people. All sorts of outfits traversed unfrequented roads—men afoot and alone, "burro men," carriages, wagons and automobiles. The inevitable reaction of such furore is no doubt deplorable, yet the rapid development of any new mining region depends upon the excited "tenderfoot" rather than the conservative mine operator. At Goldfield it was "a sight to see." There were hundreds of people walking over the hills, many with a canteen of water slung over one shoulder, while a small iron mortar hung to the other, and a pestle, a pick and a 5-inch frying pan constituted the equipment for sampling, grinding and testing. The rock is soft and the gold at the surface is free.

There is no good map of this region. The best is that of the United States Geological Survey; but this and the Land Office map are incorrect, particularly in the topography between the northwest arm of Death valley ("Lost valley") and Owens lake. A correct map of Inyo county, Cal., has been made by the county surveyor. A very useful map, particularly of the country farther south, is issued by Mr. Crowell of Vegas, Nev.

The high Panamint range is usually mapped with about twice its actual length. It ends at latitude 36° 30′ north. A wagon road from Furnace creek in Death valley to Ballarat in the Panamint valley follows around this mountain at its base. The geological maps would be far more useful to prospectors if the older Tertiary volcanics were separated from the recent ones. A good map showing the potable waters would save much suffering, and perhaps some lives, this summer. The springs should be marked by the Government. So far this year about thirty lives have been lost on account of thirst in that desert region.

Tonopah is 6000, Goldfield 5500, and the Bullfrog region from 3500 to 4000 feet above sea level. The climate at Goldfield is much the same as that at Pueblo, Colo., except that the rainfall is less than half. The topographical variation is not great in Nevada. The summits of the mountain ranges are rarely more than 2000 or 3000 feet above the surrounding deserts. Inyo county, Cal., is different, being remarkable for deep valleys and high, precipitous mountains. The altitude of Owens lake is 3575 feet, and the Sierra Nevada, a few miles west, reaches an elevation of 14,500 feet above sea level. The Panamint peaks rise to 11,000 feet, while Death valley, opposite these peaks, and but a few miles east, is below sea level. On the west the Panamint valley is 1100 feet above tide, while Saline and Butte valleys are not far from sea level. Roughly speaking, 600 feet in elevation is equivalent to 1° in latitude; moreover, a deep valley has not the circulation of air that prevails on the tablelands. Hence this is a region of extremes of wind and calm, heat and cold, both diurnal and annual. The storms of winter seem to blow through one and to take all warmth away; yet on a summer day, without any shade, down in one of these deep valleys, protected by high mountains from the prevailing winds, it is hotter than any other part of the American continent. The maximum temperature at Furnace Creek ranch, in Death valley, is said by those who live there to be 127° F. The extraordinary amount of detritus brought down through every little mountain gulch indicates terrific cloudbursts.

Life would not be so intolerable in these valleys in the summer season if our people would learn more of the Mexicans. Americans even go across the border into Mexico and farther south with their light board houses, low ceilings and thin roofs. Thick stone or adobe buildings, with high ceilings and thick or double roofs, are always comfortable. The good climate of the whole year in Tonopah and Goldfield is much appreciated by the mining men who have come from the tropics, from Alaska, British Columbia, and from the higher altitudes of Colorado.

Montezuma mountain, 8 miles west of Goldfield (altitude 8000 feet), is ever green with pinon and scrubby pine, with a little cedar and juniper around the edges. (It is remarkable how closely one can estimate the elevation through the entire Rocky mountain region by noting the vegetation.) The Montezuma mountain timber belt extends southwest to the White mountains and to the Fish Lake range. The north end of the Grapevine range is also covered with timber. Cordwood sells in Tonopah and Goldfield at $16 per cord; at Bullfrog the price is $25. Below the timber there is considerable sagebrush, with a few cacti and some yucca palms, locally known as Joshua trees. The desert is often green with several varieties of desert brush having different local names—a short, stunted growth of no value, which gives the valleys the appearance of being more fertile than they really are. A strange feature is the almost entire absence of grass. At the head of the Amargosa and southward, "creosote" brush and other desert growths are the same as one sees in northern Chihuahua, western Texas, and in New Mexico, which is good grazing country. Old timers say that this was not so once, but that several years ago a drouth killed all vegetation that could be used as fodder. Along the water courses, such as the Oasis valley, at Ash meadows, in the Death valley, Panamint, and others where there is water, salt and wire grass present a meadow-like appearance, but will barely keep cattle from starving. Along the water courses willows, cottonwood and, to the south, screw bean and mesquite grow. The latter, which is an excellent fuel, is by common consent left to the Indians. Sometimes there are in the valleys large areas devoid of vegetation, with the ground so hard that a wagon leaves but a slight track. Along the low ridges the wind has blown away the soil and arranged the pebbles so as to appear like a mosaic.

The traveler usually takes the "Overland Limited" to Reno, Nev., then the Virginia City & Truckee Railroad 41 miles to Mound House, the Carson & Colorado 137 miles to Sodaville, and the Tonopah Railroad 66 miles to Tonopah. The Carson & Colorado is a narrow gauge road, with light rails and limited equipment. It was completed to Keeler, Inyo county, Cal., in 1881, and was a barren investment until lately, when the Southern Pacific Co. obtained control of it, just in time to reap the benefits of the Tonopah rush. During the past winter this road has been swamped with freight. For six months there were from 500 to 1000 cars awaiting trans-shipment in the various yards near Reno. From Sodaville to Tonopah is also narrow gauge. From Tonopah to Goldfield there both stages and automobiles are running—the latter making the distance of 27 miles in two hours. All this will soon be changed, and the traveler will be able to leave the main line of the Central Pacific in a broad gauge car that will take him through to Goldfield.

Surveys have been made and there is much talk of railroads from the south. A factor in this situation is furnished by the large deposits of colemanite (calcium borate) between Amargosa and Death valleys. A railroad route presenting no special difficulty runs from Vegas on the "Clark" road to Goldfield, via Beatty. The distance to Ash Meadows is 90 miles; thence it is 45 miles up the valley to the Bullfrog district and 35 miles diagonally across (south) to the most developed borax mines.

The outfit for a trip through this section requires, as a usual rule, 1 pound each of vegetable and animal food per day per man, and 14 pounds of hay and 12 pounds of grain per horse per day. A larger amount of alfalfa, with a smaller amount of barley, can be fed. Mules are preferable to horses, because they are more hardy and eat and drink less. In a country where evaporation is so great (an acre of tanks will evaporate 1700 gallons per day), a team of horses will require 15 gallons (say 120 pounds) of water per day; in the heat of the summer more. Where there is running water in the winter there is nothing but a dry "arroyo" in the summer. Indeed, in a channel where there is a stream of running water in the morning sufficient for stock, it may be dry and even dusty at sundown.

A good assaying equipment sufficient for 1000 assays will weigh 500 pounds and require five cases of gasoline. A portable balance, sensitive to 0.005 milligram, can be had, and is best, in that it enables one to reach a desired degree of accuracy with less fluxes and smaller weight of crucibles.

The people are very kind about giving information as to water and roads, but such information is often inaccurate. Nye county, Nev., has had signboards put up at crossroads, and some of the freighters, also, are thoughtful enough to leave some mark or sign.

*Trans. Am. Inst. Min. Engs.

Personal.

T. S. MATHIS is at Yerington, Nevada.

THOS. H. LEGGETT is at El Oro, Mexico.

MARSHALL BOND is at Phœnix, Arizona.

F. L. BOSQUI has gone to Parral, Mexico.

W. P. BONBRIGHT is at Colorado Springs.

POPE YEATMAN is at Guanajuato, Mexico.

EMILE R. ABADIE is now in San Francisco.

HENRY C. CALLAHAN has returned from Mexico.

L. L. HUBBARD has gone to Salt Lake City, Utah.

H. H. CLARK of Bullfrog, Nev., is in San Francisco.

J. M. MCGEE of Oroville, Cal., has been in San Francisco.

FORBES RICKARD is examining mines at Silverton, Colorado.

N. A. ROBINSON has left Mariposa and is now in San Francisco.

R. G. KIRKLAND has returned to Mexico from San Francisco.

WALTER P. JENNEY of Salt Lake City is at the Palace Hotel.

W. B. FISHER is visiting Spokane, Wash., and Wardner, Idaho.

D. P. PULLINGER of London is in New York on his way to Mexico.

MARK B. KERR has returned to San Francisco, from New York City.

E. D. MCDERMOTT has left El Oro, Mex., to proceed to Johannesburg.

H. I. KEEN of the Allis-Chalmers Company is visiting San Francisco.

F. P. SHERWOOD has returned to Parral, Mexico, from San Francisco.

O. F. POSEY AND CHAS. WEIR, both of Los Angeles, are in San Francisco.

J. H. ELSPASS, patentee of the Elspass mill, Denver, is at Toronto, Canada.

GEORGE H. EVANS has returned to Breckenridge, Colo., by way of Denver.

H. H. LANG, superintendent Kendall mine, Kendall, Mont., is in San Francisco.

FRANK ICKES has been appointed manager Globe M. Co. of Lead, South Dakota.

ARTHUR HOULE is superintendent Calumet & Arizona smelter at Douglas, Arizona.

ARTHUR GOODALL, manager Fremont mine, Amador county, Cal., is in San Francisco.

FRANK E. SHEPARD, president of the Denver Engineering Works Co., is at Boston.

S. B. SALISBURY has been appointed manager Dakota M. Co. at Virginia City, Montana.

W. H. BAKER has been made superintendent Gold Pan mine at Breckenridge, Colorado.

C. M. YEOMANS is visiting San Francisco, from El Oro, Mexico, on his way to Australia.

O. BERGSTROM is consulting metallurgist for the United Verde smelter at Jerome, Arizona.

THEO. F. VAN WAGENEN is examining copper mines on the Isthmus of Tehuantepec, Mexico.

A. F. KENSINGER has been appointed superintendent Chicago-Mexican M. Co. of Chihuahua, Mexico.

GEORGE A. PACKARD has gone to Baker City, Ore., after examining mines in Inyo county, California.

ROBT. H. ANDERSON has been made manager Sullivan Group M. Co. at Kimberley, East Kootenay, B. C.

DAVID MIEKLEJOHN has been appointed manager Buena Vista mine in the La Yesca district of Tepic, Mexico.

H. E. CRAWFORD, consulting engineer Hermosa M. Co., Hanover, New Mexico, has returned there from Denver.

H. H. NICHOLSON has resigned as manager Standard Con. Mines Co. in Grant county, Or., but will act as consulting engineer.

JOHN S. GEORGE AND W. J. MACCONNELL of the Snowstorm Hydraulic Co., Fairplay, Colo., have returned to Milwaukee.

ROBT. K. PAINTER has accepted the superintendency of the mines of the Newfoundland Syndicate at Pilley's Island, Newfoundland.

E. S. GRAHAM of Graham, Texas, has been appointed superintendent Aquila mine, of the Mazeppa Co.'s G. M. Co., near Hostotipaquillo, Jalisco, Mexico.

C. D. ROOKLIDGE has resigned as manager Nevada-Superior Mines Co., working near Humboldt, Nev. F. W. Correll has been appointed his successor.

WILLIAM C. POTTER, manager of mines for Mexico, in the interest of the American Smelters Securities Co., has moved his office from Mexico City to Aguascalientes.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ALASKA.

The first smelter to be built in Alaska was blown in Dec. 5 at Hadley, on Prince of Wales island, 400 tons of ore being treated. It will be known as the Brown Alaska smelter, its owner being B. D. Brown. The smelter has a daily capacity of 750 tons, and will treat both copper and gold ores. The mines of Prince of Wales island and surrounding districts will furnish all the ores it can handle.

ARIZONA.

The question of the increase of the assessment of mines in Arizona has gone over until January, at which time the supreme court will hand down a decision in the certiorari proceedings instituted by the Copper Queen and other mining companies of the territory, setting up the contention that the territorial board of equalization exceeded its authority when it raised assessments of the mining companies. In the meantime the county treasurers in the several counties have been instructed by the Attorney General to accept from the mine owners the amount of taxes due on the assessment as turned in by the county assessors, pending the decision of the supreme court which will be on January 17.

Cochise County.

At the Pittsburg & Arizona Co.'s group, near Charleston, a double-compartment shaft has been started on the Manila mine and will be sunk to a depth of 400 feet. ——J. L Bachelder has bonded his copper claims in the Dos Cabezas district to the Western M. Co.

It is reported that J. L. Bachelder has bonded his copper claims, near Dos Cabezas, to the Western M. Co. ——December will see five producers credited to the Western district—Copper Queen, Calumet & Arizona, Lake Superior & Pittsburg, Pittsburg & Duluth, and Shattuck & Arizona. The above named companies will be producers in the order they are named, the Shattuck & Arizona being the last, which will commence shipping from its stock pile on the dump to the Copper Queen smelters some time during the present month.

Gila County.

The Copper Hill mine of the Arizona-Commercial Co. has twelve stopes of sulphide ore from which to make shipments and is shipping 100 tons per day to the Old Dominion smelter and 1000 tons per month of siliceous ores to the Douglas smelter. Superintendent W. S. Sultan is preparing to sink the Copper Hill shaft 200 feet deeper, to a total of 800 feet. An auxiliary hoist will be put underground. The Blackhawk shaft, now domn 260 feet, is to be sunk to a depth of 600 feet before a level is run. A steam hoist will be put in and power drills used.

Mohave County.

The Aztec Turquoise Co. is working at Mineral Park, 9 miles from Chloride, under the direction of Superintendent McNulty.——High-grade ore is reported from the West Flores mine, near Cerbat, owned by W. B. Campbell.——The P. K. and K. P. mines, in IXL Basin, near Kingman, are being unwatered and may be worked by E. M. Carson.——Superintendent Nadeau has opened up rich silver ore in the Windy Point mine, near Mineral Park. New machinery is to be put in.——The Arizona-Mexican M. & S. Co. is putting in a 40-ton mill at the Infallible mine, at Stockton Hill, near Kingman. A road is being made from the mill site to the Alta mine.——A mill is to be put in by the Union Pass G. M. Co. in the Union Pass district, near Kingman. J. D. Jordan has charge.

Santa Cruz County.

The Gold Bullion mine, near Old Glory, has been sold by W. S. Wilde to Clay Peters of San Francisco, Cal. J. M. Drennon of Los Angeles, Cal., will be in charge of the development work. A 10-stamp mill and a concentrator will be built at the mine as soon as the wagon road is completed.

Yavapai County.

A hoist and mill are to be put in at the Pittsburg-Jerome property, near Jerome. A wagon road has been built from Yaeger. The company has fifteen claims, formerly known as the Larson-Avery group, between the United Verde and Equator mines. D. S. Cochran is superintendent.——The Jerome Mines Development Co. is testing a new diamond drill.

The Bradshaw mountains of Arizona have been mapped by the United States Geological Survey. A folio descriptive of this quadrangle has recently been prepared by J. A. Jaggar Jr. and Charles Palache. It includes one topographic map of the quadrangle, one map illustrating the areal geology and one illustrating the economic geology, a page of structure sections and a page of photographic views. The quadrangle is in the southeastern part of Yavapai county and includes a small part of Maricopa county in its extreme southeast corner. A portion of the Prescott Forest Reserve occupies the western half—a mountainous region including all the higher summits of the Bradshaw range. The city of Prescott is 2 miles north of the northwest corner of the quadrangle, and Jerome is 17 miles north of the northeast corner. The only settlements in the quadrangle at the time of the survey were small mining camps and scattered ranches. On the north the Prescott & Eastern Railroad enters the quadrangle near Valverde smelter and terminates at Mayer station. The eastern third of the quadrangle consists largely of low-lying desert land and basaltic mesas. The mineral resources include gold, silver, copper and iron ore deposits, building and ornamental stones, and undeveloped bodies of volcanic ash. No definite statement of the output of precious metals from this region is possible, but an estimate based on scattered contemporary statistics and on the Mint reports gives an approximate value of $9,500,000, equally divided between gold and silver. At the time of the survey (1901) only two or three large mines were actually producing, and the output of the district, chiefly gold, was probably less than $200,000. A number of other mines, recently active and of demonstrated value, were closed down by reason of litigation or other adverse circumstances. The ore deposits of the quadrangle, with few exceptions, are fissure veins of simple structure. The veins may be classed, according to the dominant value of their contents, into gold, silver and copper deposits. The important mines in the quadrangle are in its northern and western parts, and occur in groups associated in a striking manner with the four intrusive stocks of quartz-diorite which occupy the basins of Groom and Hassayampa creeks, of Lynx creek, of Bigbug creek and its branches near McCabe, and of Poland creek near Crown King. Rich placer deposits formerly existed along most of the streams of the quadrangle. The only stone quarried in the quadrangle for building purposes is the green rhyolite tuff found abundantly in the valley of Castle creek. The stone was said to be soft and easily worked when quarried. It hardens on exposure and presents a handsome appearance. Near Mayer, on the left bank of Bigbug creek, is a considerable deposit of onyx marble, small portions of which are of a quality that renders it suitable for a decorative stone.

CALIFORNIA.

Calaveras County.

The Eastland-Gray Development Co , under the management of D. P. Gray, has found a rich gravel at the Hageman ranch, near San Andreas.——It is reported that rich ore has been struck at the 2400-foot level of the Gwin mine.

A promising quartz vein has been opened up in the Red Gold mine near Murphys.——The Beatrice M. Co. is working west of Murphys.

El Dorado County.

The North Weber Land & M. Co. has bonded the Golden Hatchet drift gravel mine, near Placerville, to T. G. Patton. Work will be commenced at once.

Kern County.

(Special Correspondence).—The Zenda mine, on Caliente creek, is putting up a 10-stamp mill.——Mr. Blood of San Francisco is putting up a 10-stamp mill near Caliente creek, on the Gold Peak M. Co.'s property.——A. D. C. McKay is working the Jeannette claim on Piute mountain and taking out good ore.——The Barbarosa mine, recently bonded to a French syndicate, is working seven men developing their ore bodies on the lower level. ——The Atlas mine, owned by A. W. McRae, has started up again.——The Minnehaha M. & M. Co. have completed a 3-stamp mill and are concentrating their low-grade tungsten and crushing and sacking high-grade tungsten. They intend to start tunnel No. 6 to tap the main ledge at a depth of 850 feet, having to run 900 feet. M. D. Hamilton is general manager; H. B. Ward, superintendent; and H. Wischmeyer, foreman. H. Wischmeyer has bought the Bear claim from Theo. Crees.——E. F. Evans has bought one-half interest in the Golden Rule from James Rayme. Active work will be commenced by E. F. Evans and Judge Dearborn soon, sinking 200 feet on the ledge. This ledge carries $10 per ton free. ——The Initial claims, owned by H. C. Jones, have been bonded to San Francisco parties.

Paris, Dec. 12.

(Special Correspondence).—The Phœnix mine, near Johannesburg, has been closed down, on account of lack of water, by Superintendent Gender.——The Yellow Aster has found water 15 miles from the mine after sinking 1600 feet.——Sulphide ore has been struck at the 550-foot level of the Butte mine, near Randsburg. ——Rich ore has been found at the 300-foot level of the Orphan Girl mine, 3 miles from Randsburg.

Randsburg, Dec. 13.

The Francis M. & M. Co. is preparing to start development on the Francis mine, 40 miles north of Mojave. The 700-foot shaft is being unwatered. Besides the cyanide plant, the Francis company has two 2-stamp mills. J. C. Meadows of Kansas City is president.

Mariposa County.

The Three Trees mine, on the Merck estate, near Hornitos, is being developed by a Los Angeles company. A mill operated by electric power is to be put on the property.

Nevada County.

It is stated that work is not to be resumed at the Mountaineer mine, near Nevada City, until next spring, and the pumps have been stopped in the shaft. This is due to the shortage of water, with poor prospects of receiving a sufficient amount shortly. The pumps have been placed in condition, so that when they are needed in the spring they will be ready. The shaft will be allowed to fill up, but the water can not go above the 400 level, as it will drain elsewhere. It is the company's intention to drive ahead the tunnel on the opposite side of the creek, which is headed toward the Summit mine. This tunnel is in 400 feet.——The new company which is reopening the Idaho-Maryland mine, at Grass Valley, has reached the 800-foot level, having cleaned out and retimbered the shaft. From the 1000 level, which will be reached by February, a new shaft will continue on the perpendicular for 1200 feet.

The Birchville mine, near Graniteville, has been closed down for the winter on account of water shortage. J. McKelvey is superintendent.

All is in readiness at the Central Con. mine, near Banner mountain, near Nevada City, to start up the 20-stamp mill which has been put in by W. S. May. Until the slime plant is constructed the mill will remain idle. The tunnel is in 1300 feet, striking the old shaft at a distance of 900 feet and continuing beyond. At the mouth of the shaft a chamber is being cut in the rock for a 30 H. P. electric hoist. Electricity will operate the entire plant.

San Diego County.

It is reported that work is to be resumed at the Stonewall mine, near Cuyamaca. The shaft has been pumped out and retimbered to below the 600-foot level. E. B Tustin is owner and G. H. Clarke is manager at the mine. Machinery is to be put in so that the shaft can be sunk to the 1000-foot level.

Santa Clara County.

It is reported that the New Almaden quicksilver mines may be closed down. For a year past men have been laid off at the mines, until at present there are less than 75 men employed. The mines are owned by the Quicksilver M. Co. of New York. The reason assigned for closing the mines is that the property has been developed enough.

Shasta County.

(Special Correspondence.)—The Middle Creek G. M. Co., who have been developing the Dobrowsky mine, near Shasta, have just started their new stamp mill. The shaft is down 260 feet and three levels have been run. No ore has been stoped, and what ore not sent to the Keswick and Mammoth smelters during the shaft and drift work is piled up on the dump. H. O. Cummins is manager.

Shasta, Dec. 12.

The Bullychoop G. M. Co. has sixty men at work at its mines near Ono under the superintendence of Lester Greenwell. There is a 10-stamp mill and a 2700-foot aerial tramway on the property. It is reported that Manager Beall intends to put in an electric power plant and increase the number of stamps.

Sierra County.

(Special Correspondence.)—The Sierra Buttes mine, at Sierra City, has been closed temporarily because of trouble with the new tramway.——Ed. Westall, manager of the Marguerite, near Downieville, expects to have the mine unwatered soon.——R. Phelan of Sierra City has his power plant ready to run, and will start the Butte Saddle and the Roman.——The electric plant at the Telegraph mine, near Downieville, has been finished. ——The Eureka quartz ledge, on the Balsam Flat ridge, has been sold to the Alleghany M. Co. by A. M. Bixby.

Downieville, Dec. 12.

Sonoma County.

The dam for the Socrates Con. M. Co., near Cloverdale, has been completed. Water power sufficient to run the plant seven months in the year may be considered a certainty. The output each month during the last quarter averaged fifty flasks of mercury.——The Culver-Baer Co., near Cloverdale, is driving its main tunnel to cut the ore body formerly worked by the managers of the Oakland mine.——The Cinnabar King, near Cloverdale, is having its roadways improved and its buildings repaired, so as to be ready for future development work.

Tehama County.

(Special Correspondence).—The main ledge at the Basler copper mine, near Lowrey, is said to have been struck after running the tunnel 200 feet. The ore is stated to be chalcopyrite and bornite.

Lowrey, Dec. 12.

Tuolumne County.

The Moody mine at Big Oak Flat has been leased to Connally & Conde. The mill is to be started soon.—— A 5-stamp mill has been put in at the North Star mine, 7 miles southeast of Groveland. H. Argall is superintendent.

Yolo County.

It is reported that drills will be put to work on the Albert Bemmerly place in the tule, 7 miles northeast of Woodland, to prospect for gold.

COLORADO.

(Special Correspondence). — Several of the mining camps throughout the State are complaining of the shortage of cars to handle the product from their mines, as well as shipments to the mines. This is due to the increased output of the various properties and to the climatic conditions existing in the higher altitudes of Colorado. The traffic at Silverton is congested on account of the large amount of mining and milling machinery now being sent into that district; besides, the railroads entering the camp have been blockaded on account of the heavy snowfall.——The Telluride mill at Colorado City and the Homestake mills at Cripple Creek are reported sold to the Golden Cycle Co. and the Stratton estate, respectively, for the treatment of the ores from the various properties of the two companies.—— The forestry question is attracting considerable attention in this State at present, and a school of forestry in connection with the Colorado college at Colorado Springs is to be established. In some sections of the State timber for mine use is becoming serious and the preservation of the forest is being agitated. A large tract of land has been donated for the use of the school as a field for experimenting, and it is believed that students of forestry will attend the school from the entire arid region as well as from Colorado.

Denver, Dec. 12.

Boulder County.

(Special Correspondence).—The American Tungsten M. Co. report they have opened up tungsten ore which will concentrate twenty tons into one. The company has a lease on ground near Nederland.——The Jenny Creek G. M. Co. is operating on vein No. 1, and has a mineralized streak 4 feet in width which they claim averages $30 per ton. The company expects to put up a mill this year.

Frantz, Dec. 11.

The Inter Ocean mine on Gold hill, near Boulder, has been sold to the Inter Ocean M. Co., with main offices in Chicago, for $100,000. A 100-ton per day mill is to be erected near the mine. Development of the property is under way.

It is reported that a cyanide plant is to be added to the Struggler mill at Ward.——Sinking is to be continued during the winter by Manager G. M. Mitchell. ——The Myrtle mill has been closed down until spring.

Chaffee County.

Announcement was made Dec. 12 that a controlling

interest in the Ohio & Colorado smelter at Salida had been sold and that the purchasers would extend the business of the company by constructing new plants at Salt Lake and Denver. Timothy Goodwin of Denver, one of the former owners of the stock transferred, is authority for the announcement.

The Independence mine at Turret is being reopened under the direction of John Harrison.

Clear Creek County.

It is reported that work is to be resumed on the Atlantic tunnel near Georgetown. C. H. Morris of Georgetown is resident agent.——The work of putting in a switch and station on the Silver Queen vein in the Newhouse tunnel, near Idaho Springs, has been completed. This claim is held under a bond and lease by the Jackson M., L. & Dev. Co.——A Pennsylvania syndicate has secured the Gold Medal group of four patented claims near Idaho Springs. Work has been started by the new company.——Rich silver-lead ore has been struck in the Muscovite property on Democrat mountain, near Georgetown, in sinking the shaft from the tunnel level and at a depth of 35 feet. This property was secured recently by S. H. Clift and associates of Denver. Superintendent Hennengben has put fifteen men blocking out the reserves and knocking down the ore.——The United Light & Power Co. of Georgetown will double the capacity of its plant.——A rich strike of native and ruby silver and gray copper ore has been made in sinking the shaft on the Bellman mine in Gilson gulch, near Idaho Springs. The Bellman is owned and operated by the Memphis & Idaho Springs G. M. Co. C. A. King is manager.

Work has been resumed on the Vidler tunnel through Argentine pass in to Summit county, with machine drills. The present heading is between 700 and 800 feet from the portal. With the new drilling power it is expected that 200 feet per month will be made. It will be continued as a mining tunnel of present dimensions until the heading is advanced far enough to justify the beginning of its enlargement for railway purposes to connect with the Montezuma and points beyond on the western slope of Summit county. Next summer machinery is to be put on the opposite side of the pass to push the tunnel to a junction with the heading from the east side. Within 1200 feet of the present breast they expect to cut the Red Light lode. The men are cutting an upraise to the surface from the 600-foot point in the tunnel to afford ventilation and provide a convenient exit for employes in case of need. The distance yet to be run is about 6300 feet.

Gilpin County.

The Pewabic Consolidated Gold M. Co. in Russell district is shipping an average of five cords per day to the mill in Black Hawk and keeping forty stamps busy. This is mill ore taken from the Pewabic shaft. The Iron shaft has been finished and hoisting of water has been started.——The Old Town mine in Russell district is employing 125 men. The shaft is down 1500 feet.——James McMillan, superintendent of the Ann Rutledge M. Co., who own the North Star mining property, near Yankee Hill, is putting up a new mill to be built on the property designed to handle thirty tons per day.——Wenzel & Eilmann, who have a lease and bond on the Susan Mary mine, near Lake gulch, are working in a new 70-foot shaft, drifting east and west, using a windlass for hoisting the ore to surface.——J. Walters, superintendent of the Evergreen mine at Apex, states that the shaft has been straightened and retimbered and is down 75 feet.

At the Brooklyn mill on North Clear creek, above Black Hawk, the Colorado Chemical Amalgamating Co. is treating a large tonnage of ore. The ore is first put through the Blake crusher, and then fed to a Wild pulverizer, which reduces it to 20 mesh. It is then automatically carried to the grinding pans, where it is ground to 150-mesh fineness, and during grinding chemicals are added to the pulp, which oxidizes it during the four hours that it is being stirred and agitated, after which the pulp is thinned and diluted and put through the amalgamator. The present capacity of the chemical plant is twenty-five tons daily, and the ore is obtained from the Cashier lode of the Brooklyn mines, south of Central City. S. C. Arnold of Denver is manager.——The Brooklyn management is preparing to run the compressor to drive the north and south crosscuts from the sixth level. R. St. John Cleary of Denver is manager of the Brooklyn G. M. & M. Co.——Glanville & Peeck of Central City will rebuild the new shaft building of the Fairfield G. M. Co., which was blown down and destroyed by the recent heavy winds. The new machinery has been put in.——Sinking has been started at the Aduddell mine in Willis gulch on a contract calling for a lift of 100 feet, the shaft being down 450 feet.——The Taawasa Gold Mining & Cyaniding Co. intend to connect with the lateral from the Newhouse tunnel, at a depth of 1700 feet.——Work is to be resumed on the Hillhouse mine, near Russell Gulch. The main shaft is down 400 feet.'——The Old Town mine employs 125 men, forty on company account, the balance being leasers.——The new extension of the Gilpin tramway lines from South Willis gulch to the property of the Pleasant Valley M. & M. Co. at the bottom of Elkhorn gulch is almost completed.——The Mineral Hill G. M., M. & T. Co. is operating the Southworth property in Moon gulch. Sinking is to be resumed. W. H. Knowles and associates of Denver are interested. It is reported that the company will put in an air compressor.

Gunnison County.

C. F. Wahl, superintendent of the Gold Vein M. Co., operating on Cross mountain, near Tincup, is sinking on the recent strike, being down 60 feet.——The Gold Cup Co., of Tincup, is pushing their tunnel on Middle Willow creek. This tunnel will cut the Gold Cup contact at greater depth than has been reached at any other point.——The Brunswick concentrator, at Tincup, is running on ore from the Jimmy Mack dump. A. Lejune, superintendent of the Blistered Horn tunnel, is advertising for bids to run the main crosscut tunnel 200 feet. The tunnel is in nearly 1600 feet.

The Cleveland Mine Operating Co., recently organized to lease and operate mines at White Pine, has secured the Victor mine. The shaft is down 385 feet. The mine is to be worked for the silver, lead and zinc values. W. S. Rogers of Cleveland, Ohio, is president of the company and W. S. Barker of White Pine vice-president and general manager.

Lake County.

In Little Evans, at Leadville, the New Era Leasing Co. will resume work on Hoffer's claims north of the Coronado. Farther up Little Evans a leasing company, under the management of W. F. Page, is working claims partly developed by the Progressive M. Co.——Bohn's Mammoth placer shaft near Evansville is approaching the ore zone proven by drill holes.——On Big Evans, H. K. Whyte has resumed work on the Josie shaft and a new shaft is being put down on one of the claims of the Josie Consolidation, west of the Josie.——On the Bohn shaft, in Leadville, Manager Newell has recently sunk 150 feet, cut two stations and commenced two drifts from the bottom.

The Iron Silver M. Co. reports that during November it hoisted 500 tons more of zinc ore from the Moyer, Tucson and Dome shafts than in October. There was also an increase in the shipment of carbonate ore from these properties to the smelters. About the same quantities of copper and iron sulphide were shipped last month as the month before. The figures as given out by Manager William O'Brien are as follows: Zinc, 10,500 tons; iron sulphide, 1500 tons; carbonate, 500 tons; copper, 500 tons. The entire ore output of Leadville camp was slightly less during November than October, owing to the weather preventing the smaller operators from working their properties. The zinc tonnage also fell off somewhat, according to the local representative of the zinc trust, Patrick O'Dwyer. The amount of zinc ore taken by the trust is about 15,000 tons, while a month ago it was 16,000 tons. The total output of all grades of ore during November was 77,500 tons, as against 79,000 tons for October.

Judge Owers of Leadville has rendered a decision making permanent the injunction restraining the Mine Owners' Association from forcing miners to take out working cards.

The machinery at the Coronado shaft in Leadville has been overhauled and new tramways constructed.——The Fortune shaft, on Little Ellen hill, Leadville, is shipping good ore.

Mineral County.

A lease upon the Commodore mine, near Creede, has been given to A. L. Wilson, H. Van Horn, W. Dwiggans, J. Wilson, and C. Withrow, all of Creede.

Ouray County.

The Evening Star vein has been cut 430 feet from the bottom of the 500-foot shaft at the Imogene G. M. Co. workings, near Ouray.——The Grecian mine, adjoining the Sultan group, near Ouray, and owned by R. W. Clinton, is said to have opened up an ore body 100 feet long and in the breast there is a body of lead-zinc ore 2 feet in width. It is the intention to equip the property with a mill soon.

Park County.

(Special Correspondence).—The Snow Storm Hydraulic Co. recently held their annual meeting in Denver and intend to consolidate development work. The company owns the placer ground extending from near Fairplay to the head of the Platte river, above Alma. J. S. George of Milwaukee, Wis., is president, W. J. MacConnell general agent and W. E. Thorne general manager.

Fairplay, Dec. 10.

San Juan County.

The capacity of the Hamlet mill, near Silverton, is to be increased to treat rock from recent strikes. The lower crosscut tunnel is in over 400 feet.

At the concentrating plant of the Hercules Con. M. Co., at the foot of Sultan mountain, south of Silverton, ten new stamps will be added to the equipment, making forty stamps in all. An addition to the mill, 30x65 feet, has been completed. The present power plant of 125 H. P. will be increased to 275 H. P. by the installation of additional steam boilers. Development and the blocking out of ore in the mine has been in steady progress all summer.

San Miguel County.

The Menona M. & M. Co. has leased the Columbia-Menona mines and 30-stamp mill, in Savage basin, 5 miles from Telluride, to John P. and John B. Olson. Operations have been started.

The work on the Butterfly-Terrible mines at Ophir Loop, 14 miles from Telluride, consists largely of that performed by lessees who are working on the ore shoot between the second and the third levels, and taking out enough ore to keep from ten to twenty stamps of the Butterfly-Terrible 30-stamp mill dropping part of the time. The officers of the company are driving the tunnel to tap the ore shoot 750 feet below the third level. The tunnel is in 1000 feet and is being pushed with machine drills.——Development has been resumed on the Congress group, above Blue lake, at the head of Bridal Veil basin, near Telluride. The group is owned by L. W. White, E. M. Arthur, J. W. Hanson and Peter Hansen.——The Blue Lake group, owned by J. A. Adams, C. F. Hilgenhaus, D. Smith and others, is being developed.

Summit County.

(Special Correspondence).—Foote & Hight, who have been working the Bullion King mine on Gibson hill, near Breckenridge, shipped five cars of zinc ore recently.——The Lanyon Zinc Co. of Denver has taken a bond and lease on the Country Boy vein on Nigger hill. This is a portion of the Juniata mine, owned by the Lincoln Gold Mines Co. Carroll Clark is in charge.——C. C. Acton has struck gold ore on the Acton-Lyman property in Summit gulch.——The King Solomon Tunnel & Development Co. at Frisco has cut two ore bodies in its main tunnel. A contract has been let to drift on this vein.——The management of the Mint M. Co. has let a contract to extend their main tunnel into Ophir mountain.

Breckenridge, Dec. 10.

Teller County.

C. F. Springer of Colorado Springs has taken a bond and lease on the Louisiana claim of the Ore-or-no-go Co. on Raven hill, near Cripple Creek. A hoist is to be put in and the shaft sunk from the 143-foot to the 200-foot level.——J. K. Miller and associates of Colorado Springs have taken a two-year lease on the north end of the Oro claim, Cripple Creek. The shaft is to be sunk to a depth of 200 feet from the 60-foot level. New machinery is to be put in.——The Rose Nicol shaft on Battle mountain, near Cripple Creek, is being sunk from the 600-foot to the 700-foot level.——The Scranton shaft on Little Bull mountain, south of Victor, is being sunk from the 90-foot to the 200-foot level.——The Duncan & Cain shaft on the Teutonic, on Ironclad hill, Cripple Creek, is to be continued to the 650-foot from the 350-foot level.——Selbach & Johnson, operating the Pride of Cripple Creek, on Ironclad hill, under lease, are working on the 300-foot level to cut the extension of the ore shoot opened on the Mt. Rose, adjoining.

IDAHO.

Idaho County.

C. C. Vancy and M. B. Merritt have returned to Roosevelt from Ramey ridge, where they have been developing the Florence A. group of claims, which they own in conjunction with V. Welch and O. Hayberg. About 200 feet of tunnels and open cuts were made.——On the Mildred group, which adjoins the Florence and has a parallel vein, considerable work has been done by Hussey & Wakefield of Spokane. Lynch, Stephenson & Mahon, the discoverers of this district, have done considerable work on their Little Gem and Gold Bug groups, which show well defined veins of good size and character. A 55-foot shaft has been sunk on the Little Gem.——One of the biggest strikes of the year has been made on the Butch, owned by Butcher & Gassett.

Lemhi County.

In a report to W. A. Beyers of Salt Lake, general manager of the Virginia M. Co. of Baker, it is stated that the property consists of twelve claims and has been opened up by 3000 feet of development work. The last work done was by a tunnel 700 feet below the upper workings. This tunnel is in 200 feet. There are nine tunnels on the property, averaging from 35 to 400 feet in length. The mine is equipped with a 3-stamp mill. The company will build a big concentrating mill and start breaking ore.

Nez Perces County.

The gold dredge at Delta has been dismantled and is being moved to the Gaffney land below Pierce City.——The Gateway M. & M. Co. are working the Wild Rose and Hutch claims, near Pierce City.

Owyhee County.

Work has been discontinued for the winter at the Standard M. Co.'s properties on South mountain, near Silver City, by Manager F. T. Clemmens.

Shoshone County.

The Monarch Mining Co. of Murray is opening up the ore bodies on the 1400-foot adit level. A long crosscut tunnel was run some time ago, cutting two distinct veins 1000 feet apart. The first of these had been explored for 500 feet, opening up a shoot of concentrating ore. The second vein ahead, called the Monarch, will be drifted on east and west from the point of intersection. The property has a 150-ton concentrator. E. P Spaulding is manager.

MICHIGAN.

Keweenaw County.

(Special Correspondence).—The control of the Keweenaw Copper Co. and the Keweenaw Central Railroad has been taken over by Thomas F. Cole and associates. The Keweenaw Copper Co. was organized by C. A. Wright of Hancock. The Keweenaw Copper Co. has begun explorations on the Medora and Mandan, and it has there cut the Montreal River lode. The Keweenaw Central Railroad is graded to Mohawk, 5 miles from Calumet, and expects to finish this last stretch of grading in the spring. It also has part of the road from Lac Labelle finished.

Houghton, Dec. 11.

MONTANA.

The annual report of B. H. Tatem, assayer in charge of the United States assay office in Helena, on the mineral production of Montana during 1904, states that the aggregate value of the precious metals won by the mills, smelters and other reduction works from the ore mined and treated, together with the gold obtained from placers, shows an increase over the yield of the preceding year. The quantity and value of each is shown below, the gold and silver being computed at the coinage rate and the copper and lead at the average market price for the year: Gold, fine ounces, 246,605.374, $5,097,785.50; silver, fine ounces, 14,608,089.91, $18,887,227.36; copper, fine pounds, 283,945,330, $36,410,309.67, and lead, fine pounds, 4,537,598, $195,525.10. Total value, $60,590,847.63. The above shows a gain of 17% in the value of the production over the preceding year. In 1903 the entire output shown by corresponding statistics was $50,276,355. The principal increases have been as follows: In gold, $507,270; in silver, $1,789,525, and in copper, $8,209,618. On the other hand, the amount of lead produced shows a decrease of $191,920. This increase in the amount of gold arose principally in ores reduced by the cyanide process. An increase is also to be noted from the tonnage shipped to and treated at the custom smelters. The increase in silver resulted from the greatest reduction of the Butte ores ever accomplished. Smelting ores from other districts also show a gain in silver nearly equal to that noted from the copper ores of Butte. As has been noted in reviews of the production for Montana in recent years, the most important features of the output of gold and silver were furnished by the mining of the copper ores in the Butte district and in the results achieved by the development and perfection of the cyanide process. For many years the fluctuations in the amounts of gold and silver won from

the copper ores were most important, but since the advent of the cyanide process into the mining industry of Montana, whereby gold is successfully extracted from tailings and low grade ores, the annual returns from this source have increased yearly. More than 64% of the total values won from Montana's mines in 1904 consisted of the gold, silver and copper contained in the ores mined at Butte. The principal lead districts are those of Cascade, Meagher and Flathead counties. The production of gold, silver, copper and lead for the State from 1862 until the close of 1904 is shown to have been as follows: Gold, $291,228,136; silver, $404,403,578; copper, $450,327,758; lead, $13,651,075; a grand total of $1,159,610,547.

Broadwater County

The Custer Con. M. Co. at Winston is preparing to do development work. The old Custer shaft, which was 400 feet in depth, has been enlarged and retimbered and will be sunk 200 feet deeper. The second hoist is intended for sinking a new 300-foot shaft on ground belonging to the Custer group. C. S. Muffly of Helena has charge.

Cascade County.

O. C. Mortson and C. A. Martin of Monarch are said to have found tin in the Baldy range, 7 miles from Neihart.

Fergus County.

The Kendall Extension G. M. Co. has been organized by H. H. Lang, superintendent of the Kendall, and R. K. Neill of Spokane, Wash., to explore ground near the Kendall mine.

Rich ore has been recently struck in the Cumberland group at Maiden, owned by O. Stephens, R. F. Calkins of Chicago and P. Rosso of Maiden. A mill may be built in the spring.

Silver Bow County.

(Special Correspondence.)—The leading mining companies of the Butte district in 1905 yielded ore in quantities as follows, December being estimated: Anaconda, 1,600,000 tons; Boston & Montana, 1,200,000; Butte & Boston, 192,000; Trenton Co., 230,000; Washoe, 150,000; Parrot, 135,000; United Copper, 548,000; Clark mines, 350,000; North Butte, 255,000; Pittsburg, 50,000; all others, 500,000; total, 5,110,000 tons. The first six companies named are amalgamated. From this total tonnage of ore in excess of 338,000.000 pounds of copper were produced. Of that amount the Amalgamated Co. is credited with 264,000,000 pounds; United Copper, 30,000,000; Clark, 20,000,000; North Butte, 20,000,000. The Amalgamated also obtained, as by-products, 9,000,000 ounces of silver and 60,000 ounces of gold; United Copper, 2,000,000 ounces of silver and 6000 ounces of gold; Clark, 1,000,000 ounces of silver and 1600 ounces of gold; North Butte, 1,500,000 ounces of silver and 1800 ounces of gold. The output of the Washoe smelter of the Amalgamated Co. was 14,000,000 pounds of copper a month, and the Boston & Montana smelter 8,000,000 pounds a month. Ninety-two per cent of all Amalgamated ore yielded 4% copper, and 8% of it went 8½% in copper. During the last six months the Anaconda ore averaged better than 3%. The monthly payroll for miners in Butte is $1,125,000. There are employed 10,593 men in the mines, as follows: Amalgamated, 6326; United Copper, 1400; Clark, 1100; North Butte, 467; Pittsburg, 300; other companies, 1593. The State Mining Inspector, in his annual report to the Governor for the year ending November 30th, says the mineral production of the Butte district was worth $12,000,000 more than the year previous, and that since the district began producing copper it contributed $600.000,000 worth to the world's supply, or about 40% of the world's product. In the whole of the Butte district there are 26,600 acres, while the principal mines are within a radius of 1 mile square. Of the 26,600 acres of mineral ground the Amalgamated Co. owns 1981 acres, Senator Clark 181 acres, United Copper 167 acres, North Butte 72 acres, Pittsburg & Montana Co. 290 acres, East Butte 18 acres and the Raven Co. 16 acres, the remainder owned by individuals and small companies.

Butte, Dec. 10.

NEVADA.

Esmeralda County.

Ore from the January mine is being treated at the Frank mill at Goldfield. H. T. Bragdon is manager.——Considerable high grade ore has been sacked at the Red Top mine at Goldfield.——High grade ore has been struck between the 100 and the 150-foot levels of the Florence mine at Goldfield. Frank Oliver is manager.——During November 914 tons of ore from the Combination mine at Goldfield were treated in the Combination mill. An electric hoist is being put in at the shaft.

Lincoln County.

(Special Correspondence).—The Quartette M. Co. will sink a working shaft on the Hidden Treasure claim at Searchlight, where $12 ore was opened. The vein has been exposed by trenching for a width of 50 feet on the surface. Superintendent F. J. Harrington expects to get water in this vein, which will be utilized to run ten additional stamps from the old Colorado river mill, now being dismantled.——On the Azusa claim, north of Searchlight, high-grade copper ore has been struck. The gold values are slight.——It is reported that the Santa Fe will build a broad gauge line from Ibex to Searchlight, to compete with the proposed Salt Lake feeder from Nipton.——The tailings dump at the mill of the Southern Nevada M. Co. has been exhausted, and the cyanide work will cease. Crosscutting the lead is in progress on the 430-foot level of the Blossom claim, belonging to the same company.——At El Dorado Canyon the Black Hawk M. Co. is sinking a 2-compartment shaft on the Rand claim. It will be put down to the 500-foot level. On the Honest Miner claim, belonging to the same company, ore has been struck 5 feet in width.——The Venus M. Co. at El Dorado Canyon is sinking a 5x7 shaft on a 5-foot vein, in which free gold is visible. C. E. L. Gresh is manager and E. P. Jeans superintendent.——At the Techaticup at El Dorado Canyon a station is being cut at the 550-foot level. Drifting east and west will follow. At the rate the water has been coming into the shaft of late a pump will soon be a necessity.——The El Dorado Nevada M. Co., E. J. Roberts manager, is sinking on the Silver Legion group at Knob hill. Shipping ore is being taken out at 70 feet depth.

Searchlight, Dec. 11.

(Special Correspondence).—In the Good Hope mine, between the Quartette and the Duplex, in the south crossout on the 300-foot level, 12 feet of milling ore has been exposed. A mill may be put in. Station cutting is in progress at the 500-foot level. When this is completed, sinking will be resumed for the 600.——A new strike at Lewis Springs, 15 miles southwest of Searchlight, on the Blake road, has created considerable excitement.——Work will commence on a 500-foot shaft on the Eddy group, which adjoins the property of the Searchlight-Parallel, and Santa Fe M. Cos. The property has been in litigation for the past two years, but a decision was recently rendered in the lower court in favor of the defendants. The plaintiffs have appealed to the Supreme Court, but in the meantime work will be carried on by the defendants.——The Majestic Goldfrog M. & M. Co. of Denver has acquired the Searchlight-Bonanza claims. Development will be commenced at once.——Retimbering the Santa Fe shaft is going forward. A new Cornish pump has been set up.——Construction of the new gallows frame at the Boulder mine has been delayed by shortage of carpenters. The management hopes to resume sinking by the first of the year.——Operations at the Pompeii mine have been limited to drifting on the 264-foot level, owing to delay in receiving the new pumping plant.——About 30 men are employed at the Excelsior mine, in the New York mountains, 26 miles west of Searchlight, and across the California line. The Excelsior is a copper proposition, carrying also gold and silver values. About $20,000 have been expended during the last four months for equipment and development, and other improvements are planned, including a branch railroad to Leastalk.

Searchlight, Dec. 13.

A 300-foot shaft is to be started in the Oom Paul vein of the Searchlight Copper Gold property at Dupont camp, near Searchlight.——Good ore is said to have been found at the 175-foot level of the New Era mine, near Searchlight.

It is reported that the Josephine M. Co. will build a mill in the Chief district, north of Caliente, to treat ore from the Josephine and Advance mines.——Chas. Culverwell is developing claims at Caliente.——McLain & Dorsey have sold the Bald Eagle mines, on Virgin river, south of Caliente, to Laughlin, Blake & Co. of New York City, who intend to build a mill in the spring.

NEW MEXICO.

Colfax County.

It is reported that electric drills and power plant are to be put in by the Gold & Copper Deep Tunnel M. & M. Co., near Elizabethtown. The tunnel on Mt. Baldy is in 1800 feet. A. T. McIntyre is president and W. P. McIntyre superintendent.

Luna County.

Tres Hermanos camp is at the northwest end of the Tres Hermanos mountains, 25 miles south of Deming, and 7 miles south of Tourmerlin station, on the El Paso & Southwestern Railroad. It is an old lead camp, having been worked twenty years ago. Frank Thurmond and others have resumed work on the old lead claims and have developed valuable deposits of zinc carbonate.

Sierra County.

It is expected that the concentration mill of the Southwestern L. & G. Co., southwest of Engle, will be completed by the first of the year. Electric power is to be used throughout.

OREGON.

Baker County.

At Cornucopia, Manager G. W. Boggs has a large force at work in the tunnels, and is putting up a 20-stamp mill.——In the Greenhorn district most of the properties have closed down for the winter.——The Pyx mine, near Greenhorn, is being worked. The Black Eye vein, in the same district, has been cut at a depth of 250 feet, the crosscut tunnel being 500 feet long.

Grant County.

C. C. Ames, who has the Morning mine, near Granite, under lease, has cut the ledge in the lower tunnel.

Josephine County.

The placer mines near Waldo have started up. The indications are that there will be plenty of water for a long mining season.

The Booth copper mines, at Pickett creek, which were recently bonded by Haviland & Co. of Ohio for $100,000, have been taken over by the new owners. They will develop the property by tunnel and shaft. The wagon road from Merlin, the nearest railway point to the mine, will be rebuilt and improved to allow of heavy hauling at all seasons.

Lake County.

The Pine Creek mining district is south of Lakeview, where Oregon, Nevada and California join. Recent discoveries of gold and copper are expected to cause an influx of prospectors in the spring. The snow is deep in winter, as the elevation is from 5000 to 8000 feet. Claims have been located by J. Reeves, J. Sanger, C. Jeter, W. I. Fleck and D. V. Snowgoose.

Wallowa County.

H. D. Akins of the Tenderfoot mine, 15 miles southeast of Joseph, says there are twelve men sinking a shaft which will open the main vein at a depth of 200 feet. In the spring the management intends to put up a 20-stamp mill. There are about thirty locations in this district which will be worked in the spring.

WASHINGTON.

Snohomish County.

J. Meindal, foreman in charge of the Conservative M. & M. Co., near Index, says that he has suspended underground work for the winter. The tunnel is in 110 feet.

Stevens County.

Molybdenite claims 12 miles east of Bossburg are being worked by V. P. Adams and Frank O'Boyle.

UTAH.

B. H. Tatem, assayer in charge United States Assay office, Helena, Mont., reports that the values of gold, silver, copper and lead won from the mines of Utah during 1904 were the largest in its history:

	Quantity.	Value.
Gold, fine ounces	202,475.703	$4,185,544 22
Silver, fine ounces (coining rate)	12,210,527 20	15,787,348 30
Copper, fine pounds, at $12 823 per hundredweight	44,012,203 00	5,643,684 79
Lead, fine pounds, at $4.309 per hundredweight	116,350,974.00	5,013,563 47
Total		$30,630.140 78

According to counties the gold output for 1904 was:

Counties.	Fine Ozs.	Value.
Beaver, Millard, Piute and Sevier	19,314 747	$399,271 24
Box Elder, Grand and Washington	3,564.325	73,681 13
Juab and Utah	72,404 441	1,496,732 62
Salt Lake	56,472 048	1,167,380 84
Summit	13,601 991	281,178 11
Tooele	36,756 772	759,829 91
Impossible to classify	361.370	7,470 37
Totals	202,475 703	$4,185.544 22

The source is classified:

	Fine Ozs.	Value.
In quartz and dry ores	5,805 945	$120,019 53
In cyanide mill, bullion	53,518.608	1,106,329 06
In lead ores	29,909 253	618,279 10
In copper ores	100,303 582	2,073,458 44
In milling ores	12,938 285	267,458 09
Totals	202,475 703	$4,185,544 22

The amounts and value of the silver in the several counties of the State during the year 1904 were:

	Fine Ozs.	Coining Value.
Beaver, Millard, Piute, Sevier	186,992 52	$241,768 11
Box Elder, Grand, Washington	27,715 77	35,824 52
Juab and Utah	4,022,649.09	5,201,000 84
Salt Lake	1,548,617 03	2,002,252 32
Summit	5,912,936 87	7,645,009 28
Tooele	418,503.13	541,094 88
Impossible to classify	93,112 79	120,388 25
Totals	12,210,527.20	$15,787,348 30

The amount of silver won from copper and lead ores, from cyanide and milling plants and that contained in dry ores and concentrates during the year was:

Classed as	Fine Ozs.	Coining Value.
In quartz and dry ores	153,293.94	$198,198 23
In cyanide mill, bullion	55,280.52	71,473 80
In lead ores	7,904,431.94	10,219,871 60
In copper ores	3,928,328 60	5,079,051 12
In milling ores	169,192.20	218,753 55
Totals	12,210,527.20	$15,787,348 30

Box Elder County.

A cyanide plant is to be put in by the Susie M. Co., working on Dove creek, near Park Valley, to treat talc ores recently opened up. Owen Bailey is manager.

Juab County.

It is expected that the Godiva mill at Eureka will be completed by March 1, 1906.

FOREIGN.

AFRICA.

Transvaal.

Heavier stamps are being used on the Rand; those at the Simmer & Jack are to be 1415 pounds, in place of 1250 pounds, and on the East Rand Proprietary mines and the new Wolhuter mine the mills are to be built with 1350 pound stamps. This is, again, being followed by finer grinding, and a tendency to slime everything, the adoption of filter presses, and other Australian methods, the technical advisers of the General Mining & Finance Corporation taking a prominent part in all experiments tending in the direction of a higher extraction. At several of the mines under the control of the General Mining & Finance Corporation radical alterations in the method of treatment are being tried. It is suggested to dispense with stamps and substitute grinding pans, on the ground of the heavy cost of the former; and with greater application of automatic appliances the cost of treatment would be lower, while the carrying out of fine grinding in different stages would result in a higher extraction.

AUSTRALIA.

New South Wales.

The British Broken Hill has followed the example of the other companies in disposing of its accumulations of tailings, a contract having been concluded for the sale of its surface residues of tailings, and slimes from the concentrating mill, amounting to 375,000 tons. The company has also sold its current output of tailings to the same purchaser for three years. Operations are to be commenced at Broken Hill, where the metal contents of the tailings are valued at £25,000,000. It is not known what process of treatment will be adopted. Satisfactory arrangements have been made with the proprietors of the chief tailing treatments yet tried at Broken Hill, under which the corporation will have the right to test the various systems and adopt the one or more deemed most suitable. Proposals are also under consideration for starting zinc smelting works to treat concentrates instead of sending them to other parts of the world, as is done at present.

CANADA.

BRITISH COLUMBIA.

Boundary District.

J. McPhee has purchased a half interest in the Huron mine, in Franklin camp, from Thomas Donan.——Frank Fritz, the original locator of the Thunder Hill camp, has sold the Agnew property to H. W. Warrington, superintendent of the Kettle Valley Railway.——G. A. McLeod of the McKinley mine has sold an interest in the Yellow Jacket claim, in Franklin camp, to D. Whiteside of Grand Forks.——Development work on the Seattle mine, owned by Robert Clark, has been suspended for the winter.

The ore shipments from Boundary mines for the week

ending December 9, were the greatest made in seven days. Granby mines to Granby smelter, 17,473 tons; Brooklyn, Stemwinder, to Dominion Copper smelter, 1786 tons; Rawhide to Dominion Copper smelter, 480 tons; Sunset to Dominion Copper smelter, 480 tons; Emma to Nelson smelter, 90 tons; Providence to Trail smelter, 30 tons; Skylark to Granby smelter, 20 tons. Total for week, 24,163 tons; total for year to date, 857,907 tons. Boundary smelters treated as follows: Granby smelter, 18,259 tons; British Columbia Copper Co. smelter, 269 tons; Dominion Copper Co. smelter, 2746 tons. Total treatment for week, 23,614 tons; total for year to date, 874,389 tons.

At Long Lake camp the Jewel mine is being developed.——Development work has been discontinued at the Hesperus & Betts on July creek in the Grand Forks division. The tunnel is in over 850 feet. Development will be resumed when diamond drilling has been finished.

Nelson District.

The Ark Group M. & M. Co. is working claims at the head of Sixteen Mile and Clearwater creeks, 4 miles from Ymir. A 350-foot tunnel is said to be in progress to tap the ore shoot at the 200-foot level. Work will be continued all winter and a stamp mill is planned for next spring.

Rossland District.

The tonnage of ore shipped from and crushed at the Rossland mines for the week ending December 9, and for the year to date, was as follows:

Le Roi	1,740	108,886
Le Roi (milled)	....	3,240
Center Star	2,010	92,940
War Eagle	1,230	64,080
Le Roi Two	180	8,032
Le Roi Two (milled)	1,260	10,630
Jumbo	300	10,129
White Bear	....	1,100
White Bear (milled)	....	3,220
Cascade-Bonanza	....	120
Crown Point	....	350
Spitzee	....	4,800
Velvet-Portland	....	1,976
Gopher	....	180
Homestake	....	30
Lily May	....	90
Inland Empire	....	30
Totals	6,660	309,843

A station is being cut at the eleventh level of the Center Star, which is 1530 feet below the collar of the shaft.——The winze of Le Roi is being deepened from the 1550 to the 1750-foot level. Should the territory between the 1550 and the 1750 prove as good as that between the 1350 and the 1550-foot levels the intention is to deepen the five compartment main shaft from the 1350, its present lower terminal, down to the 1750-foot level. The crosscut which is being driven from the 1350-foot level into the ground of the Le Roi Two has progressed 180 feet. J. A. Trevarrow has charge of work in the mine.——The shaft of the Island Empire at Rossland is being deepened by F. S. Griswold.

West Kootenay District.

G. W. Odell of Spokane, Wash., has purchased the interest of W. S. Rugh of Rossland, B. C., in the Wagner mining claims in the Trout Lake district. C. T. Porter, one of the owners, reports that the greatest amount of work done on the group is on the Duncan claim, where 250 feet of tunnel and winze work has been done. This work has opened up a body of silver-lead ore 100 feet long and 12 feet wide. The greatest depth on the claim is 140 feet. Next year a concentrator is to be put in. The Trout Lake district has been going ahead. Adjoining the Wagner is the Abbott group, owned by the C. P. R. Considerable work has been done on it, but it is now idle for the winter.

MEXICO.

The Diario Official recently published the following decree: The metallurgical establishments of the republic which refine silver to the point of obtaining malleable bars of that metal possessing the requisites for coinage and of a fineness of at least .996 will pay, by way of interior stamp tax, 1½% only on the value of the metal thus refined. The refinement of gold and silver in the form mentioned in the foregoing and in the second article, requiring that the gold bars be malleable and .994 fine, in regard to the coinage of gold will entitle metallurgical establishments effecting such refinement to have returned to them, in the form to be fixed by the rules of practice, three-fourths of the value of the stamps due on the metals in question, and which shall have been canceled on the invoices made out in connection with the purchase of the ores or bars by such metallurgical establishments subsequently to January 1, 1906, for reduction and refinement. There will be no claim for the return of stamp duties after the lapse of six months from the date of the cancellation of the stamps. There are hereby abrogated Article 4 of the law of March 25, 1905, in regard to taxes on and franchises to mining, and the decree of June 19, 1905, in regard to the reduction of the stamp tax on metallurgical establishments.

Chihuahua.

The plans for the Chihuahua smelter of the American Smelting & Refining Co. have been approved by Governor Creel, and the erection of the smelter on the site purchased a short time ago will be commenced at an early date. The initial capacity of the smelter will be 750 tons daily. The Compania Fundidora y Afinadora has been organized in Chihuahua to build a custom smelter at Jimenez under the concession granted by Governor Creel early this year. Leopold Iwonsky, manager of the House of Stallforth, is president of the company, and the other officers are J. F. Flynn, J. F. Johnson and Antonio Ortiz. It is stated that the construction of the plant will be started at once. The Jimenez smelter will have an initial capacity of 250 tons.

Jalisco.

The Cuale Mining Syndicate, which was organized a year ago to take over the old Las Bolas silver mine, in the Cuale district, has surrendered the option under which the mine was being worked. The property reverts to the owner, Mrs. F. Orozco of Guadalajara.

It is reported that a concentrating plant is to be constructed at the Agua Blanca mine in the Autlan district. William Oliver is superintendent. The boilers that furnish the power for the pumps and hoist at the Agua Blanca are undergoing repairs, and work in the lower levels has been temporarily suspended.

NEW ZEALAND.

The annual report of the Minister of Mines states that the quantity of gold entered for exportation through the custom for the year 1904 was as follows: Auckland, 223,010 ounces; Marlborough, 473 ounces; Nelson, 5049 ounces; West Coast, 122,310 ounces; Otago and Southland, 169,478 ounces; total, 520,320 ounces, valued at £1,987,501. The winning of gold from quartz reefs is carried on in various parts of the colony, the chief centers of this branch of the mining industry being the Ohinemuri, Thames and Coromandel counties in the North Island, and the Inangahua county in the Middle Island. In the Northern Goldfields, the production of gold is greatest in the Ohinemuri county, in which are the mines of the Waihi G. M. Co. The output from the Waihi G. M. Co.'s mines for 1904 was 259,978 tons of quartz, from which bullion to the value of £673,101 18s 4d was obtained. The several mills are provided with modern plants for the extraction of gold and silver from the ore, there being 330 stamps. Over 1200 persons are employed, and dividends amounting to £297,544 4s were paid during the year. The ore bodies continue to maintain their characteristic sizes at the lowest levels. The Waihi Grand Junction G. M. Co. has made preparations for the output and treatment of quartz, a modern mill comprising a 40-stamp battery with cyanide plant being in course of erection. For treating tailings in the bed of the Ohinemuri river, a plant has been erected near Waihi. For some time operations were necessarily of an experimental character, and have, it is understood, been so satisfactory as to warrant the extension of the present plant, and the proposal to erect one of much larger capacity lower down the river.——Mining at Karangahake is carried on by the New Zealand Crown Mines, Ltd., and the Talisman Con., Ltd., the latter company having taken over the Woodstock mine, at which active operations by the former proprietary ceased last year. Bullion to the value of £137,468 was obtained during the year.——In the Thames county the principal new work has been at the Golden Belt mine, Neavesville, where a battery of forty stamps with cyanide plant has been put up. The Tairua-Broken Hills mine has not maintained the steady output which characterized previous operations.——In the Coromandel county during 1904, work was conducted on a small scale at the Royal Oak of Hauraki mine, at Tokatea. A somewhat serious drawback to the mining industry exists in connection with the drainage of mines near the lower township, work at levels below that at which natural drainage can be effected having been suspended in consequence of owners of adjacent properties failing to agree as the proportionate costs of pumping which each should bear. A proposal has been made to the department relative to prospecting the Tokatea Big Reef, and a subsidy at the rate of pound for pound up to £300 promised for this purpose. At Kuaotunu the Waitaia mine is the principal producer. In the Middle Island quartz mining has been successfully carried on in the West Coast Inspection District. The hydraulic and alluvial mining branch of the gold mining industry is carried on in the several goldfields of the Middle Island, and is well established. There have not been any new developments during the year, but the work gives employment to a considerable section of the mining community. The yield of alluvial gold must gradually decrease unless other areas of gold-bearing country are discovered and opened up. In some known instances payably auriferous ground exists, but so far has not been systematically worked owing to the scarcity of water locally for sluicing purposes, although supplies are feasible by the expenditure of capital in the construction of water races, dams, etc. During the last few years the extension of hydraulic mining methods has been somewhat neglected in consequence of the adaptability of dredgers for working on alluvial flats. Experience has, however, proved that under certain conditions the hydraulic system of mining is preferable to dredging, and in a few cases it has been found necessary to revert to the former method. The number of dredgers at work at the end of the year 1904 was 186, a decrease of about 15 as compared with the preceding year. The experiment of tree planting in Southland on a river flat area which has been dredged appears to have been very successful, and a suggestion has been made that where swamp lands have been turned over by dredgers the cultivation of native flax might be adopted. The royalty obtained by Government in respect to the purchase rights of the cyanide process now amounts to £9356, or practically 93½% of the sum originally paid. The balance will, in the natural course of events, be received during 1903 and thereupon all further royalty charges for the use of the cyanide process in New Zealand will cease.

Commercial Paragraphs.

THE Model Gas Engine Works, Auburn, Ind., now under the management of J. W. White, will be removed to Peru, Ind. The company manufactures gas and gasoline engines and automobiles, and at the present time has large orders booked for shipment to California, Mexico, Cuba and Java.

THE Westinghouse Electric and Manufacturing Co. of Pittsburg, Pa., are equipping mines with electric locomotives, to replace the older forms of haulage. The Newport M. Co. will equip their mines at Ironton, Mich., with surface and underground electric haulage, and have ordered six 4-ton Westinghouse mine locomotives. Electrical apparatus for the equipment of the necessary power station will also be provided by the Westinghouse Co., consisting of a 150 kw., 250 volt generator, direct connected to a Corliss engine of 130 r. p. m., and a three panel switchboard.

Books Received.

In a series of word pictures the reader may see the scenic wonders of this west half of America in "The Western United States," by H. W. Fairbanks. Here this experienced geologist presents the results of years of personal investigation of the geology of this region in a form that is delightfully readable. He has a style of description and of exposition that portrays the subject so that any one can understand it. At the same time the geological and physiographical description is accurate. The "reason why" is told. Mountains, valleys, deserts and coasts are each described and explained in an interesting yet instructive manner. The book is published by D. C. Heath & Co. of Boston, Mass., and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for 75 cents.

Trade Treatises.

"Ideal Power," published by the Chicago Pneumatic Tool Co. of Chicago, Ill., has appeared for November.

Latest Market Reports.

SAN FRANCISCO, December 15, 1905.

METALS.

SILVER.—Per oz., Troy: London, 30⅛d (standard ounce, 925 fine); New York, bar silver, 65¼c, refined (1000 fine); San Francisco, 65¼c; Mexican dollars, 53c, San Francisco; 50c, New York.

COPPER.—New York: Lake and Electrolytic, $18 37½@18.87½; Casting, $18.00@18.50; San Francisco: $18.75; Mill copper plates, $21.00; bars, 21@24c. London: £80 5s 6d spot per ton.

Copper has made another decided advance during the week, each day seeing a small fractional advance. The quotations to-day are the highest since 1882. Small lots have been sold in New York within the week at $19.00. It seems improbable that the price can advance still higher. The present price should and probably will prove a strong stimulus to increased endeavor in production, and in the development and equipment of new deposits of this metal.

LEAD.—New York, $5.85; St. Louis, $5.15; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6½c. London: £17 6s 3d ℔ long ton.

SPELTER.—New York, $6.55; St. Louis, $6.20; London, £28 15s ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $37.75@38.00; San Francisco, ton lots, 37c; 500 lbs., 38c; 200 lbs., 40c; less, 41½c; bar tin, ℔ lb., 42c. London, £164 2s 6d.

Tin is higher than in years. The present price—$37.75@38 00—will prove interesting to the new tin districts of the world as well as a boon to the old deep mines, where increased expenses will now find this substantial advance in price most agreeable.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35@18.85; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00,

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11½c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

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Auxiliary Mining Plants.

In any country where mines depend upon water for power—either directly applied or through hydro-electrical installations built for power purposes by large distributing companies, or owned individually by the mining companies—and where the water supply is not sufficiently abundant to be continuous throughout the year, individual mining companies would save much annoyance and expense by the installation of auxiliary steam plants. California mines, in the east central part of the State, have had the usual annual experience of a long hang-up the past fall, and even now a number of the most important mines are still idle owing to shortage of water. Unfortunately this is not the first time this state of affairs has occurred; indeed, it is almost an annual occurrence. The cause for this lies in the fact that the mountain reservoirs are neither large enough nor numerous enough to afford a continuous supply throughout the summer and fall months, during which there is generally little or no rain. The past summer has been unusually dry, and the greater part of the snows melted long before the recent rains began. During the past six weeks, it is true, there has been a series of snowfalls in the mountains, and a little rain in the lower mountains, but the cold weather in the higher altitudes has kept the snow from thawing. These early snows will be a valuable source of water supply next summer, but that does not relieve the present situation, which is unfortunate, as it, in some cases, at least, means increased expense in starting up again, unwatering flooded levels and repairing damages due to caving, flooding and other causes, and a large number of men are temporarily unemployed—a loss of time they can ill afford.

The Old Dominion Mine and Smelter, Globe, Arizona. (See Page 427).

Another View of the Old Dominion Mine and Smelter. (See Page 427).

If it were something out of the ordinary, the matter would, perhaps, be less serious, but it has occurred so frequently that the mining companies appear to look upon the situation as a matter of course. The large electrical companies have become an important power factor in California only within the past five or six years, although electricity has been used for power in California mines in some localities for twelve to fifteen years past. Those mines which formerly were operated by steam and lately installed electric power have, in some instances, kept their steam plants in good repair, and these simply fire up and continue operations as before. Others, which were, previous to the installation of electricity, run by water power direct were practically helpless, as the water is no longer available, the greater portion being required for the generation of electric power at the main power plants. This leaves them in a position where they cannot operate at all, until sufficient water is again available for power at the electric generating stations. Under existing conditions the companies which are thus annually embarrassed by shortage of power would find it economical and satisfactory to put in plants run by steam or by gas engines of some type, that the annual summer hang-up may be a thing of the past. In some situations mines may remain idle for months without sustaining great loss or damage, particularly in the case of dry mines, but on the gold belt of California there are many mines where flooding means a certain and heavy loss, owing to the peculiar geological conditions. In some of these mines are great gouge-like masses, which, so long as they are kept dry, give no greater trouble than that caused by swelling—bad enough in itself, truly—but once allow this sort of material to become wet and it is almost impossible to control it, as it will run and cause the expense of thousands of dollars until a normal condition can be re-established.

In view of these facts, it can easily be understood why an auxiliary steam plant is a good investment for a mine operated by electric power, or by water, in a country where the water supply cannot be depended upon throughout the year. The initial cost may, in some cases, be heavy, but the resulting economy will ultimately, in most cases, prove it to be a very good investment for the mining company making it.

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THOMAS W. LAWSON, early in the present week, prophesied an immediate and heavy drop in the price of copper—a drop which would carry everything before it. Up to the present time no very noticeable change has taken place in copper prices. It will be remembered that several months ago Mr. Lawson made a similar prediction, which failed to materialize, and in the present instance, as then, he was at least mistaken or perhaps premature in his announcement. Such bear tactics may have a temporarily depressing effect on the price of copper shares, while the price of the metal remains unchanged. So long as present industrial conditions continue, the demand for copper will be heavy, and, as has already been clearly demonstrated, the output of the copper mines of the world is scarcely able to keep pace with this industrial requirement, therefore, it is unreasonable to expect copper to go much below the present price. A recent reliable report showed that the total visible supply of copper in the world was about 13,690 tons, and this amount was about 2354 tons less than the supply a year ago, while it was from 2000 to nearly 3000 tons less than it had been on the first of October and November, respectively, of the present year. The visible supply of copper has been steadily decreasing lately. Mr. Lawson's pessimistic predictions may have a marked effect on the price of copper shares in the New York and Boston markets, but he does not yet control the industries of the world nor all of the copper mines.

Inclined Shaft or Vertical?

This is a question which the directors of mining companies are not infrequently called upon to decide. The engineer for the company should be able to determine this matter, but at times there seems difficulty in making a choice between the two. Generally speaking, it is good business in an undeveloped mine to sink the shaft on the vein, following it in its various changes of dip. Ordinarily, the vein has at least one good wall, foot or hanging, and this, whichever it may be, is the one to be followed.

In a certain instance a shaft was started on the vein, which was several feet in width and composed of solid quartz with a well defined hanging wall, accompanied by gouge, and the usual characteristics of a strong and continuous vein. About 200 feet from the surface the quartz became mixed somewhat with the greenstone of the footwall, and a few feet deeper the quartz left the gouge and dropped back into the foot wall. The miners, under the direction of a foreman who had, at least, the qualification of being a good miner and timberman, left the gouge and stayed with the quartz until it disappeared entirely, being mixed with and finally replaced by greenstone. A crosscut was run into the foot wall for some distance, when, no vein being found, a crosscut was run into the hanging, which soon encountered a beautifully banded vein 5 feet wide, with the gouge, as above, on the hanging wall side. This was a case of mistaken judgment, and is not an argument against sinking on the vein.

By this practice, knowledge is gained of the size, value and dip of the vein—conditions which may have an important bearing on the location of the main working shaft, to be sunk later. In the prospecting shaft, with its irregularities of dip, and changing width and value of the vein, the distribution of payable ore shoots is demonstrated, and the main shaft should be sunk with reference to the practical extraction of this known ore, and its situation also chosen with some regard to the location of reduction works.

As between the vertical and inclined shafts, the dip of the vein would naturally be an important factor in determining this question. In many cases where the vein has a dip exceeding 50°, the vertical shaft is preferred by some, and at much steeper angles, a vertical shaft would without doubt have advantages over an incline. The vertical shaft necessitates crosscuts at every level, except that at which the shaft intersects the vein. This means increased expense in driving crosscuts, and increased expense in transportation of ore from the chutes in the vein to the ore pockets below the levels at the shaft stations. Where the vein is comparatively small, this cost of transportation would manifestly be less in the aggregate than where the vein is large, as the tonnage handled in the latter would exceed that of the former in proportion to the relative size of the vein or deposit.

The inclined shaft possesses the advantage of less crosscutting, and if the shaft can be sunk on the vein or very near it (and kept at uniform angle), the transportation cost on the levels is reduced to a minimum, but the inclined shaft must be longer to reach a given depth vertically than the vertical shaft, and this, in a country where the rocks are hard and shaft sinking expensive, may in itself be the deciding factor.

As an example, take a vertical shaft 3000 feet deep as compared with a 60° incline to reach the same vertical depth (supposing the collars of both to be at approximately the same level), the incline will be 462 feet longer than the vertical shaft, which, at $60 per foot, gives an increased cost of over $27,000 for the inclined shaft. In some instances the rock may be so firm as to make full sets unnecessary in the incline, when a saving of $10 per set might be made by omitting hanging wall timbers, but the difference between vertical and incline would still be more than $20,000 in favor of the vertical shaft. In the vertical shaft the average length of crosscuts would be about 350 feet.

If twenty-eight levels were opened in the 3000 feet of depth, this would require the driving of about 10,000 feet of crosscuts, which, at as low a cost as $5 per foot, would make a charge against the vertical shaft development of $50,000—a very material item, to which must be added the cost of underground transportation through these crosscuts, which would amount to from $10,000 to $20,000, or possibly more, depending on the amount of ore which must be trammed through them to the shaft. Here is a matter of $60,000 to $70,000 to be considered in the vertical shaft, as against about one-half this amount on account of sinking the incline. In case of the incline, if it were sunk in the foot wall near the vein, a short crosscut would be necessary at each station—say 40 feet, but as a large part of this would be covered by the necessary station and ore pocket at each level, it need not be considered, unless the vein departs considerably from the line of the inclined shaft.

The principal advantage in a vertical shaft lies in the facility with which large tonnages can be speedily handled, and in less wear and tear on hoisting cables, skips and equipment generally.

When the angle of dip of a vein exceeds 65°, it would probably be the better plan to sink a vertical in preference to an inclined shaft.

Steel by Electric Process.

The smelting of iron ores by electrical methods is beginning to attract considerable attention, particularly in those countries where there are no iron blast furnaces, and where it is thought the new process may afford the long-desired opportunity to make available the iron ores of those regions. Principally is this the case in the western United States. Canada is also taking an active interest in the progress of this new metallurgical proposition. In connection with this subject the report of Dr. David T. Day, of the United States Geological Survey, which will be found elsewhere herein, is of interest. This report gives in absolute terms the results achieved in recent experiments made with magnetic iron sands in the electrical furnace at Portland, Or. While the results must be gratifying to those connected with these experimental operations, it still remains to be seen whether or not they will be of immediate commercial value. The making of steel direct from iron ore, by this process, is still in its infancy, and while encouraging results have been obtained in an experimental way both in the United States and abroad, it is still too early to look upon these experiments as anything else than an illustration of the possibilities of the future in this direction.

As an outcome of the success attending these efforts, numerous electrical smelting companies—"which promise to revolutionize the iron industry"—have recently came into existence, and capital is being solicited to engage in electric smelting with every assurance by the promoters of success. A few months ago the radium promoter had the field, but that fad, failing in the production of promised immediate results, has dwindled and almost disappeared, and the commercial world goes on its way undisturbed by the promised vast production of radium which never materialized.

With electric smelting, however, it is somewhat different. A very high grade of steel has been successfully produced by this method, and when the process and its limitations are better understood, its value commercially can be more fully estimated.

At present, at any rate, it can only be hoped that the manufacture of steel in the electric furnace may become a commercial as well as a technical success, where transportation of steel, made by the usual methods, is such an important factor that the electrically produced steel will become a successful competitor.

IN order to escape paying taxes in two States, the Portland G. M. Co. of Victor, Colo., in the Cripple Creek district, which is incorporated under the laws of the State of Iowa, will surrender its charter in that State and reorganize under the laws of Wyoming, which are more liberal in this respect. The company pays taxes in Teller county, Colo., on the improvements on the property, and they naturally object to paying an additional tax on the capital stock in the State of Iowa, which claims $400,000 as its due.

A BILL to create a Department of Mines and Mining has again been introduced in Congress, and considerable influential effort will be directed toward securing the passage of the bill. What its fate may be remains to be seen.

Value of Bore-Hole Tests, in Dredging Ground.

Prior to installation of a dredging plant on gold-bearing gravel it is desirable, and even necessary, to know the amount of gold which may be contained in a stated amount of the gravel. The unit of measurement is usually the cubic yard, following the old practice of the hydraulic miners. This is in contradistinction to the "car" of the drift miner and the "ton" of the quartz miner. There are two methods by means of which the dredge operator may form an approximation of the value of the ground he wishes to investigate with a view to possible dredging. These are sinking shafts to bedrock and boring holes with a drilling machine, and testing the materials thus made accessible. In many situations the latter is the only feasible method without going to great expense in sinking the shaft, particularly in loose and wet ground. In such ground a shaft can often only be sunk either by freezing the ground or driving sheet piling, prior to sinking operations, or, at least, driving sheet piling some distance in advance of sinking—an operation similar to what the miner knows as forepoling.

In view of these facts, the drill-hole method of sampling is generally employed, and, without doubt, this practice affords an approximate idea of the gold contents of the ground, provided the essential factors for safety be given the necessary consideration. In driving a bore hole through dry gravel of fairly even character, a very close estimate of the gold values may be obtained from results, but in wet ground such is not always the case, and where the gravel is mixed with numerous cobbles and boulders, as well as layers of sand and the entire ground is saturated with water, the results are often far from reliable. Under such conditions the driller is almost certain to get from 20% to 100% more material than the size of the bore hole calls for, owing to the fact that where the ground is loose and inclined to run it will almost invariably force itself upward into the casing.

The natural result is that from a hole 30 feet deep and 6 inches in diameter, which should produce about 5.88 cubic feet of material, there may be pumped out 7 to 10 cubic feet, or even more.

If the necessary deductions be not made the result must be a large overestimate of the value of the gravel sampled, and what may be a losing proposition might be mistaken for a most promising one until the true condition of the ground is ascertained by the results of dredging—an expensive way to get at the facts.

In addition to this excess of gravel obtained from a bore hole, the volume of boulders present must be considered and the necessary factor for safe calculation allowed.

After all, perhaps, the most important factor is the personal equation, which varies with different individuals. Moreover, it is apparent, the greater the number of holes sunk in a given area, the nearer may we expect to arrive at approximately correct results.

IN the development of mines a great deal of work is often done without regard to geological conditions, to system or to anything else in particular—haphazard tunnels, crosscuts, shafts and other excavations. Where this erratic "method" of mine development is pursued, as a usual thing there is little development on the vein, if there is a vein. In this way large amounts of money are expended and practically wasted, for, while it may be worth something to know where there is no ore, it is generally the wiser plan to develop the ore that actually exists. In one instance, a mine having a large surface outcrop has been opened by tunnel driven across the formation in the foot wall. In this crosscut tunnel are several drifts, with crosscuts extending from them, none of which are on ore, and with no sign of ore. At another place a tunnel has been driven through hard rock more than 1000 feet and then stopped short of the vein which it was started to cut and explore. The machinery at the mouth of the tunnel has been removed, and unless the tunnel is driven to completion, this work also is wasted, costing many thousands of dollars. At other points on this property are numerous cuts, shallow shafts and drifts of greater or less length. There is ore of good grade at many places, but there has been neither system nor sense in the manner that work has been done. That the mine is idle is not strange. In the development of a new property it is always good mining to "stay with the vein" and to do deadwork crosscutting and exploring the unknown region on either side of the vein later, when the vein system is better understood.

IN the Black Hills of South Dakota, famed for its forests of timber, there are thousands of acres of pine, spruce and fir being destroyed by the ravages of an insect or worm which bores into the bark, and sap of the trees, which within two years from the time of attack causes the foliage of the tree to turn from the evergreen to the well-known russet red of the dead conifer. Within another two years, if the tree is not cut down and utilized, its value for timber or fuel is practically at an end, as the wood becomes rotten and useless for any purpose. Unless something can be done to stop the inroads of this destructive parasite, the entire timber growth of the hills may be destroyed. There were found by the pioneers in the Black Hills, in the early days of its settlement, large tracts of dead timber, which it was generally supposed had been killed by fire, but the fact that thousands of the trees in these so-called "deadenings" stood stripped of bark—gray and phantom-like—unblackened by fires, indicates that in all probability this is not the first time that these forests have been visited by the destructive insect that is to-day making such serious havoc there. The Government forestry experts have here a problem well worthy their attention, for unless some way be found to stop this wholesale destruction of valuable timber, the Black Hills are likely to become entirely denuded of its magnificent forests within the next decade.

THERE is a growing tendency to employ continuous-hoisting machinery in underground ore handling. Conveying belts and bucket elevators of various types are in successful use in all parts of the mining world for handling ores, coal, etc., on the surface, but recently there have been a number of installations for underground use which are in successful operation. At the New Gooch mine, on the Rand, S. A., a belt conveyor delivers ore to the bin from which the skips are loaded at the foot of the main shaft; small buckets running on light, suspended cables are employed to handle ore in some of the stopes on the Rand; in Missouri, a bucket conveyor is in successful operation hoisting ore from a zinc mine through an incline shaft, and still other instances may be cited. There is such an evident disposition to try to find some less expensive method of hoisting ore from mines than that usually employed that these efforts are not unlikely to meet with some success. Mechanical appliances of the character above referred to will undoubtedly operate as satisfactorily in a mine shaft as they will on the surface, when the conditions are otherwise equal, but the deterioration of such a plant underground will be likely to limit the application of this class of ore hoisting machinery to comparatively shallow depths.

THE announcement that this or the other machine has been thrown out at a certain mine is not proof positive of its unfitness for the work at that place, but often, rather, indicates the peculiar personal prejudice of the superintendent or other person in charge. There are a number of types of mills, concentrators, sizers, etc., that are recognized throughout the mining world as superior, and these various machines are doing good work in many places. Notwithstanding this, machines of these various kinds may occasionally be observed lying unused and rusting on the dump and condemned as useless, while thousands of other machines of the same kind are in daily and successful operation elsewhere. It is more often the case that under these circumstances the condemnation should be placed rather on the user than on the machine.

SILVER continues to be quoted at a price which must be satisfactory to miners. It has been sold during the past week at about 65¾ cents per ounce in New York, and at 30¼ pence in London. The price is due entirely to an unusual demand for the metal, and not to speculation.

Butte's Good Fortune.

Although the Butte district of Montana is accustomed to rich strikes and unusual things, generally, in the great mines which underlie that city, the recent strike of a large and rich ore body, reported to have been made in the Anaconda mine at the 2200 level, is creating much enthusiasm among mine owners there, for the uncovering of a 50-foot body of 15% ore at a depth of 2200 feet—a depth at which the process of secondary enrichment was supposed to have had little effect on the normally low-grade ores of that section—is very gratifying, as it indicates the future possibilities for the other mines of that already noted district, in great depth. At one time it was thought that little or no rich ore would be found below 1000 feet. When very rich ore—rich in both copper and silver—was found on the 1500 level of the Anaconda, a hope was created that other rich accumulations would be found at lower levels. Occasional strikes have since been reported at greater depth, but this recently found mass, which is stated to occur at the junction of two veins, is said to surpass previous strikes both in magnitude and in average richness. The copper output of the Butte district has steadily grown year after year until it now is the largest of any single district in the world, the present output exceeding 300,000,000 pounds annually.

A CREDITABLE engineering feat has recently been accomplished in one of the shafts of the Federal Mining Co. at Mace, Idaho. The shaft had been slowly shifting for a long time, owing to the character of the ground in which it was sunk, but finally it got so badly out of line that repairs became necessary. This was accomplished without interfering with the daily work of mining and hoisting through the shaft. The method employed is familiar to many miners on the Mother Lode of California—that of cutting out around the original shaft and surrounding the old sets with new ones of larger dimensions placed entirely outside of the old sets. These new sets were firmly blocked and wedged between the old shaft and the shaft walls, and the shaft brought back into alignment. In some of the California mines the ground has been found so bad that the double-set method here referred to has been found of great value and utility in keeping the shifting timbers lined up—in fact, it is the only way in which this can be done while mining operations continue and the shaft is in daily and almost constant use. The workmen are entirely outside the main shaft sets and perform their work in safety. The swelling or shifting ground is cut away in small sections and the main sets readjusted by relieving or driving wedges from point to point, as may be required.

A COLORADO district court recently issued an injunction restraining the Mine Managers' Association from compelling applicants for work to produce a card signed by officials of the Association before they could secure employment. This has the appearance of being a purely perfunctory process, as there is no law compelling the mine operators to employ all, or any, of those who make application for work, whether they have the cards of the Association or not. The card system has been in operation in Leadville ever since the serious labor troubles in Cripple Creek district, early in 1904. It is not probable that this order of the court will have a material effect in the selection of the character of men given employment in Leadville mines, as the mine operators will not cease to exercise discrimination and judgment in the employment of first-class workmen, whose past records are not such as to make their presence in the mines undesirable.

ONE of the latest evidences of the energy and industrial progressiveness in South Africa is the establishment of an iron and steel mill by Americans at Zuurfontein, in the Transvaal. It is the intention of these pioneers in the iron industry in that country to make much of the structural steel and iron and other things used in the industries in South Africa. What the outcome of this venture may be remains to be seen. Naturally the transportation problem will have an important influence as between the product of this new local enterprise and those in America or Europe.

CONCENTRATES.

THE next meeting of the American Institute of Mining Engineers will be held February 21, 1906, at South Bethlehem, Pa.

THERE are large deposits of rock salt known in San Bernardino county, Cal., in a desert dry lake about 35 miles southwest of Danby station.

FOR the purpose of avoiding future possible legal complications it is the part of wisdom to place a mining bond or lease on record with the county recorder in the county where the property is situated.

ANY work which may be properly charged to annual assessment work on an unpatented mining claim may be considered as a part of the $500 worth of work or improvements necessary before making application for patent.

A ZINC mine at Carthage, Mo., has in successful operation a continuous bucket elevator, hoisting ore from an inclined shaft, from a depth of nearly 200 feet, vertically, or on the incline—45°—a total distance of 300 feet between the centers of the drums.

THE voids occurring in concrete may be dimnished by employing broken stone of mixed sizes, the smaller pieces filling to some extent the open spaces between the larger rocks. If this be carried too far, however, it will have the effect of weakening the concrete.

THERE are still large areas in the Leadville, Colo., mining district about which little is known. Recently some of this territory, where the ore bodies lie deep, has been prospected with diamond drill with satisfactory results. Shafts sunk on or near the drill holes have proven the records made by the drills to be reliable.

WHERE the ground in a drift swells badly, it is not good practice to put sills beneath the posts, for the sills will either be broken or bent, and the set thrown out of line, or the posts will be thrust into the drift over the shoulder cut in the sill. Swelling ground can only be controlled by cutting it away as fast as it encroaches upon the drift.

THE coal mined by dredgers from rivers in Pennsylvania is the fine material carried by water from the coal washing plants into the rivers where it settles to the bottom or is deposited on the low lands along the banks by high waters, in the same way that tailings from metal mines are deposited in and along streams in the rivers of the western States.

THE principal copper ores, which result from oxidation of the normal iron-copper sulphide (chalcopyrite) in the Butte district, are malachite and azurite (carbonates); cuprite and melaconite (oxides); bornite and chalcocite (sulphides); chalcostilbite and some other rare and complex antimonial and arsenical sulphides of copper. The latter ores are usually rich in silver also.

A LARGE blast furnace requires a great deal of water, though the amount varies considerably with changing conditions and at different places. Peters says a water-jacketed blast furnace having 36 square feet hearth area requires 7000 gallons per hour while blowing in and out, and about 2200 gallons per hour when in normal running condition. A furnace then having 60 square feet hearth area would require about 3600 gallons per hour, for jackets alone.

PETROLEUM OIL is usually found most productive in sandstones and shales, particularly where the ore-bearing strata are open and porous. Dense, hard rocks do not afford suitable conditions for the reception of large amounts of oil. As the rock strata are flexed and more open at the crest of the anticlines, the anticline is usually expected to produce more oil than strata which lie in an even plane, either flat or tilted, while the rocks in the synclinal trough are compressed and dense, and little oil is usually found in them.

AMBLYGONITE is a fluo-phosphate of aluminum and lithium. It is a brittle mineral, a little heavier than quartz, with a greasy to pearly luster. In color it is white to pale greenish-blue, yellowish or grayish or brownish white, with a white streak. It is subtranslucent to transparent. It occurs in compact masses, but is usually columnar in structure, with cleavage. It fuses easily with intumescence. This is one of the more uncommon minerals recently found in the pegmatite dikes of southern California, associated with other lithium minerals.

REPLYING to the question from Colombia, S. A., it appears, without question, that the best plan is hand labor. If scarce, he will have to endure the delay. The work is too small for a steam shovel—too many roots for any of the mechanical ditchers, and the suggested hydraulic method is wholly impracticable, especially in view of the steepness of the slopes. Aside from this, he would lose all benefit of the lower bank that would be secured by dry excavation. It is better practice to have the entire depth of ditch in excavation, but the downhill bank is a really valuable safeguard, and its retention is worth while.

THE removal of water from extensive mine workings which have been flooded does not always result in the drainage of other workings in the vicinity, but which are not immediately connected. This is sometimes due to the fact that any existing fissures, cracks or channels, through which the water might naturally be expected to pass, become "silted up" with fine sediment impervious to the passage of water, consequently no drainage results.

THE best way to take samples of gravel to ascertain their gold content, in a running stream, is by building a wing dam, where possible, and then remove the water impounded by the dam by means of a pump. Where the fall is sufficiently heavy, the gravel may be uncovered by the deflection of the water resulting from the construction of the dam. Samples may also be taken by sinking holes with a portable well-boring machine, the gravel being brought to the surface by the sand pump employed for this purpose.

IN the Golden Queen mine at Hedges in San Diego county, Cal., gold is known to occur in a silicified hornblende, schist, in epidote, hornblende without free quartz that may be seen; in an aggregation of scales of biotite, in pegmatite dikes that cut the country; and in a very siliceous rock containing much epidote and garnets. Gold is known to occur in the interior of quartz crystals, at Algerine, in Tuolumne county, Cal., in galena, zinc blende, copper sulphide and carbonate, and in mispickel in many places.

WHERE a sinking pump is in use in a shaft the handling of the pump can be greatly facilitated by putting a slip joint on both the water column and the steam line which connects with the pump. These slip joints are made of various lengths, but in pumps of the smaller sizes, a 20-foot telescoping section on each pipe line will be found a great convenience. The pump may by its use be lowered about four sets without uncoupling, which will save much time. A full length of pipe may then be put in above the slip joint and the same operation repeated.

WHEN sinking a large working shaft, employing temporarily a small hoisting plant, it is good practice to locate this temporary hoist opposite the end of the shaft in order that the foundations for setting the larger permanent plant may be prepared and the plant installed without interfering materially with the smaller hoist. When the large plant is about completed and ready to place the hoisting cables in position, the temporary head frame may be removed. By this procedure there need necessarily be a loss of only a day or two in changing from the small to the permanent hoisting plant.

WHEN ground is very bad it may usually be held in place by means of concrete placed in the form of an arch or oval, as in the Simplon tunnel. The practice of employing masonry and concrete in German mines is an old one, and thus far appears to have been satisfactory. Whether concrete would hold the "swelling ground" often encountered in the Mother Lode of California is not known, as it has never been tried there. Thus far only heavy timber sets have been used, with open spaced lagging, between which the soft swelling mass may press and be cut away so as to relieve the main members of the set.

IF the ore is to be crushed to only 40 mesh it is probable that the crushing can be done more cheaply with stamps than in a tube mill. The latter is used in some districts where it is necessary to reduce the ore to a fineness which will permit its passing a 150 to 200 mesh screen—that is, 22,500 to 40,000 meshes per square inch. A great deal depends upon the character of the ore, what the cost of fine crushing will be. Some of the flinty ores of New Zealand, breaking with a long, splintery fracture, cost more to reduce than granular quartz ore. The Homestake ore, which slimes so readily, contains comparatively little quartz, being mostly hornblende schist.

IT is improbable that all coal originated in identically the same manner, though there was, without doubt, much similarity in the formation of coal beds everywhere. In some instances the coal has been, without doubt, formed, in part, at least, from trees, as thin sections of some coal show the fibers of the original wood. In other instances the coal apparently originated from beds of peat or similar growth. Those who have been in some tropical jungles where the entire soil in the forest consists of the decayed trunks of trees, their branches and leaves—the accumulation of centuries of luxuriant vegetation—can understand most readily the possibility of a bed of coal being formed from this growth.

THE relative merit of inside and outside amalgamation in the gold mill must depend largely upon the character and grade of the ore. Where the efforts are constantly directed toward high stamp capacity, it often follows that satisfactory amalgamation cannot be accomplished inside the battery, unless the gold is peculiarly free milling, and not always then. An ore in which the gold does not amalgamate readily should be treated in such a manner as to insure an opportunity for longer contact of the gold with the quicksilver, which may be accomplished by raising the height of discharge, or employing a finer screen. Sometimes the latter is objectionable, as it is responsible for the creation of a larger amount of slimes which may be objectionable. Most mill men prefer to save gold inside the battery if possible, and as often and as soon thereafter on the outside plates as possible.

A RESERVOIR may be built on level or slightly sloping land as well as on a hill top, or where there is a valley which may be converted into a reservoir by constructing a dam across it. In the dry mining regions it is often desirable to construct a reservoir, and this may be done by leveling a piece of land of the desired area of the reservoir and building around it a square or circular wall of concrete to the desired height. The circular form is advisable, as it requires about one-seventh less material than the square wall of equal cross section. When the wall is completed, the bottom must either be laid with concrete or puddled with clay and the inside of the concrete wall should be finished with a coating of neat cement—what is known as "sidewalk finish." The reservoir may be built partly or wholly below the level of the ground, if desired; but it is usually less expensive to build the upper portion in molds above ground.

WHERE three unpatented mining claims lie side by side, and veins outcrop on each claim, and a main working shaft is sunk on the middle claim with crosscuts started in either direction toward the claims lying on each side of the center claim, work may be done in the main shaft on the center claim for the benefit of each of the three claims. An announcement to this effect should be plainly posted at the shaft on the central claim, in which it is clearly stated that the assessment work for each of the three claims was done in the shaft and a copy of this notice placed on record. It would also be well to post a notice at discovery on each of the side claims, stating that assessment work for each of these claims has been done in the main shaft on the central claim. The law provides that work may be done on one of a group of claims for the benefit of each of the claims of the group, and this is clearly a case within the meaning and intent of the law.

ALTHOUGH there are large intrusions of serpentine and other peridot (olivine) bearing rocks in California, which resemble somewhat the diamond-bearing peridotites of South Africa, none of the diamonds thus far discovered in California come apparently from the region where rocks of this description abound. Serpentine rocks are abundant in the Coast Range of California, but no diamonds have been reported found in that portion of the State. Serpentine is also abundant in the lower tier of foothills of the Sierra Nevada, bordering the great interior valley of the State; but the diamonds found have, without exception, been secured in the sluices of mines working on the ancient rivers which have their sources in the Sierra region, and far east of most, if not all, of the known important serpentine areas. In some of these old channels where diamonds have been found, a micaceous sandstone, white and slightly flexible (itacolumite), has been found; but whether this rock has any connection with the diamonds discovered is not known.

WHERE a company owns a group of mines they may take up adjoining ground as mining claims, provided the necessary discovery can be made on each claim. Then, if they perform work on the previously consolidated claims which is manifestly for the benefit of all the claims of the group, both old and new, $100 worth of work may be credited to each of the new claims, provided these join the claims of the old group. In such cases the several claims of a group must lie in a compact body—they cannot be scattered about. They may also cut timber on the claims for use in any one of them. A superintendent of a mine may locate mining claims in the vicinity and he may permit the company to cut timber growing on his claims, and allow them to use the same in the company's mine. This is on the theory that the company may itself cut timber on unoccupied mineral lands, and after location, if the locator sees fit to allow others to use his timber, it becomes a personal matter, in which the Government has no interest.

WHEN it is desired to sink a shaft deeper than the lowest working level of a mine, one compartment of the shaft can be securely bulkheaded a few sets above the lowest level and a small auxiliary hoist, operated by compressed air or electricity, placed over this compartment beneath the bulkhead, and sinking continued. The remaining compartments of the shaft should be bulkheaded at the lowest level, or a set or two beneath the loading chutes, to protect workmen below from danger from falling rocks. This method of deepening a shaft in a working mine has been successfully employed at a large number of deep mines, and is the only way that a shaft may be deepened with safety while mining operations continue above. At some mines, if the rock broken in shaft sinking is waste, arrangements are made to hoist this to some point above the lowest level where it is dumped into a bin and from there loaded into cars which deliver it to a level where the rock can be utilized in filling stopes. The economy of this is evident, as it saves the cost of a long hoist and supplies the necessary filling for worked-out ground.

Globe, Arizona.*

TO THE EDITOR:—Globe is one of the oldest mining camps in Arizona, having had a checkered history of 25 or 30 years, and perhaps more. It started first as a silver district, in the now almost forgotten days, when the Apaches owned the region, and when it was very unhealthy for the white man who could be caught afield by them. But in spite of this and other drawbacks almost as serious, it has flourished and grown, until now it is one of the best business points in the Southwest, with a railroad of its own, a prosperous and steadily producing copper mining industry, and an environment in the way of numerous undeveloped and partially developed prospects that are just beginning to be appreciated by its own citizens and those of other parts of the country that are looking for promising deposits of the red metal. Unlike Jerome, where there is little more than one big mine, or Bisbee, where the mineral field, though immensely rich, is concentrated within a small area, there is copper to the north, west and southwest of Globe, for 20 miles or more in each direction, as well as in the great mineral zone upon which the Old Dominion Co. is conducting its extensive and highly profitable operations.

The camp is situated near the head of Pinal creek, which flows northward to the Salt river. When one writes of creeks and rivers in Arizona, one should not be taken too literally or seriously. These features of the landscape possess, invariably, channels and banks, but not always visible water, though there is abundance of the element a few feet below the surface of the sand and gravel in their beds, and Globe has never suffered for lack of it, and never will. The region is hilly but not mountainous, and the geology is a complex of eruptives to which each visiting expert gives such new names as pleases his exuberant fancy, and serves to keep the plain people of the district, who are busily engaged in taking out ore, pleasantly interested and amused.

The following geological description of the ore occurrence in Globe district is from Professional Paper No. 12, "Geology of the Globe Copper District of Arizona," by F. L Ransome:"

The ore bodies of the Globe quadrangle exhibit various forms, and, as is usual in such cases, these are not sharply distinguishable from one another. For purposes of description, however, they may be classed as (1) lodes, (2) masses in limestone, and (3) irregular mineralizations of shattered or permeable rocks.

The lodes, for the most part simple fissure veins, are mineralized postdiabase fault fissures. Of the hundreds of dislocations dissecting the region, only a very small portion contain ore, and these are often structurally unimportant as faults. The cause of the mineralization of certain fissures and its absence from others is unknown. It has been impossible to discover any particular distinction, other than the presence of ore, possessed in common by the mineralized faults and not also found in some of the barren fissures of the region, although the postdacite faults, as far as known, are unmineralized. The greater number of the lodes have approximately northeast-southwest strikes and dips ranging from 40° to 90°.

As examples of lode deposits may be cited the Summit, Cole & Goodwin, and Bobtail lodes, carrying sulphide ores in Pinal schist, the Keystone vein of chrysocolla in Schultze granite, the Big Johnnie vein carrying cuprite, chrysocolla and malachite in quartzite, the Josh Billings, containing oxidized ore in diabase, the veins of oxidized ore in the quartzite of Copper Hill, the oxidized North vein in diabase in the Old Dominion mine, the pyrite lodes in diabase in the lower levels of the same mine, the vein of the original Old Dominion mine in quartzite, and many others, particularly throughout the Globe hills. Some of these lodes, such as the original Old Dominion, the Keystone and the Summit, are nearly typical simple fissure veins. The ore fills a formerly nearly empty fissure with little or no replacement of the original walls. Others, like the Bobtail and Big Johnnie, are mineralized fault breccias. The ore has filled the interstices between the fragments of the breccia, and has frequently, to some extent, metasomatically replaced the latter, thus forming a link between the lodes and the other two classes of ore deposits recognized in this quadrangle.

Still other lodes, such as the pyritic deposits in the Old Dominion and Grey mines, might be classed as stringer lodes—that is, they consist of several irregular anastomosing fissures filled with ore. Where, as in these cases, the country rock is diabase, the mineralization is not confined with the fissures, but has penetrated into the diabase by the process of metasomatic replacement. Such ore possesses no regular vein walls, but grades gradually into altered diabase containing disseminated pyrite. Such a process, while it does not extend to a sufficient lateral distance to destroy the general lode-like form of the deposit, nevertheless tends to connect fissure veins through intermediate forms with the deposits belonging to the other classes. The pyritic lode of the Continental mine, which is in a granite-porphyry facies of the Schultze granite, is also a stringer lode and is accompanied by considerable metasomatic mineralization of the neighboring country rock.

When, as is the case in the I X L, Big Johnnie, Buffalo and Copper Hill mines, lodes pass upward from diabase into overlying quartzite, the latter rock usually shows the greater mineralization. The only known exception to this is the Josh Billings vein, in which the ore occurs principally in the diabase.

Although the lodes often contain excellent ore, it has not yet been found in such abundance as in the large masses of limestone, which have supplied most of the copper from the district for the last twenty years.

All of the important ore bodies thus far discovered in limestone, with the exception of one formerly worked in the Buffalo mine, lie on the southeast side of the Old Dominion fault, and have been worked through the Old Dominion and Hoosier mines. In the former property there is exposed in the hanging wall of the master fissure—the Old Dominion fault—a thickness of from 350 to 550 feet of Globe limestone resting upon the quartzites of the Apache group. The ore bodies occur rather irregularly throughout this limestone section from the top to bottom. In general they are rudely lenticular in shape and lie roughly parallel with the nearly horizontal bedding of the limestone. Some of them are directly connected with the Old Dominion fault, the ore forming the hanging wall and extending irregularly for 20 or 30 feet out into the limestone. Others, although never far from the Old Dominion fault, are completely inclosed within this rock, which, however, always shows more or less fissuring, such as may have given access to the ore-bearing solutions. Some of these ore masses must have been of large size, one in the Old Dominion mine having been about 200 feet long, 100 feet wide, and 60 feet thick. This, however, was not wholly within the limestone, but was partly in quartzite, and really falls also into the third general class of the ore deposits of the district. Other masses of ore not coming strictly within the definition occur in the Old Dominion mine at the contact of limestone with overlying dacite. The ore, however, occupies space formerly filled with limestone and not with dacite, and the form of such deposit is similar to that occurring wholly in limestone.

The ore of these masses in the Globe limestone is always oxidized and often accompanied by large quantities of hematite or limestone. It sometimes rests snugly against the limestone, and is sometimes separated from the latter by a shell of limonite. The limestone, as a rule, shows very little alteration at a distance of a few inches from the ore or from the iron oxides.

Ore occurring in the form of irregular mineralization of shattered or permeable rocks has contributed largely to the total output of the Globe quadrangle. Here belong the masses occurring in brecciated quartzite, always associated with one or more fault fissures, but not confined within their walls. Such bodies have supplied much of the ore of the Old Dominion mine, where a mass of the quartzite lying between the Old Dominion and Interloper faults has been extensively mineralized. Similar conditions exist in the Grey and Buffalo mines, and to some extent in the Buckeye mine. Such ore masses are usually very irregular in form, and often have no sharp boundaries, as workable ore changes gradually into less broken country rock only slightly stained with malachite or chrysocolla. The ore is usually wholly oxidized, and may consist of chrysocolla, cuprite, malachite, specularite, and native copper in varying proportions. Some chalcocite, however, occurs as residual unoxidized kernels in the ore of the Buffalo mine. The microscope shows that the shattering of the brittle quartzite is often exceedingly minute, so that it is not always easy to determine whether there has been any actual metasomatic replacement of the quartzite by ore. As a rule, however, the fact of such replacement can be ascertained, although the bulk of the ore has undoubtedly filled mechanically formed spaces.

The conspicuously stained but not hitherto productive schist breccias so noticeable along the road from Webster gulch as it descends into Pinto creek, and the green tinted granitic breccias of Liveoak gulch are similar in general character to the more richly mineralized deposits in quartzite just described.

In this class also come the ore bodies of the Black Warrior (Montgomery and Dadeville claims), Geneva and Black Copper mines. In the first two the ore, which is chrysocolla, occurs as a metasomatic replacement of dacite tuff lying between schists below and massive dacite above. All gradations may be traced from the solid chrysocolla resulting from practically complete replacement to tuff showing mere traces of mineralization or none at all. In the Black Warrior and Geneva the ore bodies are flat, blanket-like masses, passing gradually into tuff on their peripheries. They rest sometimes directly upon the schists, sometimes are separated from the latter by a layer of tuff. They are always associated with fault fissures, which are in part later than the ore. In the Montgomery and Dadeville claims is a strong east-west fault, which was apparently initiated prior to the deposition of the ore.

The ore body of the Black Copper mine, also lying between schist and dacite, is of rather irregular shape, and evidently formed at least in part by replacement of dacite or dacite tuff. It has an easterly dip of about 35°, and it is possible that it occupies a fault fissure opened prior to ore deposition, and might perhaps be classed with the lodes.

The plant of the Old Dominion, which is the big mine of the camp, is one of the finest in the West. The mine has been opened to the depth of more than 1000 feet. The bulk of the ore has to be concentrated. There is a very fine plant for this purpose, fitted with both jigs and tables, and a three-stack smelter that, within the last 18 months, has been brought up to date in every particular. The town, that for a quarter of a century has straggled, after the manner of its kind, for a mile or more along the banks of Pinal creek, in an unkempt and woolly way, is also in process of reconstruction and concentration, and will in time become even attractive. But the main feature of Globe at present is its genuine prosperity, resulting in part from the large and profitable operations of the Old Dominion Co., and in part from the steadily increasing output from the numerous less notable mines of the district, that, one by one, are being carried forward to self-sustaining and dividend-paying conditions.

OCCASIONAL CONTRIBUTOR.

Globe, Ariz., Dec. 8.

*See illustrations on front page.

Mining Outlook in Northern California.

TO THE EDITOR:—No year in the history of Siskiyou county has been more fruitful in discovery and development than 1905; this in the face of early failure of the season's water supply. This failure may have been an incentive to much of the prospecting that has characterized the summer and autumn months. In more than one hundred instances bona fide placer and quartz locations, showing returns which will warrant development, are the result of the last season's researches. The records vouch for this. They are distributed all the way from the Oregon line to the Del Norte, Humboldt and Trinity borders. Along the Klamath and its tributaries, and in the Happy Camp section, research has, as a rule, told for good. On the north and south forks of Salmon river and in the Etna district, rich prospects which promise to be lasting have been made matter of record during the year. In the northeastern part of the county good prospects have been reported. Siskiyou is rich in mineral and timber wealth and increasing prosperity is assured.

In northeastern Humboldt steady and unusual advancement has been made. The record of mineral and water locations has been broken and crowds that of Siskiyou closely. This has been most pronounced within a radius of 10 miles of Orleans and along the lower Klamath. Recent researches near the mouth of that stream are to be continued on a greater scale than ever, and bluff mining on the coast will receive new impetus. Many new placer locations have been filed along Trinity river from the Hoopa reservation to the Trinity county line, a stretch of territory in which productive placers are being operated. Indications of copper are not lacking in the north slope of the Humboldt–Mendocino range, and in one or two of these development is now under way. While mining is virtually a side issue in Humboldt county, the gold yield shows a steady increase when winter snows and spring rains do not default.

A more than usual amount of prospecting has been done in Trinity county this year, and, in some instances, with gratifying results. The mines of Trinity were among the first in the north, and if the latter days' output is diminished it may be in the main charged to reduced population and isolation. No one familiar with the county believes that mining has been more than fairly commenced in Trinity. True, diggings which were covered by the waterways provided forty to fifty years ago have been exhausted, but there are enough of higher deposits yet undisturbed, of gold-bearing ledges still uncovered and opportunities for the dredgers. There has been unusual activity, short season of water supply considered, in the Junction City, Indian Creek, Hay Fork, Deadwood, Coffee Creek, and isolated New River district during the year, and in some instances good paying new deposits have been encountered. La Grange mine, near Weaverville, has given out its accustomed yield and a number of other placers have maintained their reputation as liberal yielders. The dredger has also obtained a foothold in Trinity.

Trinity Center, Dec 16. OBSERVER.

Progress of Reclamation Work.

The Secretary of the Interior has recently approved two new reclamation projects. One, which will be partly in Texas and partly in New Mexico, is called the Rio Grande project; the other, which will be wholly in New Mexico, will be called the Carlsbad project. The two additional projects will bring the number of reclamation schemes up to twenty-four. Of these, eleven are well under way. They provide for the reclamation of 1,303,600 acres of arid lands at a cost of $37,028,571. These are big figures and they represent big projects.

On June 30, 1905, the total cost of construction and engineering work performed by the Reclamation Service, together with the administration expenses, amounted to $5,462,169. On that date the reclamation fund had reached a total of $28,028,571. It was estimated at that time that the receipts for the fiscal years 1906–1908 would amount to $9,000,000, so that the sum of money available for reclamation purposes up to the end of 1908 will be $37,028,571.

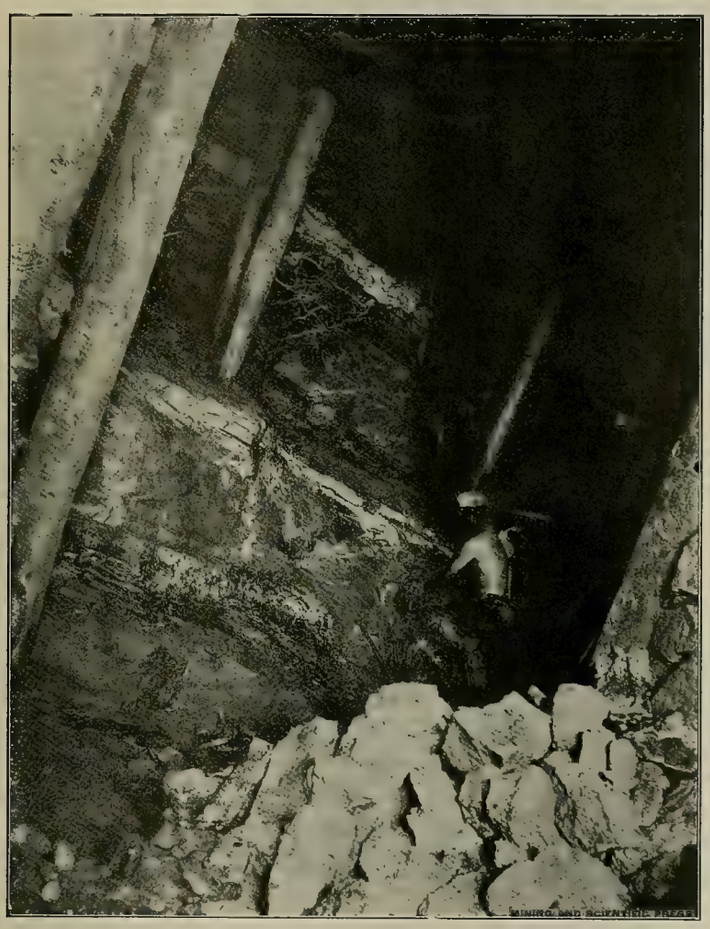
Since the work of reclamation began, 77 miles of main canals have been constructed and 54 miles of distributing canals, as well as 186 miles of ditches and 147 bridges. Over 9,350,000 cubic yards of earth have been excavated and 3½ miles of tunnel driven. The telephone lines installed have measured 250 miles and the roads built have covered 126 miles. It has been necessary to erect fifty offices and other buildings. One cement mill has been constructed, the product of which already amounts to 15,000 barrels. Besides the cement manufactured by the Reclamation Service, use has been found for 78,000 additional barrels of cement, which were purchased in open market. Over 2,800,000 feet B. M. of lumber have been sawed for the work of construction and 1,750,000 feet B. M. in addition have been purchased. The concrete completed amounts to 70,000 cubic yards, the puddling done to 4500 cubic yards, the riprap

completed to 12,000 cubic yards, and the paving to 190,000 square feet. The railroad iron used amounts to 130,000 pounds, the structural steel to 250,000 pounds, the cast iron to 600,000 pounds. The sheet piling driven has amounted to 150,000 lineal feet, the bearing piles to 10,000 lineal feet.

These figures will give some idea of the gigantic size of the enterprise which the engineers of the Reclamation Service have in hand in the reclamation of 1,303,600 acres of arid land.

The Brilliant Extended Mine, Charters Towers.

Recent improvements in the Brilliant Extended mine, Queensland, have served to call special attention to this Charters Towers property, says the Queensland Mining Journal. With the exception of the deep level mines, the workings in the Extended are the deepest on the Brilliant line of reef; so that the operations at the latter mine are of great importance to other deep mines in the vicinity, and consequently to the field generally. The grade of the ore obtained from the Brilliant Extended is low, but this is compensated for by the extent of the stone being operated upon, and the fact that it is being increased as the lower development work is proceeded with. This work is being prosecuted on a comprehensive and systematic scale, and the large area of the lease (seventy-five acres) affords the company ample scope for their extensive operations.



2200 Level of the Brilliant Extended Mine, Charters Towers, Queensland, Australia.

During the year 1902, the Brilliant Extended Co. equipped the mine with an up-to-date winding plant, with steel poppet legs, new boilers, air compressor, cooling tower, etc., at a total cost of £13,475. The engines then supplied are capable of raising an unbalanced load of five tons from any position of the cranks, and maintaining an average speed of winding with the maximum load of 2000 feet per minute. The poppet legs, which cost £895, are 80 feet high, and adapted to serve two winding engines of equal power drawing from opposite sides. The cooling tower is of the open type, having all surfaces exposed to the air, and proportioned to deal with cooling water necessary to condense 1500 pounds of steam per hour. The method of treatment adopted is that of crushing and amalgamation, followed by concentration. In the following year (1903) very important work was done in proving the deep ground; and, although the grade of the ore fell off, two dividends were declared, totaling £12,500. The total quantity of ore raised that year was 17,013 tons, and its value per ton was £3 1s 7.5d.

Last year the company purchased, on terms, at a cost of £25,000, the Enterprise Mill & Cyanide Works, then owned by the Craven estate, and situated about 300 yards from the Brilliant Extended mine. The mill was of fifteen head of stamps, and the plant included three Huntington mills. During that year, also, a number of changes and improvements in the mode of working the mine were adopted, including improved ventilation, haulage, means of transport, and electric lighting; while more than usual attention was given to development work. In opening up the various levels, work of this class averaged during the latter half of the year 450 feet per month, operations being chiefly directed to the extension of the levels in the lower ground. During the year 1904, 28,654 tons of stone were treated, for a yield of 9447 ounces of gold from the mills, with an addition of 1903 ounces of bullion from 11,712 tons of tailings cyanided; while the mine was employing 160 men. No dividends were declared. In the early part of the year returns were disappointing, but in the last six months the grade of stone treated considerably improved, the returns being about 14 dwt. to 17 dwt., exclusive of sands, which assayed about 2½ dwt. A vigorous system of opening up the mine was carried out, and at the end of the year the warden reported that its future development depended chiefly upon the deep ground being opened up by the No. 3 underlie, the sinking of which had been resumed during the year. The vertical depth of the No. 11 levels was then 2300 feet, and the workings were the deepest then being operated on the field. The accompanying engraving is an illustration on the 2200 level of the Brilliant Extended mine.

During the first six months of the present year the output was 13,054 tons, yielding 6703 ounces, including the return from cyanide treatment, so that the average of the preceding year was more than maintained during that period. In May last a decided improvement was reported in the mine, and some promising looking stone was struck in the crosscut from No. 10 east level, while a prospecting drive west was being driven on from 3 feet to 4 feet of good-looking quartz. The June report showed that the mine continued to work well in the deeper levels, and the crushing was above the average. In the following month it was stated that there was an improved appearance in Nos. 9, 10, 11 and 12 east levels, and in August these levels continued to open up satisfactorily. In the latter month it was reported also that No. 7 west and No. 12 west levels were carrying a strong and payable reef; that there was a general improvement; and that the directors had paid half the entire cost of the mill purchased during the previous year, and had given notice that the balance—£12,500 and interest—would be paid in three months. Both in July and August there was a marked increase in the quantity of stone treated, and a fair improvement in the yield. The gross value of the August crushing was £9203. At the time of writing the official report for last month (September) is not to hand, but on the 23rd of that month it was stated in the Press that the various workings of the Brilliant Extended Co., from their No. 1 level at a vertical depth of 1846 feet, down to No. 12 levels at about 2400 feet, showed from 1 foot to 6 feet of stone, some of it very heavy mineral stone. In the No. 7 west level there was still a strong reef of mineral stone. The mill and cyanide works were working constantly, and it was expected the output for September would be equal to that of the previous month.

MANY mines which show no trace of zinc in their upper portions are found to carry this mineral, usually as sulphide, in depth. For this reason a mine should be developed to considerable depth to determine the character of the ore before building a reduction plant, or there may be much unnecessary expense in aiming at a satisfactory method of ore treatment. When a mill is built it is very necessary to know that it is adapted to the ore of the mine, not only at the surface but in depth as well.

Department of Mines and Mining.

Early in the present session of Congress, Congressman Van Duzer of Nevada introduced a bill to establish a Department of Mines and Mining. The full text of the bill follows:

A bill to establish the Department of Mines and Mining: Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that there shall be at the seat of government an executive department to be known as the Department of Mines and Mining, and a Secretary of Mines and Mining at the head thereof, who shall be appointed by the President, by and with the advice and consent of the Senate, who shall have a seat in the Cabinet, and who shall receive a salary of $8000 per annum; and Section 158 of the Revised Statutes is hereby amended to include such department, and the provisions of title four of the Revised Statutes, including all amendments thereto, are hereby made applicable to the said department.

SEC. 2. That there shall be in said department an Assistant Secretary of Mines and Mining, to be appointed by the President, by and with the advice and consent of the Senate, who shall receive a salary of $4000 per annum. He shall perform such duties as shall be prescribed by the Secretary and required by law. There shall also be appointed by said Secretary one chief clerk, who shall receive a salary of $1800 per annum, and such other clerical assistance as may from time to time be authorized by Congress.

SEC. 3. That the said Department of Mines and Mining shall have general jurisdiction over all matters pertaining to mines and mining industries and the Geological Survey, and over all the matters committed to any of the bureaus, offices, departments, or branches of the public service by this Act transferred from other executive departments of the government to the said Department of Mines and Mining as fully as the same is now possessed by any of the said bureaus, offices, departments, or branches of the public service from whence the same is so transferred, and that the official records and papers now on file in and relating to the business of any such bureau, office, department or branch of the public service in this Act transferred to the Department of Mines and Mining, together with the furniture now in use in such bureau, office, department, or branch of the public service, shall be, and is hereby, transferred to the Department of Mines and Mining.

SEC. 4. That there shall be in the Department of Mines and Mining a bureau which shall, under the direction of the Secretary thereof, gather, compile and publish information in respect to the same, and it shall be the duty of said bureau to acquire and disseminate practical and useful information concerning the mines, mineral resources and mining industries of the United States; that the office of the Director of the Geological Survey and the Geological Survey Service, and all that relates to and pertains to the same, is hereby transferred from the jurisdiction of the Interior Department to the jurisdiction and supervision of the Department of Mines and Mining, to remain henceforth under the jurisdiction of the latter; and the Director of the Geological Survey is hereby made the director of said bureau.

SEC. 5. That the Secretary of Mines and Mining shall annually make a report in writing to Congress, which shall contain an account of all moneys received and expended by him in promoting and facilitating the development of American mines, mineral resources and mining industries, and such recommendations as he shall deem necessary to the further development of the same. He shall also make special investigations and reports on particular subjects whenever required to do so by either the President, the Senate, or the House of Representatives.

SEC. 6. That the Secretary of Mines and Mining shall have charge in the buildings or premises occupied by or appropriated to the Department of Mines and Mining, of the library, furniture, fixtures, records, and other property pertaining to it, or hereafter acquired for use in its business; and he shall be allowed to expend for periodicals and the purposes of the library, and for the rental of appropriate quarters for the accommodation of the Department of Mines and Mining within the District of Columbia, and for all other incidental expenses such sums as Congress may provide from time to time; provided, however, that where any bureau proposed to be transferred to the Department of Mines and Mining by this Act is occupying rented buildings or premises they may still continue to do so until other suitable quarters are provided for their use; and provided, further, that all officers, clerks and employes now employed in any of the bureaus, offices, departments or branches of the public service in this Act transferred to the Department of Mines and Mining, are each and all hereby transferred to said department at their present grades and salaries, except where otherwise provided in this Act, until otherwise provided by law; and provided, further, that all laws prescribing the work and defining the duties of the several bureaus, offices, departments or branches of the public service by this Act transferred to and made a part of the Department of Mines and Mining shall, so far as the same are not in conflict with the provisions of this

Act, remain in full force and effect until otherwise provided by law.

SEC. 7. That the jurisdiction, supervision and management and control of mines and mining lands and mining industries now vested in the Interior Department are hereby transferred to and vested in the Department of Mines and Mining.

Notes on Southern Nevada and Inyo County, California.—II.*

Written by H. H. TAFT.

FROM VEGAS TO ASH MEADOWS.—For about 90 miles the road follows a succession of desert valleys. The Las Vegas mountain, north, and the Charleston mountain, south, both of Carboniferous limestone, are little disturbed, but the small spurs west are considerably contorted. About 12 miles northeast of Ash Meadows, north of the road, the limestone beds are tilted and underlain by quartzite, and a little south of the road there is a small area of basaltic lava which has overflowed a recent volcanic tuff. For a distance of from 2 to 20 miles southeast of Ash Meadows there is considerable quartzite. Although prospectors report some lead and copper, the region is unattractive on account of the absence of eruptive rocks. On the northwest slope of Charleston mountain are two old mining districts, the Montgomery (now known as the Johnny) and the Stirling. These districts, abandoned for some years, have now taken on new life. The ore is gold quartz, with a little pyrite and chalcopyrite.

THE AMARGOSA DESERT.—This desert valley is about 100 miles long and forms with Death valley a long, narrow U, extending northwest-southeast. The upper end, 4000 feet above sea level, is formed by the joining of the Grapevine and the Amargosa mountains. The former is the northern boundary of Death valley and the latter contains the Bullfrog mining region. The Amargosa is cut through by the Oasis, a narrow valley, in which are numerous springs and a little running water. Opposite the Oasis the Amargosa is 12 miles wide; farther south it widens rapidly. Between the mouth of Forty Mile canyon and the Funeral range it is 30 miles wide. Here the road is so dry and sandy that freighters have to "double," and then can only travel at half the usual rate of speed. The roadside graves and skeletons of draught animals are mute witnesses of hardships here experienced. An enormous sand dune shows that the contour of the mountains has some peculiar effect upon the winds.

Forty-five miles southeast of the Oasis valley is a series of springs. The general locality is known as Ash Meadows. Here the valley is 15 miles wide from the Meadows to the Funeral range. In a distance of 6 miles there are four springs flowing about 50 miners' inches of water each, and a number of smaller ones. The temperature of the water in the larger springs is 76° F. and in one of the smaller ones 94° F. All these waters carry a large proportion of sodium carbonate, a remarkable amount of aluminum, a little borax and a small amount of sulphates. From the southerly spring a stream flows for a distance of from 5 to 20 miles, depending upon the season. Below these springs there are large areas of apparently good meadow land, but the rushes, salt and wire grass are of little value as fodder.

Pahrump ranch is 30 miles southeast of Ash Meadows, and 6 miles farther is the Manse. These ranches are veritable oases, and the extraordinary market which they enjoyed last winter for fodder, vegetables and fruit was a godsend to their owners.

BULLFROG MINING DISTRICT.—At the head of the Amargosa desert the Grapevine range, 3000 feet above the valley east and 7000 feet above Death valley west, is flanked east by recent volcanic tuffs. Along the summit occur limestones and quartzites dipping east, and a lime conglomerate, carrying granite, diorite and quartz, such as occur many miles north.

The Amargosa range, lying between the south end of the Ralston desert and the northwest end of the Amargosa, is formed by series of tuffs superimposed upon limestone. The various members of the volcanic series occur with the regularity of sedimentary strata, and the upper (consequently more recent) ones are highly colored. They dip 10° to 20° northeast. An extensive block faulting has exposed the edges of the various flows, particularly from the west, the escarpment being on that side. About 2 miles west of the Bullfrog mine is a small hill of gneiss, overlain by strata of chloritic slates, quartzites, limestones and tuffs, dipping flat to the east.

On August 10, 1904, two claims were located as Bullfrog No. 1 and No. 2. From August 10 to September 14, 1904, a large number of claims were located on what are known as Ladd and Bonanza mountains, about 3 or 4 miles southeast.

The Bullfrog Mining Co. was formed to take up a group of Ladd mountain claims, and later the first discovery of the district was transferred to a new corporation, The Original Bullfrog Mining Syndicate. A mile south of the original Bullfrog property some claims were staked off, surveyed and sold as lots under the name of "Bullfrog town." Amargosa, a mile farther south, aspired to be the metropolis. Out on the desert west of Ladd mountain the same thing was done, and the "town" was named Bonanza. Four miles from the latter place, in the Oasis valley, on the bank of a stream of running water, the town of Beatty, named for a ranchman living a mile above, was laid out, and soon became the most populous place. Three miles below Beatty a group of tents bore the name of Gold Center. In March, 1905, in a cove made by the desert in the Amargosa mountain, between Bonanza and Ladd mountains, Rhyolite was laid out, and Bullfrog and Bonanza moved to it. This place is 5 miles from water.

About 10 miles southwest of where Oasis valley breaks through the Amargosa range, the cliffs are of limestone, which pitches west and is soon buried beneath the soil and the volcanic tuffs that have probably borne it down. In several places the contact is exposed, and there are evidences of a flow of water not accompanied by a siliceous deposition, except in and near the Bullfrog claims. Between Ladd mountain and the Oasis creek there is a place where there has been a considerable spring on the contact. Boulders of granite 3 inches in diameter are scattered over an area 100 feet square. There is no silicification and no mineral. The Bullfrog claims cover an immense outcrop that can be seen for miles, and are only 3 miles from a spring that has been frequented by prospectors for 30 years or more. The white quartz lies like a crescent around a small dome-shaped hill, following the contact, which dips 30° north 60° west into the hill. The quartz has a maximum thickness of nearly 100 feet, and is generally massive, though sometimes there are large slightly amethystine-tinted crystals with a conchoidal base. A later cracking has occurred, and a flow of water depositing copper sulphides and the precious metals. Wherever a green stain occurs visible gold can usually be found.

The other properties of this district are entirely different, resembling somewhat those of Goldfield. There has been a nearly vertical fissuring, followed by a flow of water heavily charged with silica, filling the fissures and soaking into the country rock. One can find all gradations, from pure quartz to slightly silicified country rock. These are the so-called rhyolite dikes. The country rock itself had a slight mineralization, which this silicification did not increase. A secondary and much less extensive cracking and inflow of siliceous waters occurred, which deposited the gold. The veins are nearly vertical, strike north 10° to 30° east, are sometimes thin seams, sometimes several feet in thickness, and again wide zones of stockwerk. The better formed are calcareous and slightly stained with manganese. There are many of these veins and they were easily found; but to discover ore shoots in them is quite a different matter. The amount of work done in both this district and Goldfield during the past winter has been remarkably small.

An interesting and to the prospector a very important phenomenon is the covering of these veins. The older tuffs are mineralized and the more recent (upper) are not; the older are basic, while in the upper there is a flow of rhyolite. At Tonopah it is quite noticeable that the rhyolite is more recent than the "mineralized porphyry." The regularity of the eruptions and the exposure of the edges of the often highly colored strata make this an ideal place to study this phenomenon.

FUNERAL RANGE.—The Grapevine and Funeral ranges are practically the same. Old-timers do not agree as to the dividing line. With the mountains south they form the eastern boundary of Death valley. There has been much searching in this range for the lost Breifogle mine, one of the romances of the desert. Except in one place, both ranges are poor prospecting ground. The general formation is quartzite and limestone, overlaid by immense deposits of recent conglomerate. In the north end of the Funeral range there is a development of green shales, identified elsewhere as Cambrian. These shales usually carry white glassy quartz, which is rarely mineralized; but in this case there are ore shoots carrying sufficient gold to make the district attractive if wood and water were more available. One property has recently been thoroughly developed under bond in this district.

To the south the range ends abruptly, near where the wagon road from Ash Meadows to Furnace creek crosses. The division along the dry watercourses followed by this road is remarkable; they have large boulders of quartzite and limestone north, and on the other side black and brown lava. South, the topography is broken and mountainous, but not in a distinct range. The Green mountain, still further southwest, is another field for prospectors. One small stamp mill is running at the foot of this mountain on the Death valley side. Still farther south, the drainage of the Amargosa cuts through into the Death valley.

GOLDFIELD.—The tuffs (andesite) of this district probably lie upon limestone, elsewhere identified (e. g., at Bullfrog) as Cambrian. On the southwest side of Columbia mountain is an outcrop of dark limestone, evidently overflowed by eruptives. In the Tonopah Club claim the ore is a siliceous sedimentary that has the appearance of limestone, through which gold-bearing solutions have percolated and left enough of the precious metal to make it possible to sort out some shipping ore.

The country rock shows more mineralization than in the southern district, and has been much more disturbed since the mineral deposition. There are three large intrusions of alaskite, and a great many dikes of a green rock, probably decomposed trap, which is closely associated with the original andesite. Standing upon one of the intrusions, Vindicator mountain, one can see, both from the workings and the color of the country rock, that the mineralized area takes the form of a ring. It is yet a question whether the central part will prove of value or not. Outside, the field is completely surrounded by more recent tuffs, overflowed on the west side by dark basaltic lava, which forms a mesa some 4 miles square between Goldfield town and Montezuma mountain.

The topography presents simply hills with higher hills or low mountains around them, except to the north, which opens out to the San Antonio desert. Montezuma mountain (altitude 8000 feet) is 8 miles west. The old Montezuma lead-silver district is on the west slope of this mountain. The castings in the 10-stamp mill and 36-inch water-jacket furnace bear the date of 1886. At Lida, a boiler front recently reset was cast in 1866.

A very prominent geological feature is the reefs of silicified country rock, usually called rhyolite dikes, found all over the district, but more numerous to the south and east. They are sometimes very large (50 feet), but generally about 10 feet thick; and they extend in all directions without regularity, frequently crossing each other. They are sometimes 2000 or 3000 feet long, and again but a few feet, and exhibit all grades of silicification. On the surface they are hard and flinty; but underground, away from the weather, the rock, although harder than the andesite, which is quite soft, is not bad for drilling. The phenomenon of blackening, so noticeable in the desert and recently described by Prof. Blake, is very apparent.

The gold was deposited by successive flows of water in or near these reefs, as was the case with the dikes at Victor, Colo., but there are exceptions, as in the Velvet and Tonopah Club claims. Again, as at Cripple Creek, one often hears that the country rock shows value, and not the veins. At the surface the gold is very free, and is fine in both grain and grade. Below the zone of oxidation, the ores are not very thoroughly understood. There is probably considerable difference in the different properties. It is now certain that tellurides are present; but the principal accompanying mineral is, as usual, pyrite. Although there is no copper stain near the surface, there is considerable gray copper at depth. There is rather more antimony than arsenic, but both are present.

It is too early to say what will be the solution of the metallurgical problem. The low-grade ores, of which so little is known now, may be more simple in their composition. The Combination Mines Co. has provided plates, concentrators and a cyanide plant.

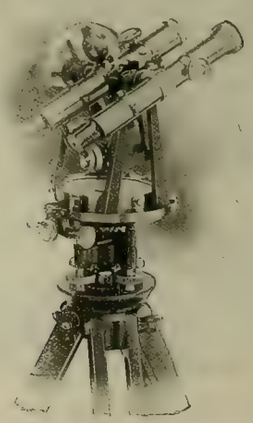
It is not at all easy to find the small rich streaks and lenses of ore that have given Goldfield its celebrity, and there is as yet no incentive to develop the low-grade or milling ores, which will later be important ones. The charges for freight and treatment are now $32 per ton.

*Trans. Am. Inst. Min. Engs.

A New Mountain and Mining Transit.

Wm. Ainsworth & Sons of Denver, Colo., have just placed upon the market a new surveyor's transit that embodies several improvements in design and construction.

The accompanying engraving shows their Type B,



5-inch limb, transit for mine surveying as fitted with interchangeable top and side telescope (Dunbar D. Scott design), 5-inch full vertical circle, stadia, gradienter, variation plate, limb verniers at 60° angle with line of sight and extension tripod.

Among the more important improvements may be mentioned the ribbing of the vernier plate, which, by a change in design, has been extended nearly ½

inch nearer the outside of the plate, thus admitting of a re-enforcement under the standard feet and producing a more rigid plate with the same amount of metal.

The inside of the telescope tubes and outside of the draw tubes on both main and auxiliary telescopes, after being turned to size, are "lapped" on a machine specially constructed for this purpose, thereby producing surfaces which are truly cylindrical and of uniform diameter from end to end to within .0001 inch, which insures that the telescope, once adjusted, will remain in collimation with the draw tube in any position.

Either erecting or inverting telescopes are furnished and only lenses of the highest quality obtainable are used.

The spindle and socket are made of hard bronze alloys of different compositions, thereby eliminating friction to the greatest extent possible, and finished by lapping.

All parts are made of hard bronze and to limit gages insuring strict interchangeability.

Full description of this instrument is given in Bulletin BX–9.

Electrically Operated Ore Loading Plants and Wire Rope Tramways.

Written for the MINING AND SCIENTIFIC PRESS by FRANK C. PERKINS.

During the past decade the methods employed for ore loading have greatly improved and the aerial rope tramway has been developed to a remarkable degree, so that there is at present a great saving of labor and the ore is excavated and loaded with economy. The ore loading plant at Vivero, Province de Lugo, Spain, includes a bridge and tramrail plant for loading vessels with iron ore, operated by the Vivero Iron Ore Co., Ltd. The plant was installed to convey the iron ore from the Spanish shore to deep water, a distance of 200 meters for sea-going shipment and has a capacity of 250 skips or 250 tons hourly. A small rock a short distance from shore forms a suitable support for the tramrail bridge, 120 meters in length, with a free extension of 45 meters. At a platform at the outer end of the extension, the ore tubs are automatically discharged into a telescope chute for the direct loading into the bunkers of the vessel. The ore from the mine is transported to the shore by means of a railway 4500 meters in length, and it is automatically dumped into large storage hoppers located on the hillside. From these hoppers the ore is discharged into tubs of the ore loading plant, delivering the ore to the vessel at the rate of about four buckets per minute. The mine is located at an elevation of 220 meters above the discharging platform on the bridge, and this difference of level is sufficient for the loaded buckets to descend by gravity on the ropeway as well as the tramrail plant, no power being required to operate the installation. It is claimed that this plant, since it has been installed, has not only made a large saving in the cost of handling the ore but also in the time required for loading the vessel.

Tension Station on a Long Line of Aerial Tram.

The two main systems of ore handling apparatus include the traveling-cable hoist conveyors and the fixed-cable hoist conveyors. The former include two principal types, in one of which both towers are movable, and in the other one of the towers is movable and the other fixed. The fixed-cable hoist conveyors also include two classes, one of which has supports or towers and horizontal lines, or lines with but little inclination, two independent ropes being required to operate such plants. The other class includes a main or carrying cable which has sufficient inclination to allow the carriage to descend by gravity and but one operating or hoisting rope is used.

It is claimed by some mining engineers that the ideal system for handling ore is an overhead cableway. In mountainous mining regions a suspended cableway is not only cheap in first cost and quickly erected, but it is seldom, if ever, blocked by debris, snow, or ice, and is nearly an ideal transportation system.

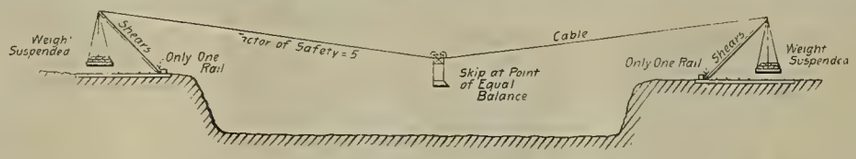


Fig.1. Balanced Cable Crane, with Load at Center

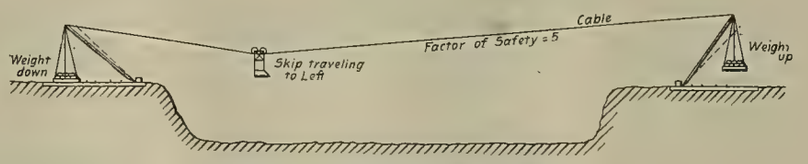


Fig.2. Skip moving towards Left-Hand Shears

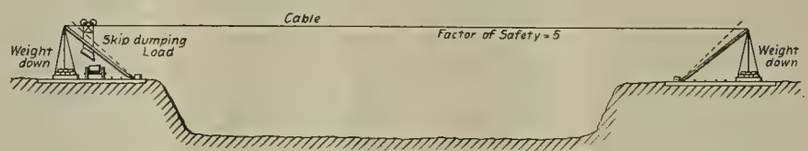


Fig.3. Skip at Shears and dumping Load.

The Balanced System of Aerial Transportation.

These cable-hoist conveyors are distinguished from ordinary wire ropeways in the fact that they are designed to move at any one time single loads of several tons over comparatively short distances. These plants may be either simple conveyors, such as used in transferring ore across ravines or materials across rivers, or they may partake of the nature of hoists as well, and in this adaptation is found their widest application for the loading and unloading of vessels and similar service.

Those installations adapted to hoist as well as to convey the load are of two types, one applicable to inclines only, in which the carriage descends by gravity, and the other applicable to either horizontal lines or lines where the inclination is not sufficient for the carriage to descend by gravity alone, in which the hoisting and conveying are done by separate ropes. The track cables rest upon saddles of hard wood or iron, forming the peaks of the supports in either case, and are anchored firmly at each end, a turn buckle, or "take up," usually being provided at one of these anchorages for maintaining the proper deflection. The supports are pyramidal towers of wood or iron, as preferred, although in many cases, especially if the loads do not exceed two tons in weight, there are "A" frames, or masts, guyed with wire ropes and in some cases these towers are mounted upon trucks so that the installation may be shifted, this being a desirable feature for some work. Electric motors, as well as steam engines, are utilized for operating the lines and towers of cable hoist conveyors and these labor-saving devices are coming more extensively into use. The accompanying diagrams show the arrangement of the balanced cable cranes for handling excavated material at Davenport, Eng., and Zambesi Falls, South Africa. It may be of interest to consider some of the details in connection with the balanced cable crane as well as some of the advantages claimed for the same over the old style cableway.

It is claimed that the balanced cable crane noted in the accompanying drawing is so designed that it offers no more resistance to the traveling car than if the cable were as straight as a string. The balanced cableway has suspended counterweights that take the place of fixed anchors, and it has inclined, oscillating towers, or shears, pivoted at the lower end, the weight of the cable and car with its load being held in equilibrium by the counterweights. It is held that in the balanced cableway equilibrium is automatically maintained by the counterweights and the oscillating towers, or shears, in some such a way

Supporting Tower of Wire Rope Friction Grip Tramway.

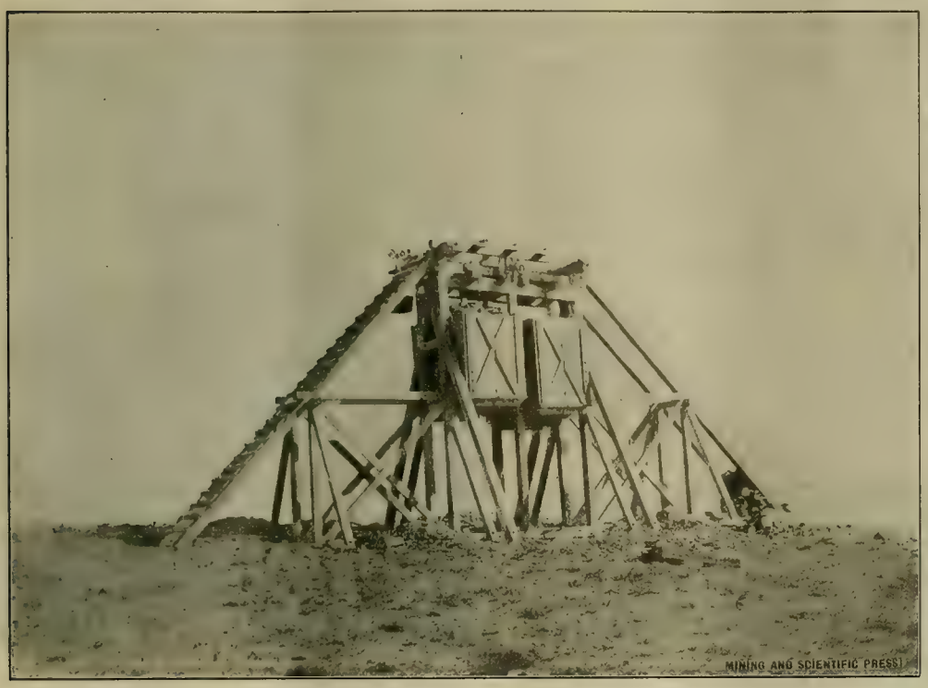
as a counterbalanced window, the electric motor conveying the load along the balanced cableway, there being very little resistance to the rolling car on such an aerial cable. It is held that the counterweights entirely eliminate the dead load as they descend with the shears, as the car moves toward them, while the opposite shears and weights ascend. As the loaded carriage reaches the shears, the opposite counterweight is at a maximum point and the cable is practically horizontal.

Steam, gasoline and other engines are utilized for power with the balanced cable system, and, also, electric power. In the latter the car that travels on the cableway is virtually a self-contained trolley car. The electric motor does not have to lift the weight in moving toward the shears, as the dead load of the car is entirely counterbalanced, and electric power is now almost universally available in mining installations, as it is utilized to advantage for not only electric hoists, but electric ventilators, underground pumping plants and other mining apparatus.

At the Zambesi river plant, in South Africa, just below the Victoria Falls, there is a balanced cableway having a span of 870 feet and a capacity of ten tons per load, the cable being 2⅝ inches in diameter. The electric motors used on the balanced cableways have a capacity of from 30 to 60 H. P., according to the size of the cables used and the loads to be carried.

There are a great many cableways in operation in the Western mining districts of the United States, which are of more than passing interest. At Ouray, Colo., there is an automatic system operated by the American G. M. Co., having a span 2100 feet in length, and another automatic tramway at Park City, Utah, operated by the Silver King M. Co. The accompanying illustration shows the supporting towers of the aerial wire rope, friction grip tramways. One of these automatic aerial wire rope tramways, with its towers and cables, is shown in the accompanying illustration as operated at Encampment, Wyo., by the North American Copper Co. This tramway is the longest in the country, having a total length of 16 miles, and passes over the continental divide, or watershed, at an altitude of 10,090 feet. The highest tower installed on this tramway is 69 feet high and the elevation of the rope saddle above the sea level is about 10,000 feet. These towers are spaced at intervals varying from a few feet to as great as 2300 feet, there being three long spans on the upper section of the tramway, ranging in length from 1800 feet to 2300 feet.

A similar aerial wire rope tramway is utilized at Telluride by the San Juan G. M. Co., also at Silverton, B. C., by the Wakefield M. Co. These automatic aerial cableways are of the double rope type, in which the carriers travel upon a stationary track cable and are propelled by an endless traction rope. The operation is automatic, thereby reducing the labor required in handling the material to a minimum and insuring a larger carrying capacity within a given time. It is customary in practice to divide a long tramway into several sections, depending upon various conditions, such as length, capacity and gradients encountered. The cables are usually supported on towers built of wood, although steel construction is sometimes employed and the number of the towers, their heights and the space employed depend on the profile of the ground. The track ropes rest on long bearing saddles placed on the tower while the traction rope is supported by guide sheaves placed directly below. The saddles are usually of special construction and arranged to prevent any sharp bends in the rope when the carrier wheels are passing over the tower, self lubricating phosphor bronze bushings being employed at the sheaves, requiring no oil. The grooves of the tower sheaves and the shape of the flanges are such as to accommodate the shape of the clip on the traction rope so that this rope always rests in the sheave, whether a bucket is passing over a tower or not. The grip used to attach the carriers to the traction rope is placed in a yoke in a pendant in such a manner as to allow the grip to revolve freely and follow the inclination of the traction rope in passing over a steep grade. In order to draw them together as the cable wears, the jaws are adjustable, so that a firm grip on the rope may be had at all times. A lever is so arranged for manipulating the grips that they automatically open at the terminal by means of a detacher frame. A double toggle, or cam, directly connected to the lever and movable jaw provides the means for clamping the rope tightly. It is stated that these grips will not slip on the cable owing to the enormous power developed, no matter how steep the grade or how heavy the load. At the upper terminal the track cables are permanently anchored, being con-



Tension Station on the Tramway of the Penn Copper Company, Encampment, Wyoming.

Building an Aerial Tramway.

Tower on Line of an Aerial Tramway.

Automatic Aerial Tramway of the San Juan Gold Mining Company at Telluride, Colorado.

nected by a rail over which the carriers travel from one cable to another. The traction rope passes around a sheave or series of sheaves of large diameter, to which brake rings are bolted to control the speed of the tramway when the downward tendency due to force of gravity of the loaded buckets is sufficient to operate the tramway. When power is required it is applied to the line by means of gearing attached to the terminal shaft. On the frame work of this terminal is placed a detacher and also an attacher frame, which either automatically detaches the incoming buckets from the line as they enter this station, or attaches them to the traction rope when leaving the terminal.

The track cables at the lower terminal are attached to weight boxes for keeping the tension on these cables uniform. The traction rope passes around a single sheave mounted upon a journal, which slides in a frame and to this frame is attached a weight box, in order to maintain the traction cable at a uniform tension. Connecting rail, attachers, and detachers are used at this station in a similar manner as at the upper end.

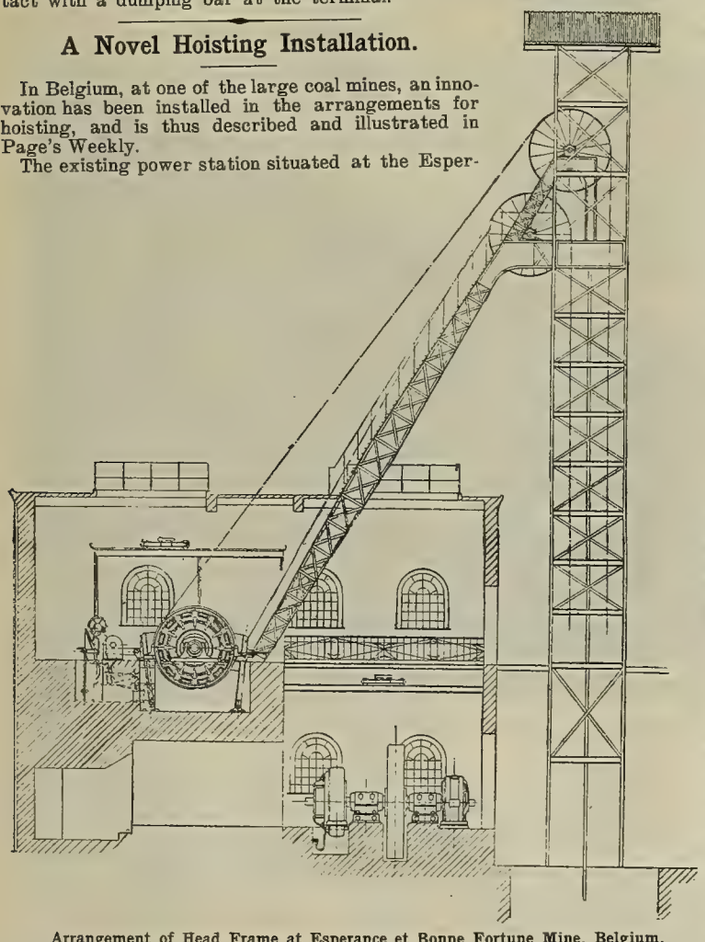
In long lines tension stations are provided, as may be found necessary. The track cables are parted, one section being connected to a weight box, or other means, for maintaining a uniform tension and the second section being permanently anchored. A short section of rail connects the two cables for the buckets to operate over. The traction rope continues by this station and is not parted but guided over the frame by guide sheaves. Buckets passing over a tension station do so at regular speed and without attendance.

Under certain conditions single line tramways are utilized to advantage and are recommended for light capacity, single endless wire rope being utilized, to which buckets or carriers are attached at intervals, depending on the capacity of the tramway. A single line wire rope tramway of this type is in operation at Chinese Camp, Cal., at the mines of the Eagle-Shawmut M. Co. The cables are supported on towers about 200 feet apart, longer spans being utilized where the contour of the ground requires it. The buckets have a capacity of 2½ cubic feet, two types being used, one having a drop bottom, to which is attached a counter weight, in order to again bring the bottom in its proper position after discharging, and the other being of the revolving type similar to those used on double rope systems, and being discharged by coming into contact with a dumping bar at the terminal.

A Novel Hoisting Installation.

In Belgium, at one of the large coal mines, an innovation has been installed in the arrangements for hoisting, and is thus described and illustrated in Page's Weekly.

The existing power station situated at the Esperance Pit consisted of three direct-coupled sets each of 225 kilowatts, the steam-engine output amounting to 300 H. P. per engine. The working voltage was 1,000 v. and the frequency 44 cycles. Connected to the power station were underground pumps at the Esperance and St. Nicholas pits, each of 125 H. P.; ventilators and sundry services absorbed another 250 H. P., so that altogether 250 H. P. was spare.



Arrangement of Head Frame at Esperance et Bonne Fortune Mine, Belgium.

The current was conveyed to St. Nicholas by two three-wire overhead lines of bare copper conductors.

In order to ascertain in the present case what would be the most favorable system, two complete propositions were worked out on different lines. In one proposition direct driving by means of a three-phase motor, and in the other proposition a motor-generator to supply a continuous current winding motor, were proposed. Similarly, the use of flat aloe-fibre ropes with reels, as in the existing steam plant, and an alternative of steel ropes with pulley, were considered for each case.

The decision finally rested with the latter, for its adoption permitted of the setting round of the winding plant, in reference to the shaft itself, by an angle of 90°. This course provided valuable space for erection of the new coal-washing plant, and, in addition, enabled the winding plant to be laid down in a space otherwise useless.

In the choice of electrical system, it was necessary to take into consideration the fact that the hoisting height was comparatively small, and that on account of the stop at an intermediate stage, starting of the winding motor would have to take place twice per journey. Employing a three-phase winding motor, therefore, the loss in the starting resistance would be proportionately higher than if winding from a greater depth, and from the lowest stage only. The plant in the existing power-station would have no longer been sufficient fo supply the necessary power at the starting and acceleration period of the winding motor.

For several reasons it was decided, in spite of the more complicated and more expensive arrangements of plant, to install a continuous-current winding motor with a motor-generator set and flywheel, or so-called Ilgner converter, interposed between the three-phase supply mains and the winding motor.

For the immediate winding requirements from 1200 feet depth, the conditions are as follows:

Effective load per journey	5,300 lb.
Weight of cage and attachments	4,000 lb.
Weight of the four tubs	2,200 lb.
Weight of flat wire rope, 3¾ in. by ¾ in.	3 82 lb. per ft.
Diameter to the Kœpe pulley	About 10 ft.
Winding speed	1,600 ft. p.m. (later to be 2,000 ft. p.m.)
Revolutions per minute of winder	51 (later to be 64)

The moment of inertia of the masses to be accelerated amounts to 31,000 foot-pounds.

When on the lowest stage two full skips are loaded and at the 1120-foot stage the second deck of the cage is also loaded.

In the determination of the design of the converter set it was decided that, in order to control the speed of the converter and flywheel, a fixed resistance should be inserted into the rotor circuit of the motor. Although the use of a variable resistance can control the power consumption from the three-phase mains so as to make the uniformity of the demand on the power station still higher, it was decided against, in the present case, in order to avoid all unnecessary complications, and it was also shown that the maximum current demanded would be within the permissible limits for the primary generator plant.

Filter Pressing Slimes.

In the issue of November 25, last, there appeared herein, on page 367, a brief description of the filter press designed by C. W. Merrill to treat the large amount of slimes from the Homestake mills at Lead, South Dakota. It should have been stated in that article that this filter press and several modifications of the principles and operation of the machine were patented by Mr. Merrill, and that the cuts illustrating the same were after the original drawings deposited in the patent office. Application for patent for the device described in the issue referred to was made January 2, 1904, and was numbered 798,200. Patent issued Aug. 29, 1905. The mention of this fact was an oversight, and has led some to believe that the Merrill filter press was subject to use by any one without restriction, when quite the contrary is the fact.

THERE are no dikes intruding the limestone strata in the lead zinc region of Missouri and Arkansas or of Wisconsin. The ores occur in flat sheets, irregular chambers, and fissures in the limestone.

Triumph Common Sense Elevator.

The cut below shows one of the Triumph common sense slow speed elevators, built by the C. O. Bartlett & Snow Co., Cleveland, O., used in the zinc mines of the Joplin district, Mo., for hoisting ore from the bottom of the mine to the crusher bins above. It is 300 feet between centers, 260 feet of which extends under the ground to the level of the mine floor. It is hoisting 500 tons of ore per day of ten hours. It is operated without any attendants. The ore is dumped into a hopper near the bottom of the elevator from the regulation mine cars, and is automatically fed to the elevator, and in turn discharged into the crusher bins at the head.

Triumph Elevator.

The buckets are of the overlapping type, made of malleable iron, 24 inches long, which are carried by two strands of Triumph drop forged steel chain with 1½ inch steel axles, to which are fastened chilled, dust proof, oil chambered track wheels, 6 inches in diameter, running on heavy T rails.

The elevator is driven by an alternating current motor, and is provided with an automatic safety brake, which prevents it from running backward in case the power is cut off.

The cost of raising ore by this elevator is said to be one quarter the cost of the old method. It is claimed to be less than ½ cent per ton. It can be built of different lengths and of any capacity.

THE PROSPECTOR.

The samples from Independence, Cal., are determined as follows: No. 1, micaceous (specular) iron, a variety of hematite; No. 2, same as No. 1, and is covered with an iridescent film, probably due to the presence of a small amount of copper. It resembles some varieties of bornite (copper sulphide), but contains little or no copper. No. 3 is quartz, somewhat corroded by mineral solutions, which have removed a portion of the original constituents, probably pyrite. No. 4 is jasperoid and siliceous iron ore. It also contains pyrite, which clearly indicates the origin of the siliceous limonite. Both Nos. 3 and 4 may be gold bearing.

The white rock from White River, Cal., is white quartz, probably from a coarse-grained granite vein—pegmatite. It is without value.

The sample of ore from the Three Friends tunnel, near Pony, Montana, is quartz, evidently occurring in granite or diorite. It contains sulphide minerals. Its value cannot be determined by "The Prospector." It should be assayed for gold and silver.

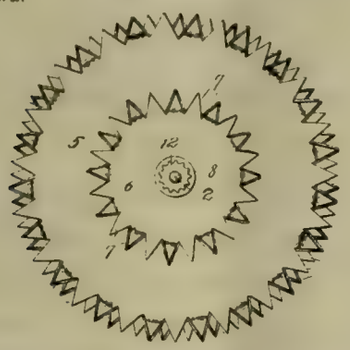
AN alloy of two parts of aluminum and one part of zinc is equal to good cast iron in strength, and superior to it in elastic limit, says the Lead and Zinc News. Its color is white. It takes a fine, smooth finish and does not readily oxidize. It melts at a dull red heat or at a heat slightly below, and is very fluid, running freely to the extremities of the mould and filling perfectly small or thin parts; in that respect it is said to be superior to brass, but is brittle, and hence unsuited to pieces which require the toughness possessed by brass. The tensile strength of the alloy is approximately 22,000 pounds per square inch, and its specific gravity 3.3.

Mining and Metallurgical Patents.

PATENTS ISSUED DECEMBER 5, 1905.

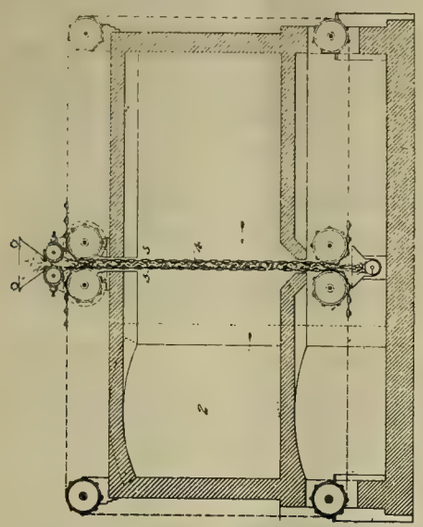
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINING MACHINE.—No. 805,685; J. Swanson, Mystic, Iowa.



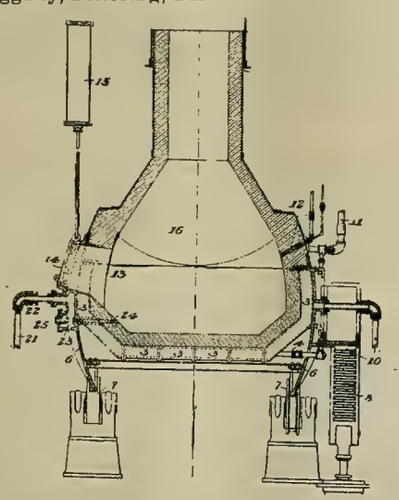
Device of character described, having pair of superposed cutting disks having toothed peripheries, teeth of each of disks being bent alternately in opposite directions and teeth of one disk being opposite spaces between those of other, alternate teeth of respective disks being parallel, and a small cutting disk disposed beneath lowermost of first mentioned disks and having toothed periphery.

PROCESS OF RECOVERING SULPHUR.—No. 805,701; R Baggaley, Pittsburg, Pa.



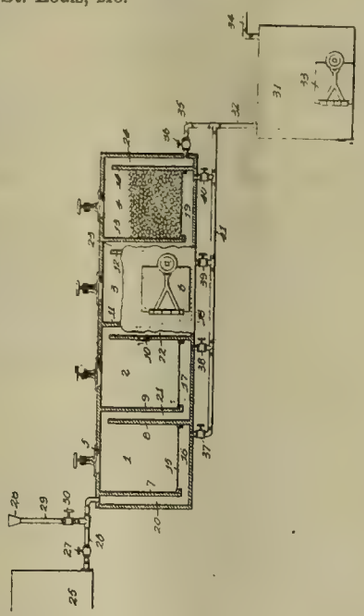
Method of obtaining sulphur, which consists in passing sulphur-bearing fumes from smelting furnace through combustible screen of waste material and depositing sulphur thereon, and then burning screen and subliming and collecting sulphur.

FURNACE FOR REFINING COPPER.—No. 805,834; R. Baggaley, Pittsburg, Pa.



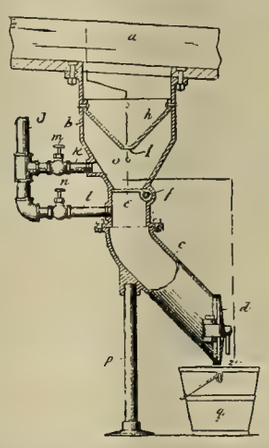
Oscillating water-jacketed furnace adapted to refine copper having removable roof-section, means for heating furnace, working door at one end thereof suitable for insertion of refining instrument, tuyere below surface level of charge to be refined, means for supplying hydrocarbon gas to tuyere, and means for oscillating furnace to empty refined charge.

APPARATUS FOR DISSOLVING AND SEPARATING VALUES CONTAINED IN ORES, ETC.—No. 805,880; C. H. Rider, St. Louis, Mo.



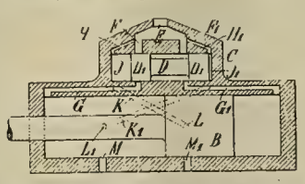
Device of class described, consisting of single closed tank divided into compartments by partitions arranged to admit passage of suitable agents, such as gas, fluid or air to bottom of first compartment upwardly through compartment, then to bottom of second compartment and upwardly through second compartment, and so on through series; air tight manholes in tops of compartments; air tight doors in sides thereof; and air tight tank arranged to receive liquid from compartments, there being connections between receiving tank and top of last compartment; and there being connections between receiving tank and bottom of each compartment.

METAL SEPARATOR FOR ORE CONCENTRATING PLANT.—No. 806 414; H. C. Krause, Point Mills, Mich.



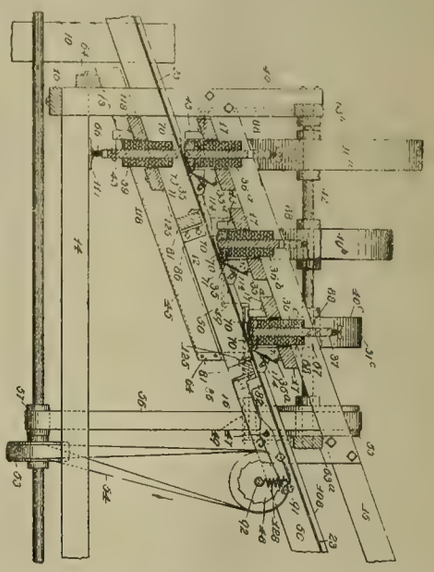
In metal separator for ore concentrating plants, combination of hopper having funnel-shaped partition which terminates at bottom in contracted discharge opening between top and bottom of hopper and forms with lower part of hopper, receptacle for metal and heavy concentrates passing through discharge opening when opening at lower end of hopper is closed, and trap connected with lower part of hopper and provided at upper and lower ends with valves, and water supply connection leading into hopper between partition and upper valve.

ROCK BORING MACHINE.—No. 806,128; H. Flottmann, Bochum, Germany.



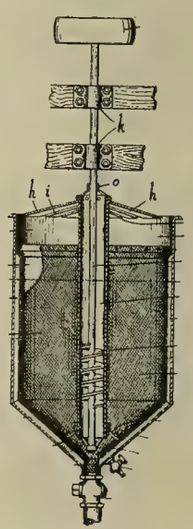
In valve gears for engines driven by compressed air and like driving mediums in combination with cylinder and single working piston therein valve casing, valve piston located therein and having enlarged heads at both ends and reduced middle portion, admission port, channels H, H′ leading from admission port to spaces at both sides of valve piston, other channels K, K′ leading at opposite sides into working cylinder space and exhaust openings M, M′ corresponding in position with openings L, L′ of channels K, K′ into working cylinder.

MAGNETIC SEPARATOR FOR ORES.—No. 805,448; H. F. Campbell, Melrose, Mass.



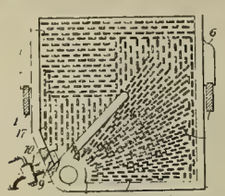
In magnetic ore separating machine combination of magnet, flat table composed of non-magnetic material located beneath magnet and secured against movement in plane of surface of table, means for jarring table without bodily raising and means for causing film of comminuted ore of substantially uniform thickness to travel along table and for presenting ore to action of magnet while separated from poles by intervening space.

APPARATUS FOR LIXIVIATION PROCESSES.—No 805,635; A. W. Constans, Nelson, Canada.



In machine of class described, in combination, receptacle for matter having suitable elevating means and filter of woven material therein arranged on slats having wire netting corresponding in surface area and covering filter and secured to slats, and means for distributing matter over said netting.

FILTER PRESS.—No. 806,491; R. Pick, Buffalo N.Y.



In filter press, plate having on sides horizontally arranged projections, vertically arranged projections, and angularly arranged projections, and arms extended at upward angle from lower front corners of plates.

Smelting of Magnetic Iron Ore by Electricity.

As the result of experiments in the concentration of black sands, which he conducted at the Lewis and Clark Centennial Exposition in Portland, Or., during the past summer, Dr. David T. Day of the United States Geological Survey, makes the noteworthy statement that conditions for the production of steel by electricity are fully as good in Oregon as they are in Germany, where pig iron has been obtained in similar electric furnaces at slightly lower cost than in ordinary blast-furnace practice.

A preliminary report on the subject of smelting by electricity the magnetic iron ores obtained from various points on the Pacific beach has been submitted by Dr. Day to the Director of the Geological Survey.

After considerable correspondence with the patentees of various forms of electric furnaces, arrangements were made with the Wilson Aluminum Company of New York for the services of C. E. Wilson, their expert in electrical smelting. Mr. Wilson arrived in Portland on October 11, and at the end of one week had erected a small but efficient electrical furnace, and was making steel. He had procured in the East 25 carbon electrodes—each 48 inches long and 4 inches square—such as are ordinarily used in electric furnaces. The rest of his equipment was obtained in Portland from materials kept in stock or easily made at a foundry.

In building the furnace a course of ordinary Carnegie fire bricks was laid upon the ground. Upon this single course was laid a cast-iron plate, ⅝ inch thick, 3 feet long and 3 feet wide. On this was placed an oval sheet-iron drum of No. 16 iron 3 feet long by 3 feet high. The sides of this drum were lined with fire bricks to form a crucible 18x18 inches and 24 inches high. The bottom of the crucible was covered, from the cast-iron plate up to the tapping hole, with broken carbon electrode. The carbon electrode to carry the current was suspended by a pulley above this furnace and connected with a balanced axle and wheel by which it could be readily raised or lowered. The top of the furnace was covered with two double plates of riveted wrought iron, between which cold water was run. In the center of this water-jacketed cover an opening was left sufficient to allow the free play up and down of the carbon electrode. This furnace is referred to as "Small Furnace," or "Furnace A."

POWER FOR FURNACE A.—Through the co-operation of the Portland General Electric Company, a special wire, bearing a 2300-volt alternating current, was run from the city supply to the smelter. This was carried into a series of six transformers and yielded a current varying from 50 to 20 volts by 1000 to 2000 amperes.

INITIAL RUN OF FURNACE A.—On the afternoon of October 17, a current of 57 volts and 1000 amperes was passed through the furnace and the arc established. The furnace was then fed with a mixture of magnetite, coke and lime. This consisted of 200 pounds of magnetite, obtained from the sand at Hammond Station, near Astoria, Or., at the mouth of the Columbia river; 44 pounds of "Fairfax" coke, which contained about 25% of ash; and 24 pounds of lime. About 50 pounds of this charge was slowly introduced into the furnace, and within an hour there was tapped from the furnace 70 pounds of steel, which contained 8% of iron and 53% of titanic acid.

On the following day the furnace was again heated and filled with a mixture similar to that used on the first run, except that it contained less lime. Steel was successfully cast twice, making, for that day's run of two hours, a product of 90 pounds of steel from 300 pounds of iron ore. This gives the furnace a capacity, on a continuous run, of 1440 pounds in 24 hours.

COMPOSITION OF CHARGE.—The iron ore fed to the furnace showed the following percentages of magnetic oxide, of titanic acid, manganese, and undetermined matter:

ANALYSIS OF COLUMBIA RIVER CONCENTRATES.

Fe_3O_4	79.06
TiO_2	16.00
MnO_2	2.45
Silica, moisture and undetermined matter	2.49

It will be noted that the heat was sufficient to keep the entire slag in a fluid state whether much or little titanic acid was present. It is evident also that no titanium went into the iron. Instead of the steel usually obtained, the charge of October 20, as shown by the analysis of that day, gave what was practically pig iron.

NATURE OF SLAGS OBTAINED FROM FURNACE A.—The slags first obtained consisted of fused iron silicates, fused oxide of iron, and silicate of titanium. Later in the experiments these slags grew lighter in color and in specific gravity. It became possible also to lessen the quantity of slag produced, which was unduly large owing to the great quantity of ash in the coke. The coke used showed on analysis 41% of ash. It is difficult to procure in this locality coke that is well adapted to metallurgical needs.

FURNACE B.—Experiments with the small furnace having been successful, it was thought desirable to build a larger furnace, with thicker walls, in which higher temperatures might be obtained and maintained. An iron plate 2 inches thick, 5 feet wide and 6 feet long was therefore procured and laid upon two courses of fire brick, to form the base of a furnace, on which was set a wrought-iron cylindrical shell ¼ inch thick, 5 feet in diameter and 4 feet high. This was lined with fire brick, the bottom having the usual lining of one course of carbon electrode bricks 4 inches in diameter. Two carbons clapped together with a water-jacketed head or clamp formed the electrode for introducing the current. The voltage was run up as high as possible—that is from 75 to 90 volts, the limit of the current obtainable over the wires. In all respects except these mentioned, this second furnace is identical with the first.

Iron ore from Aptos, Bay of Monterey, California, was smelted in this furnace on November 10. This iron ore is very fine grained and contains a notable percentage of manganese, much of which goes into the steel. It is not so rich in titanium as the other sands that had been used. From the start this furnace made a satisfactory run, maintaining easily a high temperature and turning out a very smooth product. After a few trials the slag became as light in color as that from any well regulated blast furnace. The later products of steel were much denser than those first made, which would seem to indicate that, at the higher temperature, the process of reduction is complete, even in the short time that elapses between the beginning of reduction and the tapping. In every case, however, small blow holes were observable in the steel. These were due to gases which formed wherever grains of magnetite were still entangled in the steel in process of reduction. The capacity of this furnace with a current of 125 volts, 1200 amperes, would be 2000 pounds in 24 hours.

Obituary.

H. H. OFFICER, formerly of Leadville, was suffocated by sulphuric fumes arising from ores which he was testing at Salt Lake City, Dec. 15.

J. D. MCGILLIVRAY, a well-known mining engineer and journalist, died in San Francisco, December 19, from cancer, aged 49 years. He resigned as editor of the MINING AND SCIENTIFIC PRESS at the time of the Klondike excitement to represent the New York Herald in Alaska.

Personal.

JAS. W. NEILL is in Shasta county.

GEORGE ROBINSON is at Vancouver.

H. VINCENT WALLACE is at Los Angeles.

THOS. B. STEARNS, of Denver, is in New York.

CHARLES BUTTERS is on his way to Mexico City.

F. P. ANDREAS of Boise, Ida., is in Chloride, Ariz.

IRA P. BOSS, Silverton, Colo., is in New York City.

A. F. HOLDEN of Salt Lake City is in San Francisco.

OLOF WENSTROM is on his way from Boston to Mexico City.

BERNARD CUNNIFF, of Prescott, Ariz., is in San Francisco.

ROSS E. BROWNE is in London, having returned from South Africa.

JOSEPH HYDE PRATT has gone to Arizona on an engineering trip.

F. W. BAKER, chairman of the Venture Corporation, is in New York.

F. LYNWOOD GARRISON has returned to Philadelphia from Santo Domingo.

C. L. SHAW is superintendent Arizona Mines Company at Casa Grande, Arizona.

REGIS CHAUVENET of Denver recently examined coal lands in southern Colorado.

W. L. AUSTIN of New York has gone to Clifton, Ariz., where he will remain for several months.

H. J. SHEAFE of New York City has finished an examination of mines at Searchlight, Nevada.

FRANK WOODBURY has returned to Beverly, Mass., from Silverton and Red Mountain, Colorado.

W. R. WADE has been made superintendent Azure Mining Company at Silver City, New Mexico.

C. MCDERMID, secretary of the Institution of Mining and Metallurgy, London, is visiting New York.

C. M. WOODS, manager Denver Fire Clay Co., Denver, Colo., is in New York City for a few weeks.

ARTHUR LAKES, JR., is superintendent Bullwhacker mine of Alturas M. Company, near Hailey, Idaho.

R. D. SEYMOUR, Denver, Colo., representative the Trenton Iron Company, is at Trenton, New Jersey.

FREDERICK GRUNDY is returning to Los Angeles after examining mines in southern Mexico and Chihuahua.

CARL DAVIS, formerly superintendent Centre Star and War Eagle mines at Rossland, B. C., is in South Africa.

COURTENAY DE KALB has left San Francisco to examine mines at Guadalupe y Calvo in Chihuahua, Mexico.

E. W. AVERILL AND W. W. TUXBURY of Amesbury, Mass., have returned there from the Red Mountain district, Colorado.

O. H. FAIRCHILD has charge of putting up the new cyanide mill of the Inter-Ocean Mining Company at Boulder, Colorado.

JOHN WEIR, president Nevada-Utah Mines & Smelter Corporation, has returned to New York City from Salt Lake City.

A. E. WEINBERG has finished examining mines in the Etheridge district of North Queensland and is at Sydney, New South Wales.

GEO. GUNN, with the American Smelting & Refining Company, has returned to Salt Lake City from inspecting properties at Ely, Nevada.

C. E. FRYBERGER, for some time past with the Colorado Iron Works Company, Denver, Colo., has been made manager of the mine and mill of the Wheeling Milling Co. at Mine La Motte, Missouri.

RECORD OF DAILY RUNS OF FURNACE A.

Number of Run	Date.	Hours Run	Volts	Amperes	Mixture Used. Magnetite	Coke	Limestone	Sand	Total Weight of Mixture	Metal Tapped From Furnace	Slag Produced	Carbon Electrode Consumed	Horse Power	Steel Produced per Horse Power Day	Magnetic Iron Ore per Pound of Steel
	1904.				Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.		Lbs.	Lbs.
1	October 17.	1½	57	1000	200	44	24	.....	268	70	.....	1.80	76.40	14.66	2 86
2	October 18.	2	57	1000	300	60	30	.....	390	90	200	2.10	76 40	14.14	3.33
3	October 20.	2	57	1800	97	19	8	.....	124	23	125	1.20	137.53	2.01	4.22
4	October 20.	2	57	20 0	91	21	4	...	116	120	88	3.50	152 81	9.42	.76
5	October 21.	2	57	1800	150	74	7	.....	231	23	115	2 30	137.53	2.01	6.52
6	October 21.	2	57	18 0	103	27	2	.....	131	106	105	3 20	137.53	9.25	1.03
7	October 23.	8	57	1200	500	100	24	10	634	247	410	2.80	91.68	8.08	2.03
8	October 25.	3	57	1200	202	40	12	12	266	38	150	3.50	91.68	3.21	5.32
9	October 26.	1	115	800	298	60	30	10	398	122	120	4.00	123.33	23.75	2.44
10	October 27.	5	115	1200	800	160	96	.....	1056	263	318	2.00	184.98	6.83	3.04
11	October 30.	3	115	1200	800	154	64	.....	1018	200	400	1 50	184.98	8.65	4.00
12	October 31.	5	115	1200	1200	175	112	.....	1487	575	280	3.00	184.98	14.92	2.09

RECORD OF DAILY RUNS ON FURNACE B.

Number of Run	Date.	Hours Run	Volts	Amperes	Mixture Used. Magnetite	Coke	Limestone	Total Weight of Mixture	Metal Tapped From Furnace	Slag Produced	Carbon Electrode Consumed	Horse Power	Steel Produced per Horse Power Day.	Magnetic Iron Ore per Pound of Steel.
	1904.				Lbs.	Lbs.	Lbs.	Lbs	Lbs.		Lbs.		Lbs.	Lbs.
1	November 10	4	100	1200	1000	200	160	1360	480	250	2.00	160.86	17 91	2.08
2	November 11	7	75	1600	1000	250	48	1298	175	312	3.69	160.85	3.69	*a*5.71
3	November 14	9	80	2000	858	154	18	1030	450	457	6.00	214.47	5 59	1.91
4	November 16	8	80	2000	800	170	84	1054	*a*1025	500	8.00	214.47	14.34	*b*.78

a Metal not all tapped.
b Includes metal not tapped from previous run.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

ARIZONA.

A canvass made of the copper producing companies of Arizona shows that the year's output for 1905 may aggregate 246,500,000 pounds. Montana heads the column with an output estimated this year of 325,000,000 pounds, giving Arizona second place with 246,500,000 pounds and Michigan third place with an estimated production of 225,000,000 pounds. The production as based upon the output for the eleven months of the year with December's production estimated gives the following results for each of the individual producers:

Company—	Pounds. 1905.	Pounds. 1904.
Arizona Copper Co.	30,000,000	29,000,000
Arizona Commercial Co.	750,000	.....
Calumet & Arizona	34,000,000	31,600 000
Copper Queen Co.	76,000,000	58,000 000
Detroit Copper Co.	18 000,000	18,000,000
Imperial Copper Co	6,500 000	2,500,000
Lake Superior & Pittsburg	1.700,000	.....
Pittsburg & Duluth	550,000	.....
Shannon Copper Co.	12,000,000	11,900,000
Old Dominion Copper Co.	30,000,000	16,000,000
United Verde Copper Co.	30,000,000	30,000,000
Miscellaneous.	7,000,000	4,000,000
Totals.	246,500,000	201,000,000

In the miscellaneous output are included the figures represented by those other enterprises that had occasion to ship their ores out to other smelters, principally to the El Paso plant in Texas. The Arizona Commercial Co. at Globe is planning to sink its main working shaft from the 600 to the 800-foot level. At present the company is shipping 100 tons of sulphide ores to the Old Dominion plant and thirty tons of silicon ores to the Phelps-Dodge smelter at Douglas. Within four months the property will be shipping 250 tons daily. At the Calumet & Arizona Co. much improvement was accomplished during the year; a new furnace was blown in, making four in commission, the latest addition having a capacity of 300 tons per day. The new furnace will be used largely on ore from the Lake Superior & Pittsburg and Pittsburg & Duluth companies, which are likewise included in the Bonanza Circle group of mines. The Copper Queen Co. has eight furnaces at Douglas, though the management does not expect to have more than six of these in commission at any one time. The company's output is now averaging over 7,000,000 pounds of copper per month. The Imperial Copper Co. plans a 300-ton smelter upon the company's mines at Red Rock. Both the Lake Superior and Duluth properties commenced their active careers this year after having been opened up in connection with the operations of the Calumet & Arizona Co. at Bisbee. The new Calumet & Arziona furnace is taking their ore at Douglas. The Shannon Copper Co. was delayed during the year through floods, and the output will be at least 3,000,000 pounds less than anticipated for 1905. The company intends putting in its own converter in 1906.

Cochise County.

It is reported that the Black Mountain M. Co., of Bisbee, will begin crushing low grade gold ore January 1. Mill and mine have been under construction since October, 1904. The cyanide plant, for treating tailings, will be ready in March next.

The 24x8-foot shaft of the Tombstone Con. Co. at Tombstone, being sunk by three eight-hour shifts, has been sunk 75 feet below the 800-foot level. They are making on an average from 8 to 10 feet per week. The pumping record has been increased, but the pumps have no trouble in handling the water, which so far has not interfered with the work. Most of the water is being pumped from the sump on the 800, the water collecting there from the various drifts on that level. The work at the mill is rapidly being completed and the management expects to be dropping stamps by January 1.

Graham County.

The Stevens Copper Co. has thirty men at work on its properties 2 miles from Metcalf. The country rocks are granite overlaid by Cambrian quartzite and Silurian limestone, with much faulting and intrusive porphyritic dykes, ores occurring near the fault lines. C. E. Stevens is superintendent.——A survey has been commenced for the tramway to connect the mines of the New England & Clifton Co. with the Clifton smelters. It is understood that construction work on the road will be commenced soon.

Mohave County.

A shipment of ore has been made from the Redemption mine at Chloride by R. J. Ferguson.——The Queen Bee and Keystone mines at Mineral Park, near Kingman, are being worked by J. Detar.——It is reported that ore has been struck in a crosscut from the 270-foot level of the West Gold Road mine at Vivian.——The Merrimac mine at Chloride is to be unwatered and work resumed.

Yavapai County.

J. F. Caspar, superintendent of the Redman M. M. & S. Co., near McCabe, intends putting in a gasoline hoist. The company is drifting from the 200-foot level.

After the recent stockholders' meeting of the Stark G. M. Co. at Massillon, Ohio, with mines in the Black Canyon district near Turkey, E. H. Smith, the president, telegraphed to the agent of the company in Prescott that it was decided to resume operations immediately and instructed him to perform the annual assessment work as well as to arrange other matters preparatory to resumption. The Stark Co. owns the Hidden Treasure gold mines, and has put up a 10-stamp mill and cyanide plant.——The Pittsburg-Arizona M. Co. has purchased a 60 H. P. engine, a compressor, two power drills, a pump and a hoist, which will be put in as soon as delivered. Operations will be resumed. The properties of the Pittsburg-Arizona M. Co. are in the Black Hills, near Jerome.

CALIFORNIA.

Butte County.

The Ohio Gold Dredging Co. of Los Angeles has bought 900 acres of land on Butte creek, 8 miles east of Chico, and have contracted for a dredger capable of handling 3000 cubic yards daily.

Calaveras County.

(Special Correspondence).—The smelter of the Union Copper M. Co. at Copperopolis has been started and is running successfully. This company has the Union, Keystone and Empire mines. G. McM. Ross is superintendent.

Copperopolis, Dec. 20.

El Dorado County.

Development work is being pushed at the Rosencrans mine, near Garden Valley. —— It is reported that another rich strike has been made in the Beattie mine at Georgia Slide. —— The Coloma M. Co. has been formed by N. P. Bailey, F. D. Parker, C. L. Whipple, F. B. Levitt and F. C. Farnell, all of Los Angeles. —— The Lone Star mine, 5 miles east of Placerville, is running under the management of William Rupley.

Mono County.

The Syndicate mine and mill, near Bodie, have been closed down indefinitely.——Lack of water has curtailed operations at the Standard Consolidated mine.

Nevada County.

The New York-Grass Valley M. Co. expect to resume work soon. Edwin Fernald has charge at Grass Valley. ——Work at the Chicago mine, near Grass Valley, is said to be promising.——The Union mine on Banner hill, near Nevada City, is being pumped out.

The Gold Flat Con. Quartz M. Co. will reopen and develop the Gold Flat mine, near Grass Valley, under the direction of Mark B. Kerr. A double-compartment shaft is down 370 feet, which will be changed to three compartments from the 370-foot level to a depth of 600 feet. A raise will be put through from the 370 level to the surface, enlarging that part of the shaft to three compartments also. There is a 10-stamp mill on the property.

At the monthly meeting of the Jenny Lind M. Co. of Grass Valley, A. J. Rowe was elected superintendent and F. J. Thomas to the board of directors. Retimbering the lower tunnel will soon be finished. During this period the mill will be put in shape to crush gravel. The tunnel is now in 1400 feet, whence a raise of 200 feet taps the gravel channel. From that point a shaft extends to the surface.

Shasta County.

The Bully Hill mine in the Pittsburg district has been opened to a depth of 900 feet, the upper levels being worked by tunnel and those below the 300 by shaft. It was first opened as a gold mine, but with the development of copper values operations were increased. The compressors and hoist are run by electricity.——The Rising Star and Copper City mines are also furnishing ore for the smelter. After heap roasting the ore is treated in two McDougal calcining furnaces and two 42x120-inch blast furnaces, giving a 35% to 50% copper matte which is converted to 98% blister copper and shipped to the De Lamar refinery in New Jersey. J. B. Keating of De Lamar is superintendent.

Sierra County.

(Special Correspondence).—The Sierra Buttes tramway at Sierra City has been finished and the new 40-stamp mill has been started. They will soon have the old 20-stamp mill repaired and resume crushing with it.——R. Phelan has his electric plant nearly completed and will soon be able to furnish power to mines in the Sierra City district.——The Mountain mine at Sierra City is running forty stamps on good ore.——The Sovereign Co. of Downieville is blocking out ore and preparing to build a mill in the spring.——At the Telegraph mine, near Downieville, the electric plant has been completed and sinking has been started.——The Gibsonville M. & Dev. Co. has begun work on the Gibsonville ridge to develop a part of the Thistle shaft channel. Power drills are to be put in. A mill to crush the cement is planned.

Downieville, Dec. 20.

Siskiyou County.

At the Drummer Boy mine, on Cherry creek, 8 miles southwest of Yreka, a 10-stamp mill is being put up. The property consists of eight claims—the Drummer Boy Extension, Antelope, Alice, Lily, Great Mogul, Ella J. Morton and Whitney quartz lode claims, and E. W. Emmons has charge of construction work. About 1000 feet of tunneling and raising have been done, chutes have been put in and track has been laid.——The Ball mine, near Etna, has been acquired by the Cons. M. Co., who will develop it under the direction of W. H. Young, superintendent King Solomon mine. ——At the Ethellium hydraulic mine on Horse creek, near Yreka, the 5-mile ditch and reservoir have been finished and hydraulic mining will be started by Manager F. C. Dilberger.

The demurrer to the complaint in the case of C. A. Mitchell and G. G. Skillen vs. G. V. Gray was recently overruled in the Superior Court and defendant allowed ten days in which to file an answer. This case involves the ownership of the Lanky Bob mine in the Sawyer Bar district. Skillen was the owner and gave an option to Mitchell for $10,000, half of which was to be paid in ninety days. Within a short time afterward he gave another option on the same property to defendant, Gray, for $12,000, Gray making a cash payment of $5000 and taking possession of the property. It is charged in the complaint that Gray obtained his option by misrepresentation. Before the expiration of the first option Mitchell tendered the $5000 stipulated in his contract and asked for possession of the property. Acting under advice of counsel Skillen accepted the money and then tendered the amount to Gray and asked for a cancellation of his contract. Gray refused and the present litigation followed. Mitchell & Skillen brought suit to annul the second contract and obtained an injunction against Gray, enjoining him from working, encumbering or disposing of the property pending the decision of the court. Defendant demurred to the complaint, setting forth that it did not state a good cause of action. The demurrer was overruled. Gray filed action to the complaint on December 6, denying all allegations of fraud and alleging that the first contract was a bare option, revocable at will by Skillen, and that the owner availed himself of that right when he gave the second option.

Trinity County.

Robt. Hicks, superintendent of the Hunter mine, in New River district, reached via Eureka or Denny, has six men at work.——The Mountain Boomer, in the same district, owned by the Bob's Farm M. Co., of which J. H. Byers is superintendent, has eight men at work. The mill has been shut down owing to the scarcity of water.

Tuolumne County.

J. H. Hall, superintendent Standard G. M. Co., plans an increase in the force at the company's mines, 5 miles southeast of Tuolumne. The track from the Hunter mill to the Hardtack mine has been extended to the Paymaster mine, and an air compressor has been put in.——The 5-stamp mill at the Los Angeles mine has resumed crushing.——The Confidence mill is running on ore from the upper levels. Drifting is being continued on the 900-foot level.——A 5-stamp mill has been put in at the North Star mine, southeast of Groveland. H. Argall is superintendent.

Yuba County.

The Marysville Gold Dredging Co. has bought 170 acres on the Yuba river, east of Marysville, adjoining lands now being dredged by the company. They have one dredger at work and expect to finish another soon.

COLORADO.

(Special Correspondence).—Arrangements are being made for building an electric line to be used for passengers and freight between Denver and Littleton, a distance of 12 miles. It is understood the line will extend to a coal mine which is owned and controlled by the company undertaking to build the road.——From now until next spring the usual number of fatalities may be expected as a result of snowslides. Already a number of deaths from slides have been reported.——A coal famine in Utah is helping many of the mines of Colorado dispose of their output and in many cases increasing the output of the coal mines. The railroads have been asked to assist in relieving the situation.——A large electric power plant is being projected for Summit county. It is the intention of the company to furnish power to Leadville, in Lake county, as well as the mines in Summit and adjoining counties. It is understood the Wilcox Co., operating near Georgetown and Silver Plume, are at the head of the scheme.

Denver, Dec. 18.

Clear Creek County.

B. J. Hatmaker of Buffalo, N. Y., a stockholder in the Covode M. Co., whose properties are on Miller mountain near Empire, accompanied by A. Sylvester of Georgetown, is inspecting the properties of the company and making arrangements to resume operations.

Eagle County.

The Pittsburg Gold-Zinc M. Co., working the Iron Mask group at Gilman, will build a zinc separating mill at the base of the tramway and across Eagle river. The waters of Fall creek have been appropriated and a ditch and pipe line surveyed.

Grand County.

A new mining district, at the head of St. Louis creek, about 5 miles south of Byers peak and about 14 miles southwest of Fraser, has been discovered by O. T. Bibb and John Troutt. It is tributary to the Moffat road and gives promise of developing large deposits of low-grade gold and copper-bearing ores. Owing to deep snow, nothing can be done there this winter, but as soon as it is possible to get there in the spring the discoverers will prospect the ground thoroughly.

Gunnison County.

The 30-ton Maple Leaf cyanide mill at Sillsville, near Gunnison, will soon be completed.——Beyond Sillsville at Cooper mountain, Colorado Springs people have put in a stamp mill to treat ores from property in that belt.

The Cleveland Mines Operating Co. has leased the Victor mine at Whitepine and has commenced development. The main shaft on the property is 835 feet deep. L. B. Stitzer is superintendent.

Huerfano County.

The Black Diamond coal mine, near Ruddy, has been purchased by George Dick, William Dick, J. R. Dick and F. R. Roof. The new owners of the property have changed the name to the Cucharas Coal Co. William Dick will have active control, and the general office and the company supply store will be in Walsenburg.

Lake County.

The 1100-foot drift connecting the Cloud City and the Home Extension shafts, in Leadville, has been completed and cars are running from one mine to the other. The connecting drift is 600 feet below the surface sloping towards the Cloud City, so its pumps can carry off the water. A cage is being built at the Home Extension. Hoisting is to be commenced. The north drift of the Cloud City is to be extended.

The Penrose people at Leadville have succeeded in placing the last large compound pump at the lower station of the shaft, and the mine is now in a position to control the water situation of the downtown section. There are three large pumps at the station, one triple expansion and two large compound, with a combined capacity of 2500 gallons per minute. With the setting of the pumps it is taken for granted that the water situation in the downtown section is controlled and that properties in the neighborhood which desire to sink to the depth of the Penrose can now do so without being bothered with the water problem. The Penrose will now start drifting toward the Coronado and to the south to the end lines of the property, to develop the

ore that has been opened in the Coronado. When the drift reaches the Coronado, nearly 1000 feet, it will be beneath the shaft about 100 feet and an upraise will be made to connect the two; the water from the Coronado will then be diverted to the Penrose and this shaft will be used as a pumping shaft to raise the water from the different properties owned by the Western M. Co. in the downtown section.

Two new furnaces are in course of construction at the Arkansas Valley plant, and when completed will give the plant eleven blast furnaces, which will help the condition at Leadville. It is understood that the smelting trust will enlarge the Eilers plant at Pueblo at the beginning of the year and bring it up to date. The Philadelphia plant will not be put into commission, as it would cost too much to remodel it. If the Eilers is enlarged it will be of great benefit to Leadville, as a heavier tonnage monthly will be the result.

Dolores County.

Preparations for sinking the Atlantic Cable shaft at Rico have been completed. The tank has been put at the 102-foot level to catch all surface water, and the shaft has been protected by connecting the various drifts in the 60-foot level with the watercourse which passes through the mine at that level. The building around the gallows frame has been enlarged.——Jumbo No. 3 vein, of the Enterprise group of the United Rico Mines Co., is making regular shipments of high-grade ore to the Durango smelter.

Gilpin County.

The Perigo mill in Gambell gulch, near Central City, has been running on ore taken from the Perigo mine by leasers.

Ouray County.

The forty-ounce gold ore recently struck on the Hultana, near Ouray, gives promise of continuing. The property is being worked by J. H. Henler under bond and lease.——A company is being organized to equip and work the Sutton group on Mount Hayden, near Ouray.

Work in the crosscut tunnel at the Bankers' National mine, near Ouray, has stopped, the breast being 2200 feet from the mouth of the tunnel and the Modoc and Babcock veins having been cut. J. R. McNeill is superintendent.——Ore has been struck in the Midnight, one of the Mineral Farm group, near Ouray, and owned by W. J. Lucas of St. Louis. The ore was struck in the shaft, which is 70 feet deep and was sunk at the breast of the 240-foot tunnel. B. H. Dupraw is superintendent.

Routt County.

In the the spring a dredger will be started at Hahn's peak, the first in the eastern end of the county. C. R. Hutchinson and Samuel Stevens of Cripple Creek, who have been developing a property near Hahn's peak, have a ten-year lease from Michael Condelin and Charles E. Blackburn on 425 acres of placer ground on Beaver creek, near Bugtown, and intend to put in a steam dredger with a capacity of 1000 yards a day.

San Juan County.

The Kendrick-Gelder smelter, north of Silverton, will be blown in the first of the new year, after an idleness of three years. Owing to the shut down, many of the smaller producers of the camp have been unable to operate because of the excessive freight rates on getting their mineral to the outside smelters for treatment. The smelter has been leased to a company headed by William Buecher of Denver and the work of overhauling the plant and getting things into shape for blowing in has been commenced. Manager Buecher is personally conducting operations. It is stated that the copper matte furnaces of the smelter will be changed into lead furnaces and that roasters will be built for the treatment of sulphide ores. Contracts are being closed with various mine managers to supply the plant with ore. The plant will be run independent of the smelter trust.

J. H. Terry & Sons, owners and operators of the Sunnyside mines, near Eureka, have started a tunnel which will be nearly a mile in length, to tap the Sunnyside at a depth 1000 feet below the present workings. The bore starts into Eureka mountain midway between the Sunnyside mill and the mine. It will probably take two years to complete the work.

The experimental 25-ton plant for the treatment of the iron-copper product of the Silver Wing mine, which has been under construction at the Silver Wing mill, near Animas Forks district, for the past two months, has been put into operation, and the results are said to be satisfactory. The method of treatment is known as the Waterbury leaching process, and consists of first roasting the ores, where sulphur is contained; second, by leaching with sulphuric acid, and third, the precipitation with sheet steel. The first run of the new plant was 10 tons of 7% copper ore, which was reduced to 95% pure copper in the operation.

San Miguel County.

Near Ophir the mines are receiving their customary winter development, and a few are making regular shipments of ore to the smelters.——G. B. Pickett, manager of the Carbonero group, near Ophir, is shipping one and two carloads a week to the smelter at Salida.——According to James Real, who has charge of the Suffolk-Globe group, near Ophir, owned by the Suffolk-Globe M. & M. Co., leasers are developing and blocking out ore in that property. The Suffolk 40-stamp mill will be started soon on ore coming down over the wire rope tramway.——Work on the Badger tunnel, which is in 2400 feet, is being continued with machine drills to cut the numerous veins traversing the Suffolk-Globe group at depths varying from 1000 to 2500 feet. It is hoped to cut the Golden Crown vein by driving 400 feet further.——The Telluride Gold Mines Co., through R. H. Wilson of Telluride, has let a contract for driving the crosscut tunnel on the Nellie Bly group 700 feet, when it is expected to cut one of the principal veins. This property is on Silver mountain, between the Suffolk-Globe group on the Ophir side and the Gold King mine on the Telluride slope.

Another rich strike is reported to have been made in King and Lindsey's lease on a portion of the Sheridan mine, on ths same vein and adjoining the Smuggler-Union on the north. They are making preparations to begin sinking the Mendota shaft, which is down a distance of 360 feet, 300 feet deeper. After the workings in the Sheridan are connected with the shaft, the product can then be handled and delivered to the surface for transportation over the tramway to the mill without any hoisting. The output of King and Lindsey's lease is supplying thirty stamps of the Smuggler-Union mills with ore. These mills, located at the head of the valley, 2 miles above Telluride, are treating from 400 to 450 tons daily. Robeson and Carter's lease on the Smuggler-Union is keeping sixty stamps pounding, and Wager Bros.' lease on the Smuggler and Sheridan dumps and the Seventy-Six claim on the Smuggler vein is providing thirty more with mineral. The ore incidentally encountered by the Goldfield-Rex M. Co. while prosecuting development, under its lease and contract, on the Smuggler vein 2300 feet vertically under the surface, supplies ten more stamps, and in a few days additional batteries will be started to dropping on the product of the Pandora Gold M. M. & D. Co., which is leasing the Pandora vein. The electric hoist which was recently put underground in the Union shaft, in place of the old steam plant, has been put in operation.

Summit County.

(Special Correspondence).—The Old Union M. & M. Co. concentrate returns show from 38% to 40% zinc and 30% to 40% lead. The steam-heating system in the mill has allowed running the plant in the coldest weather. The management is preparing to put in additional jigs. The main tunnel of the Old Union vein is in 1300 feet.——The first payment has been made by the Carrie M. & M. Co. of Breckenridge on the Carrie mine, on Wise mountain, near Breckenridge, to Westfall & Condon.——The Washington-Joliet M. & M. Co. are getting their water works into shape to resume milling.——The Wellington mine, near Breckenridge, operated by the Colorado & Wyoming Development Co., continues its shipments of high-grade lead and zinc ores.——The Masontown M. & M. Co. of Frisco is arranging to sink the main shaft to strike the main ledge of the mine in the sulphide zone. A hoist and pumping plant will be put in.——The main tunnel of the Square Deal M. & D. Co. is in 150 feet.——The North American Mines Co.'s main tunnel into the base of Peak 1 is in 520 feet.——The Mary Verne M. Co.'s main tunnel near Frisco is in 465 feet.——The King Solomon Tunnel & Development Co. has men drifting on the last ledge of ore cut through by the main tunnel.

Breckenridge, Dec. 18.

Teller County.

William Seallars and B. M. Morrell, lessees on the Geneva claim of Gold hill, Cripple Creek, have struck good ore at a depth of 150 feet. Sinking an additional 100 feet has been started.——Becker & Travell, who recently took charge of the Homestake mill, on Ironclad hill, Cripple Creek, expect to again have the plant running soon.——Superintendent D. J. Burt of the Henry Adney mine of Beacon hill gulch, near Cripple Creek, is making big shipments of high-grade ore from the 400-foot level.——A lease on the Agnes property, on the east slope and near the northern extremity of Beacon hill, has been obtained by Brown and associates. The lessees begin work in the north shaft, which has a depth of 200 feet. They propose to add another lift of 50 feet.——The granting of a lease to Sheehan, Day & Co. on the Bonanza Queen No. 2 causes the Jerry Johnson G. M. Co. to have all of its forty-one acres of ground under lease. The tract controlled by the company is 3500 feet long and about 850 feet wide, and beginning with the Jerry Johnson No. 2 and extending in the course of the exposed ore body to the Stratton estate at the base of Globe hill. The leases are for three years, with average royalties of 25%.——B. Shell, S. D. Crump and C. E. Harrison are crosscutting at a depth of 100 feet each from the shaft to cut a vein on the Little Joe claim of the Alert Co., on Ironclad hill. The prospects are very flattering for these lessees to get some good ore. They are located near by the W. P. H., Jerry Johnson and other well known producers.——The Hummer M. Co. of Loveland, operating on the Humboldt claim, on the north slope of Bull hill, is employing two shifts. A crosscut is being driven west.——The Ironclad Leasing Co., operating a lease on the Finn lode of the Royal Oak Co., on Ironclad hill, has made its initial shipment from the recent strike made at a depth of 200 feet. The drift has been driven west for 75 feet.——Another cyanide mill is to be built by the Exposition Mines & Leasing Co. on the site of the plant destroyed by fire several weeks ago. W. S. Walker is manager. The destroyed plant stood on the Los Angeles property of the Stratton estate, at the southwest extremity of Bull hill. It had been in operation but a few months when destroyed, along with the engine house and other buildings erected by the lessee. A new engine house is also to be built. The new plant will probably have a maximum capacity of 200 tons.

IDAHO.

Boise County.

The Black Pearl mill at Pearl has been in position for a month, most of which time has been devoted to adjusting the machinery. A loss of 2% of the values is reported in the tailings. The cyanide process is proving as successful as was hoped for. The main crosscut on the 400-foot level in the mine has not yet reached the large vein, but ore to supply the mill is being produced from the ledge already opened.——The Lincoln mill at Pearl has been in operation since the first of October, and during this time has demonstrated fully that the cyanide treatment is the best and most economical method of handling Pearl ores.——The Osborne at Pearl is preparing to put in a concentrating and cyanide mill of the same type as is in operation at the Black Pearl and Lincoln mines.

Idaho County.

The Syndicate M. M. & S. Co. has been formed, with R. H. Hillen of Weiser as president and James Potter as superintendent. The company will work the Syndicate group in the Mountain View district, 90 miles north of Weiser, on the western slope of Seven Devils range, and 1 mile from Snake river, on Three creeks.

Shoshone County.

R. H. Pascoe, superintendent of the Federal M. & S. Co.'s mines at Mace, has finished part of the shaft repairs. The shaft in the Mace mines is down 2300 feet vertical. This shaft had gradually become twisted and drawn so that portions of the wall plates had to be cut away to allow the cages to pass through. In 1904 the problem the management had to solve was the retimbering of 200 feet above the 400 station, and at the same time maintain the regular daily output. This task was accomplished without closing the mine for a single shift. A double-lined shaft was constructed, with an outer and inner lining. The inner opening, through which the cages are operated, has an open space all around it, and is braced with heavy timbers against the outer wall. Access to this space can be had at any time to repair or replace the braces. In case of movement these can be shortened on one side, thus relieving the shaft from any side pressure. This mine works nearly 400 men, and produces an average of 15,000 tons of ore daily. This season Mr. Pascoe is retimbering another part of the shaft between the 800 and the 600 levels. He is employing the same tactics he used in the work done last year, except he is enlarging the compartments 8 inches to give the cage more free space.

The Cœur d'Alene L. & S. M. Co. has been formed by J. M. Porter and Walter J. Nicholls, both of Spokane, Wash., to acquire ownership of the Kate, Helen, Hannah and Mary lode claims, in the Hunter mining district.

Nine Mile creek joins the South Fork of the Cœur d'Alene river at Wallace. There are on the creek three large concentrators. The nearest to Wallace is that of the Pittsburg Lead Mining Co. The next belongs to the Rex Co., the old Sixteen-to-One mine, and the third is that of the Success Co., the Granite mine. The Pittsburg Lead Mining Co., which owns the California and Black Cloud mines, also owns the Panhandle group, to the east, and a group of fourteen claims located during the past summer, to the west. At the California-Black Cloud group, eighty men are employed in the mine and mill. Two hundred tons of ore are produced daily and 600 tons of concentrates are shipped monthly to the smelter. The mill has recently been rebuilt, is operated by electric and water power, and has been connected with the Nine Mile branch of the Northern Pacific Railroad by a short spur. H. F. Samuels of Wallace organized the company working the Success. The ore carries more zinc than lead, and the Success mill now saves both the zinc and the lead.——The Rex is being worked under lease and contract by Theodore Anderson. The mill is not in operation. Among mines in this district being developed are the Tamarack & Chesapeake, the Custer, the Ruth, the Treasure Vault, the Shoshone and the mines of the Idaho-Los Angeles Co.

The Snow Storm mine, near Mullan, has been producing copper for eighteen months. The average value of the ore shipped has been 5% copper, seven ounces silver and $2 to $3 in gold. All of the ore shipped from the Snow Storm mine has so far come from the No. 2 tunnel. This level, with the ore bodies above it, is under lease to J. H. Howard & Co., who have developed and equipped it. The lower workings of the mine are being driven by the company, there being no lease on this portion of their ground. The No. 3 tunnel cut the ledge at a depth of 1072 feet and is being connected with the No. 2 level by an upraise, about half completed, the distance between the two levels being over 600 feet. The No. 4 level, which will open the ledge at a depth of 1700 feet below the apex of the ore body, has been begun and is now in several hundred feet. It will be over 3100 feet long. The leasers have equipped the mine with a tramway from the No. 2 tunnel to the Northern Pacific Railway siding of Larson, where their ore bins are located and where they have also put up a leaching plant, which is now making its preliminary trials. The company is arranging for the purchase of an air compressor.

Washington County.

The Iron Springs M. Co. has thirty men employed and will use that force the entire winter. Its new mill has been completed.——The Gold Coin Co., operating at Black Lakes, is well in with its 600-foot tunnel.

MONTANA.

Fergus County.

The Argus estimates that the metal production of Fergus county for 1905 will be $1,300,000, this including the gold from the two cyanide camps representing the Kendall, Barnes-King and Gold Reef Cos. In addition to this, a number of shipments to the Helena smelter were made by the Globe & Maginnis and War Eagle, at Maiden.——The Kendall shaft has been sunk nearly 700 feet, under the direction of H. H. Lang of Kendall. Drifting is to be started from the 700-foot level.——Ore has been proven in the Moccasin Mountain mine near Kendall by means of diamond drills, and the mine is to be opened up under the direction of W. G. Moore.——There are 85 men at work at the Gold Reef mine at Gilt Edge, under the management of H. M. Rae.

Granite County.

The Hope hoist, near Phillipsburg, has been started up and work resumed in the Hope shaft, which was abandoned several years ago on account of water. Since then the water has practically disappeared, there being scarcely 8 feet in the bottom of the shaft. When it was decided to abandon work, the water rose so rapidly that it flooded the pump and station before the machinery could be hoisted to the surface. A. J. Jose and J. P. Beaupre, former hoisting engineers at Granite, are in charge of the hoist. The company is experimenting with ore from the upper level in the shaft. It is base, but carries fair values, including some copper. It is stated that the company will make further tests with concentration and for this purpose the west end of the Hope mill is being reconstructed.——The Tussle M. Co., operating the Wahlgren property at the head of Little Gold creek, near Royal, is shipping regularly three cars of ore per week.——C. M. Schmille of Royal is running a tunnel on the Mollie Gibson claim.

Silver Bow County.

(Special Correspondence).—The fear that the copper deposits in the Butte district are growing poorer with depth, and that they might in time become exhausted entirely, has been dispelled by a strike made in the Anaconda mine at a depth of 2200 feet. For many months the company was running a crosscut to the vein at that depth, and recently cut into the ore body. The total width at that point has not yet been demonstrated, but it is believed to be between 30 and 50 feet wide. Much of the ore runs 15% in copper, and the whole vein characteristics are identical with those on the upper levels of the mine. The shaft of the Anaconda mine has reached a depth of 2440 feet, and the company will now run another crosscut from the 2400-foot level and open the vein at that depth.——The East Butte Mining Co., which has under option a number of small mines in the southeastern portion of the city, has secured 122 acres of ground additional, making between 300 and 400 acres in all now under option. The mines, which are being worked by leasers at present, are shipping about 150 tons of ore a day.——The Washoe smelter, operated by the Anaconda Co., produced monthly during 1905 copper to the value of $2,780,000; gold to the value of $95,000, and $432,000 worth of silver. Daily the smelter has received from the Butte mines 8000 tons of ore, and daily consumed 600 tons of coal, 400 tons of coke, 1600 tons of limerock, 190 tons of flue dust, and produced an average of 500,000 pounds of copper per day.——The North Butte M. Co. has completed the work of reconstructing its main shaft, and has begun hoisting ore through it again, but using the old machinery. The new hoist, which was promised for delivery on the 1st of December, has not yet arrived in Butte. For four months the North Butte hoisted its ore through the shaft of the High Ore mine, an Anaconda property, paying $10,000 a month for the privilege. That sum will now be saved. The output of ore has been increased from 550 tons a day to 900 tons, and when the new hoisting plant is installed the output will be raised to 1200 tons.

Butte, Dec. 18.

Zinc ore is being shipped by the Montana Zinc Co., which is operating the Alice mine under a lease. The ores treated thus far by the company are from the Lexington mine, but the plant will soon be in shape to run to its full capacity of 150 tons daily, and will be ready to treat the ores from other Butte mines. This is the only plant in the State treating zinc ores. Other experiments have been tried in the State, but this is the first to meet with satisfactory results on a large scale. The process is one of concentration and reduction, and the ores under treatment have shown values of 18% to 20% in zinc, running from $4 to $5 per ton. The plant has been operated on an experimental scale ever since its installation last August, and is now running about 80 to 100 tons of ore daily. The pay roll of the company at present numbers about forty-five men, and this number will be increased when the mill is run to its full capacity. C. B. Wisner is president of the company and B. T. Spaulding is general manager.

Teton County.

The Spokane Petroleum Co. intends to start drilling near Lubec siding, on the Great Northern Railroad. No oil has been found beyond seepages from the shales, but it is hoped to strike oil at a depth of 800 feet. W. C. Howell is superintendent. Three oil rigs are drilling at Swift Current and one at Lubec.

NEVADA.

Esmeralda County.

The Silver Peak G. M. Co., owned by the Blair estate, has entered a $160,000 damage suit against the Mohawk-Alpine M. Co., which is charged with having entered upon a ledge having its apex within the Silver Peak's Western Soldier claim, and taken out valuable ore. An injunction preventing the Mohawk-Alpine Co. from further operation on the ledge is being asked.

Work has been started on the Ridge lease on the Daisy No. 1 at Diamondfield, under the direction of W. Goepp.——Sinking has been resumed in the Portland shaft at Goldfield, and will be continued from the 250 to the 500-foot level.——A 25 H. P. hoist is to be put in at the Keystone mine at Goldfield, and the shaft will be sunk to a depth of 200 feet.

The Bullfrog district is 75 miles from Goldfield and 125 miles from Las Vegas, and freight rates are high. It costs $35 per ton to ship and smelt the ores of the district, and the mine owners feel that it is best to hold their ore and treat it on the ground. All the big companies are planning for mills as soon as the railroad gets there, and Humboldt Gates, president of the Bullfrog Townsite, Water & Ice Co., expects to put in a custom mill soon. There are three towns in the district—Bullfrog, Rhyolite and Beatty. At Beatty the Montgomery-Shoshone has been opened to a depth of 150 feet and has shipped ore worth $76,000, and has blocked out much high-grade ore. A 500-ton mill is to be built at Beatty. E. A. Montgomery is president and manager, and M. Hoveck is superintendent.——The shaft of the Shoshone-Bullfrog is down nearly 100 feet and crosscutting is to be started. A gasoline hoist is to be put in and the shaft sunk to a depth of 250 feet. It adjoins the Montgomery-Shoshone. T. F. Bonneau is president.

The Florence mine at Goldfield has been opened up to a depth of 350 feet, sulphide ore being struck at 130 feet. A 40 H. P. electric hoist, an electric blower and pump have been put in. The pumps have been handling 4000 gallons daily. A mill is being put up to treat ore from all the claims of the Florence group. In two years this mine is said to have produced $1,850,000, of which $1,500,000 was paid to leasers. F. Oliver is superintendent.——The Combination is credited with having produced $1,800,000. Work was commenced on the shaft in October, 1903.

Lincoln County.

Johnson & Morton, owners of the Last Chance claims, northwest of Moapa, have sold the property to McBride, Long & Wilberforce of Philadelphia. The purchasers intend making shipments of the ore already extracted, four carloads. They expect to put in a 40-stamp mill within 3 miles of their claims for the treatment of the ore blocked out.——Morris & Denny, owners of the Green Light claims, west of Caliente, have struck ore showing good values in silver and gold at 60 feet depth.

The Panaca mine, 16 miles north of Caliente, has been sold to Idaho people. McLain & Zimmermann, owners of the Windsor mines, southwest from Caliente, have sacked fifty tons of gold ore showing values of from $4 to $123 per ton, taken from a 3-foot ledge, on which they are drifting.

Nye County.

The Tonopah M. Co. is working through shafts on the Mizpah, Silver Top, Desert Queen and Red Plume claims, the principal work being done at the Mizpah. This shaft is 850 feet deep, the Desert Queen 1100 feet, the Silver Top 750 feet and the Red Plume is a new shaft 450 feet deep. The ore bodies are the largest in the camp, ranging from a few feet to 30 feet wide, the values going from $40 in milling ore to several hundred dollars in the shipping ores. F. A. Keith is manager of the company and B. W. Turner is superintendent. The company is putting up a 100-ton mill at Millers, 14 miles northwest of Tonopah. An electric power plant has been built at Millers to furnish power for the mill and the mines at Tonopah, where electric hoists are being put in. The company built the Tonopah Railroad, 60 miles from Tonopah to Sodaville, to connect with the Virginia & Truckee road. It has been changed to a standard gauge and connects with the Southern Pacific at Mina and has been extended to Goldfield, 30 miles south.——The Montana-Tonopah has been opened up by five levels, the deepest being at 765 feet, and over 14,000 feet of development work has been done. Much ore has been shipped and there are 12,000 tons of milling ore on the dump. A steel head frame and an electric hoist, good for 1500 feet, is to be put in. A mill is to be built in accordance with results of experiments being made on the sulphide ores. J. A. Kirby of Salt Lake City, Utah, is manager.——The Tonopah-Belmont is being worked through the Desert Queen shaft and is shipping 100 tons of high-grade ore weekly. The Jim Butler is being developed by the same company, but is not shipping. Milling ore is being piled up.——The McNamara is being prospected for the extension of the Tonopah ledge.——The Ohio-Tonopah is being opened up from four levels from an 800-foot shaft.

The Deseret News estimates the value of the Tonopah ore output during the past five years as $13,000,559, crediting the Tonopah of Nevada with $10,120,767, of which $3,000,000 was shipped by leasers, $863,927 was worked by leasers at the mill, $5,691,940 was shipped by company since expiration of leases, and $564,900 is milling ore on the dump. Similarly shipments and milling ore on the dumps credit Montana-Tonopah with $1,113,542, Tonopah-Extension with $926,700, Tonopah-Midway with $364,000, Belmont with $296,800, Jim Butler with $63,000, North Star with $64,250 and West End with $51,500.

White Pine County.

Ore carrying high values in silver, lead, zinc and gold has been struck by the National M. Co. of Cherry Creek in a winze sunk from the crosscut tunnel.

NEW MEXICO.

Sierra County.

At Shandon the Shandon M. Co.'s pumping plant is pumping 250 gallons of water per minute. They have a 7-inch pipe sunk down 60 feet, which taps the underflow of the Rio Grande river, and pump with a centrifugal pump into a cement tank and goes into the big pump, which pumps up the hill 2 miles into a large earth tank which stands 150 feet higher than the placer ground. This gives them a good pressure for their hydraulic plant. By pumping twenty-four hours they can have 750 gallons per minute for eight hours a day. The ground is rich and the company contemplate enlarging their plant. It takes about seven cords of wood per day to run the engine. J. H. Parker of El Paso is the general manager.——The Union-Esperanza Co. have a large pumping plant at the mouth of Apache canyon, near Shandon, using five pumps and pumping into an 8-inch pipe 2 miles in length, raising the water 400 feet. They have commenced to wash gold in the Union gulch, but they have not yet sufficient water to pump twenty-four hours. They are developing more water and will build a tank overlooking the Union-Esperanza ground.

OREGON.

Baker County.

Ten stamps have been running steadily in the new Tabor Fraction mill at Bourne. An additional extraction of 25% is expected with the cyanide plant to be put in. The Tabor Co. intends to spend $10,000 in extending the stamp mill early in January. The stamp battery is to be doubled and a cyanide section added. The ore for milling is being taken through the E. & E. tunnel under lease, which taps the Tabor vein at 300 feet. A tunnel has also been leased from the owners of the Victoria Co., and this is being extended to tap the Tabor vein at 700 feet.

Josephine County.

An additional 10-drill compressor, pump and electric transformers at the Granite Hill mine, near Grants Pass, are being placed by Superintendent Wickersham. Work is being done on the 500-foot level. The twenty stamps of the mill are operated continually, and sixty men are employed.

Lane County.

W. B. Dennis, owner of the Blackbutte quicksilver mine, 15 miles southwest of Cottage Grove, says that a number of important improvements have been commenced or are contemplated at the mines. Men have begun clearing ground for the new furnaces, which are Mr. Dennis' own invention and which will be put in next summer. A new surface tramway will be built from the 900-foot level of the workings to the reduction works, the present aerial tramway being of insufficient capacity to handle all the ore desired. The new tram will haul between 250 and 500 tons of ore a day. An extension of the flume for the hydro-electric plant will be 3500 feet long.

UTAH.

In some approximate summaries, the Deseret News estimates Utah's metal output of 1905 as follows:

Gold, 347,353 ounces at $20.67 per ounce	$ 7,180,786 51
Silver, 14,412,928 ounces at 59 76 cents per ounce	8,613,165 77
Copper, 57,267,706 pounds at 15.341 cents per pound	8,785,558 78
Lead, 96,661,605 pounds at $4 551 per 100 pounds	4,399,069 65
Zinc, 13,476,129 pounds at 5 828 cents per pound	784,984 52
Quicksilver, 1000 flasks at $45 per flask	45,000 00
Totals	$29,808,565 23

Juab County.

The Lower Mammoth at Eureka has contracted with the Murray smelters for the reduction of the ore bodies opened up on the 1400 and 1500-foot levels and below the latter level. A crosscut is being driven east on the 1500-foot level, at the bottom of the winze which was sunk from the 1200-foot level.

Salt Lake County.

The foundations for the American Smelting & Refining Co.'s new smelter at Garfield will be completed in two months. The excavations made necessary for the big plant have been almost finished. This work extends over several acres. The construction company is using eight locomotives, 125 teams and three steam shovels, and 350 men in addition to the 350 regularly employed by the American Smelting & Refining Co. and by the sub-contractors. The site of the smelter, on the narrow strip of land between the Oquirrh mountains and Salt lake, has made necessary a great deal of filling in, which is being taken from the grade of the new Western Pacific Railroad, as well as that taken from the west and southern portions of the smelter is being utilized. The company has not yet solved the water problem. Two boring outfits are at work, one near the lake and the other at a considerable elevation. No water fit for use has yet been struck and all drinking water is now shipped from Salt Lake City. The company is looking for a daily supply of 2000 gallons per minute. Common labor is paid for at the rate of from $2 to $2.50 per day of eight hours. Aside from the three office buildings now under construction, there will be nine big buildings. Of this number, the Minneapolis Steel & Machinery Co. has undertaken the construction of seven. The blacksmith shop, practically completed, occupies space 45x75 feet and is constructed of steel and brick; the machine shop, to be equipped with every modern device, is nearing completion. The dimensions of this building are 80x195 feet. The power plant will cover 130x256 feet and is to contain all of the steam and electrical power equipment; the building that is to contain the McDougall roasters will cover ground space of 60x222 feet; there will be two sampling mills, each of 70x82 feet dimensions, while the main building of the lot, to contain the reverberatory, blast furnace, converter and bullion departments, will rest on concrete foundations within the area of 360x305 feet. The carpenter shop, a wooden structure, is completed and in use. The building is 30 feet wide by 80 feet in length; the storehouse of the company is also finished and is 44 feet wide by 110 feet in length. In the construction of the foregoing buildings, 4000 tons of steel structural material will be used. The stack, which is to stand at an elevation above its base of 300 feet, is to be connected by a system of flues 2000 feet in length, to which will be attached bins for the collection of the dust. The inside measurement of the stack at the base is 30 feet, tapering gradually toward the top.

The New England Gold & Copper Co. intend to keep their mill at Bingham running throughout the winter.

The Deseret News describes Bingham as a camp of tunnels. In the Utah Consolidated mine six tunnels are in operation. Its No. 7 tunnel is the lowest one, and is the main avenue through which the ores are taken from the mountain. All the tunnels are connected and ore mined in the upper one is dropped through chutes to the main tunnel level to be moved to the surface. A winze has been sunk 200 feet below the No. 7 level to what is known as the No. 9 level, and late developments to this portion of the mine have added to the ore reserves. The distance between the upper and lower levels is 650 feet; the lowest tunnel (No. 7) is 2500 feet in length, while the others range from 1000 to 2100 feet. The total underground workings is estimated to be 12 miles. In the mine have been opened six distinct ore bodies, each independent from the other. The largest of these is 340 feet in length, 220 feet at its greatest width, and has been followed vertically over 400 feet. The top-slice caving system, common in the Lake Superior regions, is used in the operation of the mine, as well as the system of square set rooms and filling. The contract system in the employment of miners has proven satisfactory both to the company and its employes. The ores, on being mined, are carried to lower Bingham over an aerial tramway to the ore bins located there for loading onto cars of the Rio Grande Western railroad, whence the product is moved to the smelter, 17 miles away, for treatment. In July this year a smaller tramway was constructed and placed in operation. It was built across South Carr Fork canyon, connecting with a station on the Copper Belt railroad, and was put in for the purpose of facilitating the handling of lumber and supplies. This has proved to be decided convenience, and has done away with the uncertain service of teamsters.

The Parvenue, or deep tunnel, of the Utah Apex is being run and is to become the main exit for all ore extracted and will tap the ore bodies from 1000 to 1500 feet vertical depth. The adit is now in 700 feet, and it is figured it will be necessary to go 800 feet more to catch the first vein, when it will be continued on to other known ore bodies in the property, all of which can be cut by the same tunnel within a distance of 4000 feet. W. C. Orem is manager.——The 1800-foot Phœnix tunnel is in 500 feet. H. A. Gebhart is superintendent.——A 75-ton mill is to be put in to treat ore recently opened in the Silver Shield of Bingham. H. S. Joseph is manager.——The Ohio Copper Co.'s mill is handling 200 tons of ore daily. On the 400-foot level a crosscut has been run south for 450 feet, cutting the mineralized porphyry zone on which the Utah Copper has worked. This crosscut is still being extended, and is approaching the What Cheer vein. Werner Ziegler is superintendent.

——The 5-stamp test mill of the Boston Con. M. Co., at the mouth of the Tech tunnel at Bingham, is expected to be finished and in operation by the first of the year. It is hoped to finish the experiments by April, when a large mill will be built near Garfield, with an initial capacity of 5000 tons.

Work has been started on the first 3000-ton unit of the Garfield plant of the Utah Copper Co., 4 miles from the new Garfield smelter. It is planned to eventually build three more units of the same size, and which are to be supplied with ore from the company's mine in Bingham. The concentrator building will be 300x508 feet and is to contain the coarse and fine ore crushing departments, ore bin and table sections; the machine shop building is to be of steel frame, with the sides and ends lined up with brick and is to be 50x150 feet, while the warehouse is to be constructed entirely of steel and is to cover ground space of 50x105 feet. This unit is to be ready for operation not later than October 1, 1906, and the second unit will probably be ready to go into commission six months later. During the past year the company's mill now in operation at the mouth of Bingham canyon has been working on an average of 20,000 tons per month. Within the next year the Utah Copper Co. will have facilities for the treatment of 7000 tons of ore from its mine at Bingham and which will be transported direct from the mine over the tracks of the Rio Grande Western Railway. The Utah copper ores concentrate eighteen to twenty-four tons into one. Arrangements are being made to open the mine up by steam shovels, and opencut methods. The first big shovel to be employed in this great work is contracted for delivery before February 1. D. C. Jackling is the manager, Frank Janney is mill superintendent and G. O. Bradley chief engineer in charge of the mill construction.

Sevier County.

The B. W. & H. mine, near Richfield, shipped another carload of ore recently. This was taken from the winze in No. 2 tunnel. The vein has begun dipping to the south and east, instead of to the west, as was expected. An effort will again be made to tap this lead through the No. 3 tunnel.——H. W. Ramlose, president of the Lone Tree M. Co., is equipping the property at Gold Mountain for work during the winter.

Tooele County.

The Honerine drain tunnel at Stockton is in nearly 9000 feet.——Superintendent T. W. Galigher of the New Stockton mine, at Stockton, reports that the recently discovered shoots in the mine are showing up well. The shaft is being put in shape for more extensive development. An air compressor capable of operating eight drills is being put in. The new head gear on the shaft, which is 50 feet in the clear, will be completed within a month, and the new hoist will be ready for operation about the same time. The shaft is now down 850 feet, and the work of sinking it to a depth of 1000 feet will begin as soon as the new hoist can be operated.——Improvements during the past year at the Con. Mercur, at Mercur, include a new sampling mill and foundry. The Golden Gate shaft has been retimbered; the electric hoist was repaired at an expense of $2000 and the roof of the main building has been covered with corrugated iron. The mill handles from 600 to 800 tons of ore per day. The Manning mill was operated on ore from the old tailings dump during the summer. During the last fiscal year the Con. Mercur's Golden Gate mill produced $728,703.86 in gold. The ore values ran $3.95, while the extraction averaged $2.97 to the ton. The tailings averaged 98 cents. The company is employing 400 men at its mines and mills.

WASHINGTON.

Okanogan County.

(Special Correspondence).—The Grand View M. Co. has completed its 20-stamp mill, including the four Wilfley concentrating tables, but is awaiting the completion of a double-system aerial tramway and storage bins. The towers and upper terminal are up, ore bins have been built at the mine and timbers are being framed for the lower terminal and storage bins. Foundations have been made for the latter by cutting into the hillside at the rear of the mill, with faces respectively 30 and 40 feet deep. The cables and nearly all of the equipment have been delivered, after several weeks of delay along the railroads. The delays in transportation and sending some of the plans from Ohio have set back the completion of the tramway. The equipment has to be packed up a steep trail to the top of an elevation, about 1800 feet vertically higher than the mill. From the rail tower to the lower terminal will be a span of 3300 feet. A power house on Cecile creek, 6 miles from the mill, has been equipped for the generation and transmission of power and light and a pole line between the power house and the mill has been completed. The tramway, 1 mile long, will be used for carrying ore from No. 3 tunnel to the ore bins at the mill and also to deliver supplies from the mill to the mine. By the time that all of the construction is completed, the total expenditure by the company for mining, construction and equipment, also including ½ mile of a flume on Cecile creek, will exceed $100,000. The company owns twenty claims on one of the foothills of Mount Chapaca, 4 miles northwest of Loomis. The mill is near the north end of Palmer lake and is also 4 miles from the town. The gold occurs in iron sulphides distributed through the quartz gangue. No. 3 tunnel is in over 400 feet. It strikes the vein at 150 feet from the portal, where a crosscut has shown the vein to be 11 feet wide. This tunnel and lateral drifts and crosscuts will be continued.——The new Pinnacle tunnel is in 50 feet through slide rock and ten sets of timber are in place. It is intended to be driven 1500 feet to intersect several quartz veins. It will strike the principal one 700 feet below the apex.——The south crosscut of the Copper World Extension on the 200-foot level, in over 100 feet, has passed through several feet of hard and tough ground.——The Palmer Mountain Tunnel & Power Co. has received the first installment of machinery at the power house. The pole line is nearly finished.—— The Six Eagles M. Co. at its annual meeting at Nighthawk elected the following trustees for the ensuing year: C. A. Andrus of Seattle, M. Harman of Nighthawk, F. M. Dallum of Loomis, A. B. Lee of Wooster, Ohio, and J. A. Homer of Lodi, Ohio. Mr. Andrus is general manager. A new shaft will be sunk on the vein at the north end of the company's claims, to be connected later on with the tunnel, which is in 1800 feet. The original shaft on the Six Eagles group was sunk 225 feet on the vein. A shoot of ore was struck at the bottom and followed by a northerly drift.——The Mineral Hill M. Co. has U. S. patents for the Washington, Idaho, California, Oregon, Florida, New Jersey and Virginia mining claims and the New York millsite, in Salmon River mining district.——At the Douglas Mountain group good results have been obtained from shaft work and tunneling. The company is planning to put in power drills, work in the meantime being suspended. ——The Second Prize group, comprising the Columbus, Second Prize, Lorraine, North Star, Copper Dyke, Good Hope, United Verde and United Verde Nos. 2 and 3 claims, adjoining the Copper World and Copper World Extension mines on the north, is showing up well. A shaft was sunk on the Columbus and another on the Second Prize, both on the vein. The latter is down 190 feet, showing the vein dipping 60°. A tunnel follows the vein 70 feet at a depth of 50 feet. A crosscut lower down the hill has cut the vein where it is 12 feet wide. A drift will be driven from the point of intersection and an upraise made to connect with the bottom of the shaft, where the best ore was found. A discovery shaft has been sunk on the Lorraine claim and some quartz on the dump is mineralized with galena and chalcopyrite. On the southeast side of the ridge a hole 6 feet deep has been sunk in the cropping on heavy pyritic ore, which shows some copper. This will be intersected about 100 feet deep by a tunnel which has already been driven 128 feet. An easterly drift runs 43 feet on a stringer of ore which is rich in gold, copper, silver and lead, that may be assorted to good advantage. The main tunnel will be driven ahead and the bigger vein will be developed during the winter. —— The Kimberly group of fourteen claims in Golden camp, on Palmer mountain, has been bonded to a syndicate, through J. J. Bennett of Loomis. Two of the claims carry an extension of 300 feet of the Triune main vein. Another vein of silver-lead-bearing ore, 12 feet in width, has been traced 3000 feet through the Buzzard and one other claim of the group.——The Butcher Boy group of claims, in the Myers creek district, is reported to have been bonded by J. L. Cresson and J. J. Ritchie to parties from Greenwood, B. C., and the development of the property will be undertaken without delay.

Republic, Dec. 18.

Snohomish County.

The concentrator at the Ethel mine, near Index, has been started.

WISCONSIN.

Iowa County.

The Drybone or Centerville diggings, between Montfort and Highland, which have been worked for lead and zinc in a small way since 1836, are now to be worked on a big scale by the Red Jacket Lead & Zinc Co.——The Delta Lead & Zinc M. Co., in the same district, has a shaft down 50 feet.——The Consolidated M. Co. is building a mill at Montfort.

WYOMING.

Albany County.

The trustees of the Strong Copper M. Co. have ordered a concentrator for the ores of the Strong mine, 14 miles east of Laramie, and a mill will be put up in the spring. I. W. Swigart is general manager. The ore occurs in a fissure vein in pegmatite and contact veins between granite and limestone.

FOREIGN.

AFRICA.

Cape Colony.

The report of the DeBeers Con. Mines, Ltd., Cape Colony, for the year ending June 30, 1905, shows that there has been realized from the diamonds produced during the year $23,341,822, and after deducting expenses of $14,276,294 there was left a net profit of $9,065,528. Dividends paid absorbed $8,748,000, leaving $317,528 to be added to the revenue from other sources, making the total amount carried forward $415,370. The highest value per carat of the five mines producing diamonds was from Dutoitspan, which reached $16.98, and the lowest, from the Bulfontein, $8.48. The stock of blue ground and lumps on the floors on June 30, 1905, amounted to 4,474,259 loads. The contract with the Diamond Syndicate is still on a satisfactory footing, and the market for diamonds remains buoyant. The company's dynamite factory at Somerset West has increased its output considerably, 175,281 cases having been produced during the year, and there is every indication that this will be enlarged materially. The capital expenditure of the factory was entered at $3,645,000; but the company has actually spent, including stores on hand of $1,370,520, the sum of $6,358,158 out of earnings in bringing the factory up to its present state of efficiency. The litigation between the company and the Income-Tax Commissioners in England in regard to the assessment of the company's profit for income-tax purposes will be appealed to the House of Lords for a final decision. The company has a share capital of $21,870,000, of which $9,720,000 represents 800,000 preferred shares, and $12,150,000, representing 100,000 deferred shares. In addition there are outstanding $10,540,465 5% first mortgage debentures; $8,450,787 4½% South African Exploration debentures, and $708,977 4½% Bulfontein obligations; total, $19,700,229. Consequently the company is liable for shares and bonds to the amount of $42,570,229.

Transvaal.

Consul Snodgrass of Pretoria reports that the Premier Diamond M. Co. of the Transvaal has ordered an oil concentrator plant under the Elmore system to be used in the treatment of their diamantiferous ground. This comtemplated installation is interesting as being the first application of the Elmore process for the recovery of precious dumps of waste of the Premier, near Pretoria. A portion of this waste material was carefully re-sorted three times with a view to eliminating all diamonds from it as far as this was possible by hand sorting; then to this specially sorted waste was added a number of known weighed diamonds. The Elmore process was then applied, with a view to determine its efficiency for recovering the added diamonds. Not only were the added diamonds recovered, but, in addition, several other stones were also found. These trials were repeated many times, and proved that 100% recovery of the values was easily obtainable in every case. In addition to the advantages of the total extraction of the diamonds, the trials have shown that no preliminary sizing of the material to be treated is required, which is a distinct advantage over existing methods. Clean water, which is required in large quantities by usual methods, is unnecessary with the Elmore process. The plant lends itself to the prevention of theft of stones during treatment, because all the diamonds are finally collected in a small centrifugal separator, which can be easily locked up, to be opened only by the manager in charge, who from time to time can remove the precious stones from the centrifugal machine without their being handled by anyone else.

AUSTRALIA.

New South Wales.

In the half yearly report, dated October 9, of the Broken Hill Junction North, the manager states that the magnetic plant, which in its initial stages was operating on crude ore with negative results, was subsequently put through an exhaustive series of trials for the retreatment of middlings from wet concentration. High metallic recoveries could not be obtained, and it was found that a marketable zinc product could not be made, as the small quantity of zinc contained in the ore did not exist in a sufficient state of purity to suit the process. The magnetic plant was finally shut down on September 2, and is being dismantled. It was then decided to depend solely upon wet concentrating methods, and the change over was made with very little delay.——At Broken Hill Block 14 the diamond drill is boring westward between two legs of lode at the 500-foot level, in the vicinity of the southern shaft. It has already reached 140 feet in schist and massive feldspar. This bore will probably explore the ground for 500 or 600 feet.——The Mining Journal states that considerable interest is being taken in the Mines Amendment Act, recently introduced by the State Minister for Mines, and numerous suggestions are being made for its improvement, especially in the way of reducing the rentals of gold mining leases. It is also urged that any person who re-pegs an abandoned quartz lease should be exempt from rent or labor conditions. It is probable that a provision similar to that contained in the Queensland Mining Act will be adopted, to the effect that every mill owner should, within seven days after the expiration of each month, supply the Mining Registrar with a declaration of the tons of stone put through his mill during the month previously, the number of ounces of gold, whether such gold was retorted or smelted, when weighed, the office it was from, etc.; also, that every mine manager should do likewise as regards his output, and the number of men employed for the month, so that outsiders could obtain the fullest and most reliable information to enable them to judge if the industry was worthy of investment. It is likewise proposed that all gold buyers should be licensed, and compelled to keep a record of their purchases, with a view to checking gold stealing among a certain class of miners.

CANADA.

BRITISH COLUMBIA.

Boundary District.

W. C. Thomas, superintendent of the Dominion C. Co.'s smelter at Boundary Falls, expects to blow in the second furnace by the first of the year. The first furnace has been doing satisfactory work. Approximately 350 tons of ore a day have been smelted, all ore coming from the company's Brooklyn, Stemwinder and Rawhide mines in Phœnix camp, and Sunset mine in Deadwood camp, the latter being a flux. Sixty men are employed at the smelter. Matte from the plant is converted into blister copper at the British Columbia C. Co.'s works in Greenwood. With the blowing in of the second furnace the output of the mines will be doubled. The company has 160 men on its payroll. The monthly payroll is $10,000.——Early this year it was expected Boundary mines' ore output in 1905 would pass the million ton mark, and the total is over 870,000 tons, with shipments running over 3000 tons daily. November's output was not quite as large as in October. Following are the figures in detail for November: Granby mines, 67,246 tons; Mother Lode, 14,524; Brooklyn–Stemwinder, 1830; Rawhide, 930; Sunset, 360; Emma, 380; Oro Denoro, 30; Providence, 100; Last Chance, 45; Skylark, 65, and Crescent, 30; total, 85,540 tons.——For the first time in the Boundary's history the weekly ore shipments exceeded 25,000 tons for the week ending December 16. The output was: Granby mines, 19,703 tons; Mother Lode, 3296 tons; Brooklyn-Stemwinder, 1530 tons; Rawhide, 240 tons; Sunset, 600 tons; Emma, 287 tons. Total for the week, 25,636 tons; total for the year to date, 883,563 tons. The Boundary smelters treated ore as follows: Granby smelter, 18,622 tons; British Columbia C. Co., 2835 tons; Dominion C. Co., 2376 tons. Total for week, 23,827 tons; total treatment for year, 898,250 tons.

The directors of the British Columbia C. Co., Ltd., owning the Mother Lode mines and the smelter near Greenwood, have made definite announcement of the letting of contracts for the enlargement of the reduction works of the company. Three new blast furnaces have been contracted for, 48x240 inches hearth area, with a capacity of from 500 to 600 tons each per day. Charging will be done from side-dumping cars, which will be hauled by trolley, and molten slag will be hauled away from the furnaces by electric locomotives in cars of twenty-five tons capacity each. Each slag car will be provided with an electric motor for tilting the car. The new furnace building will be constructed of steel. Three

blowers have been contracted for, and will be driven by three 300 H. P. motors. At the smelter the ore bins will be reconstructed and made 10 feet higher. At the company's Mother Lode mine, Deadwood camp, it has been decided to substitute electrical power for the steam-driven compressor, and for this purpose a 500 H. P. motor will be put in. The ore crushers will be driven by the motors now in service at the smelter.

Vancouver Island.

(Special Correspondence).—The Tyee Copper Co.'s smelter ran eleven days during November and treated 2051 tons of Tyee ore, giving a return, after deduction of freight and refining charges, of $31,062.

Duncans Station, Dec. 16.

By the organization of the Howe Sound Copper Co., with a capital of $5,000,000, all the copper properties on Howe sound have been united under one management. The company will be incorporated under the laws of the State of New Jersey.

Yale District.

It is reported that platinum has been discovered in place at the Bear creek property of W. H. Armstrong and C. F. Law in the Nicola valley.

ONTARIO.

R. I. Jacobs, manager of the Jacobs cobalt mine, in the Cobalt mining district in the Temiskaming section, says that the seventeen mines comprising the Cobalt district are producing on a basis of $5,000,000 annually. The camp is a year old and the deepest level is 100 feet. The ore occurs in vertical fissures from 1 to 5 inches in width. The product is shipped to Newark, N. J. A committee of mine owners met at Cobalt on December 16th to decide as to the construction of a home reduction plant. The ore of the Jacobs property carries silver, 2% nickel, for which the smelter formerly allowed a small amount, but since cut off; 6% cobalt, for which they received 65 cents a pound, and as high as 70% arsenic, the allowance for which has been ½ cent a pound.

YUKON TERRITORY.

United States Consul-General Foster of Ottawa reports that a Canadian order in council abolishes for a period of ten years the royalty on gold produced from any quartz claim in the Yukon Territory in regard to which an expenditure of money has been made to the amount of not less than $25,000 within five years after the date of the order, or within five years after the date of issue hereafter of the patent. The royalty on copper mined in the Yukon is permanently abolished in respect to those claims upon which an expenditure of money has been made to the amount of $50,000 within ten years after the date of the order or after the issue hereafter of the patent. The royalties previously payable were 2½% on gold and 5% on copper.

Trade Treatises.

Bulletin 1047 from the electrical department of the Allis-Chalmers Co. at Cincinnati, Ohio, illustrates and describes the construction of the Bullock oil-insulated transformers.

The Bullock multipolar motors and generators are beautifully illustrated in construction in Bulletin No. 1046 of the Allis-Chalmers Co., Electrical Department, at Cincinnati, Ohio.

A. Leschen & Sons' Rope Co., 920 North First street, St. Louis, Mo., send their twenty-sixth wire rope list. This contains a condensed statement of facts pertinent to the construction and use of wire rope for all purposes.

Special Circular No. 55 from the Chicago Pneumatic Tool Co., Fisher Bldg, Chicago, Ill., presents pictures and descriptions of pneumatic appliances for foundry and concrete block work. It contains considerable practical information on concrete mixing.

The Abner Doble Company of San Francisco has issued an attractive treatise pleasingly illustrating the Doble tangential water wheel. Besides showing the details of construction, the booklet describes a number of typical installations. Useful tables and hydraulic data are included, making a valuable reference book for engineers.

Instruction Book No. 3022 from the Fort Wayne Electric Works, Fort Wayne, Ind., details the construction and operation of their Type M multiphase induction motors. Bulletin No. 1071 illustrates the varied uses to which small-power motors may be put; Bulletin No. 1072 shows the design and construction of Type S single-phase motors; Bulletin 1074 presents the multiphase induction integrating Tyke K wattmeters.

Commercial Paragraphs.

T. H. TRACY, formerly with Power & Mining Machinery Co., Milwaukee, Wis., is in Denver, Colorado.

W. J. SPENCER, Western representative Revere Rubber Company, is at the factory, Boston, Mass., from Denver, Colorado.

THE Cassel Automatic Water Motor Company of Seattle, Washington, report that they have now fifty plants running in different parts of the world under heads of water varying from 40 up to 700 feet. Among their installations on the Pacific coast are the following: Copper Mountain, Alaska, 350 feet head; Hedley, B. C., 400 feet head; Excelsior, Wash., 340 feet head; Gilligan Creek, Wash., 640 feet head; Loomis, Wash., 240 feet head; Kimball Creek, Wash., 300 feet head; Mineral Creek, Wash., 110 feet head; Stites, Idaho, 150 feet head.

Latest Market Reports.

SAN FRANCISCO, December 22, 1905.

METALS

SILVER.—Per oz., Troy: London, 30 1/16d (standard ounce, 925 fine); New York, bar silver, 65¼c, refined (1000 fine); San Francisco, 65¼c; Mexican dollars, 53c, San Francisco; 50½c, New York.

Silver is still higher than last week, a small fractional increase to 65¾c being quoted. If the demand for silver continues it is difficult to predict to what price the metal may go. The demand is at present chiefly from India, where the year has been a very prosperous one, necessitating the use of a largely increased silver coinage.

COPPER.—New York: Lake and Electrolytic, $18.50 @19.00; Casting, $18.12½@18.62½; San Francisco: $18.75; Mill copper plates, $21.00; bars, 21@24c. London: £79 5s spot per ton.

Copper still maintains its high price, being quoted in New York at $18.50@19.00. The visible supply has continued to shrink during the past three or four months, despite the heavy production.

Following are the figures of German consumption of foreign copper for the months January to October, 1905, as compared with the same period of time for 1904 and 1903:

	1905.	1904.	1903.
Imports, tons	92,187	95,797	70,958
Exports, tons	9,972	7,309	8,477
Consumption, tons	82,215	88,488	62,481

Out of the above, 77,172 tons were imported from the United States.

LEAD.—New York, $5.85; St. Louis, $5.15; San Francisco, $5.00, carload lots; 5½c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £17 6s 3d ₱ long ton.

SPELTER.—New York, $6.60; St. Louis, $6.65; London, £28 12s 6d ₱ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¼c.

TIN.—New York, pig, $36.25@36.37½; San Francisco, ton lots, 37c; 500 lbs., 38c; 200 lbs., 40c; less, 41½c; bar tin, ₱ lb., 42c. London, £165 2s 6d.

PLATINUM.—San Francisco, crude, $18.50 ₱ oz.; New York, ingot, $20.50 ₱ Troy oz. Platinum ware, 75@$1.00 ₱ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ₱ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

NICKEL.—New York, 55@60c ₱ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ₱ lb., 50c; dust, ₱ lb., 10c; sulphate, ₱ lb, .04c.

ALUMINUM.—No. 1, 99%, small lots, 37c ₱ lb.; 100 lbs.. 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35@18.85; gray forge, $14.60; San Francisco, bar, 3½c ₱ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ₱ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ½c ₱ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7½c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ₱ bbl.

CEMENT.—Imported, $3.00@4.00 ₱ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ₱ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00; shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11½c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BONE ASH.—Extra No. 1, 5@6c ₱ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ₱ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ₱ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ₱ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10¾c; 10 oz. stearic, 40s, 9¾c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ₱ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ₱ 100 lbs.; hyposulphite of soda, 3@3½c ₱ lb.; caustic soda, in drums, 3@3½c ₱ lb.; Cal. s. soda, bbls., $1.10@1.20 ₱ 100 lbs.; sks., 90c@$1.00; chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2¼@2½c; powdered sulphur, 2¼@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ₱ lb.; copper sulphate, 5¾@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66% B, 1¾@2c ₱ lb.; nitric acid, carboys, 8c ₱ lb.

CHROMIUM,—90% and over, ₱ lb., 80c.

FIRE BRICK.—Domestic, carloads ₱ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ₱ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

BISMUTH.—Subnitrate, ₱ lb., $2.10.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ₱ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ₱ lb., 2¾@4c.

MERCURY.—Bichloride, ₱ lb., 77c.

MOLYBDENUM.—Best, $2.75 ₱ lb.

PHOSPHORUS.—American, ₱ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ₱ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ₱ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ₱ lb., $1.

TUNGSTEN.—Best, ₱ lb., $1.20.

URANIUM.—Oxide, ₱ lb., $3.40.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR WEEK ENDING DECEMBER 5, 1905.

806,090.—HOT WATER BAG L. Allenberg, San Francisco.
806,390.—BLACKING BRUSH DAUBER—B. Barbolla, San Francisco.
806,515.—SAW—J. Baumgartner, Silverton, Or.
806,628.—FURNACE—W. N. Best, Los Angeles, Cal.
806,732.—CONVEYOR—H. W. Blaisdel, Los Angeles, Cal.
806,392.—PHOTOMETER—B. B. Bolton, Wilmington, Cal.
806,235.—PENCIL RUBBER HOLDER—A. F. W. Bowen, San Francisco.
806,632.—WATCH GUARD—C. Breer, Los Angeles, Cal.
806,319.—SIGNAL—Burt & Vanatta, San Francisco.
806,524.—BOILER—J. M. Colman, Everett, Wash.
806,322.—DISK PLOW—W. S. Cook, Santa Maria, Cal.
806,470.—PRESSURE REGULATOR—A. J & N. Hodge, Pasadena, Cal.
806,245.—TOY—J. W. Hughes, San Francisco.
806,417.—BUTT GAUGE—F. H. Lockwood, Alameda, Cal.
806,277.—STOVE CABINET—W. W. McKee, Tacoma, Wash.
806,695.—WINDOW SCREEN—Monnin & Mecchi, San Francisco.
806,173.—FURNACE—R. W. Myers, Fruitvale, Cal.
806,426.—MAP HANGER—J. J. O'Leary, Sisson, Cal.
806,562.—SNATCH BLOCK—A Opsal, Kelso, Wash.
806,496.—FIREARM—E. E. Redfield, Glendale, Or.
806,188.—INJECTOR—D. W. Rees, Needles, Cal.
806,571.—BUCKET LOADER—B. C. Ribler, Spokane, Wash.
806,753.—FIBER CUTTER—A. M. Sheakley, Stockton, Cal.
806,372.—TELEPHONE—J. Silverman, San Francisco.
806,591.—PILE PRESERVER—P. S. Smout, Everett, Wash.
806,374.—WAGON—G. N. Spencer, Hillsboro, Or.
806,213.—FILTER—L. C. Trent, Vantrent, Cal.
806,214.—AMALGAMATOR—L. C. Trent, Vantrent, Cal.
806,219.—CLAMP—R. H. Walker, Tacoma, Wash.
806,444.—TROUSERS PRESS—H. H. Welch, Los Angeles, Cal.
806,225.—CAR FENDER—W. G. Winans, Spokane, Wash.
806,226.—SWEEPER—R. Wylie, Napa, Cal.
806,230.—SASH WEIGHT—O. F. Zahn, Los Angeles, Cal.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

STICKY FLY PAPER.—No. 807,040. Dec. 12, 1905. O. Mausert, San Francisco, Cal. This invention relates to improvements in fly paper, and especially in fly paper having a sticky surface acting as a lure for flies and other insects. The object of the invention is to provide a blank for sticky fly paper which can be folded into attractive shape and stood on shelves, counters and elsewhere and which, being covered with adhesive, will prove an efficient lure, having a considerable exposed surface, and which blank when so folded may be easily handled without soiling the hands, and can be compressed into a small compass for purposes of shipment and the like.

GOLD WASHING AND SEPARATING SCREEN.—No. 807,023. Dec. 12, 1905. C. W. Gardner, Oroville, Cal. This invention relates to an apparatus which is especially designed for the separation of gold and precious metals from sand, gravel or other gangue or material with which it may be associated. It consists of a revoluble inclined screen, made in sections of constantly decreasing diameter, from the upper receiving end toward the lower discharge end, and in water supply and mechanical devices used in conjunction therewith; all adapted to produce a new and valuable device.

ACCORDIONS.—No. 807,018. Dec. 12, 1905. Raffaele Carbonari, San Francisco, Cal. This invention relates particularly in the connections between the several keys and valves whereby an actuation of any single key may result in the production of a desired variety of tones or chords. It consists in an accordion, of a sliding part, pivoted members carried by said part and reciprocable therewith, a key, and connections between the key and said part to reciprocate the latter, means to rock said pivoted members, valves, and means connected with the valves interposable in the path of said rockable members to operate the valves.

WASHING MACHINE.—No. 807,007. Dec 12, 1905 M. L. Winegarden, Alameda, Cal. This invention relates to improvements in machines for washing clothes. Its object is to provide a simple, cheap, practical, easy-running machine, which will not tear the clothes, which will have a large capacity, and which is adaptable to take a greater or less charge at one time and handle it with equal thoroughness. The various parts of the mechanism are assembled and adapted to bring about the desired result.

WORD REGISTERING ATTACHMENT FOR TYPEWRITING MACHINE.—No. 807,022. Dec. 12, 1905. R. R. Fowler, Madera, Cal. This invention relates to improvements in means for counting and registering the number of words or symbols having the numerical value of words struck upon a typewriter. It consists in a counting attachment for typewriting machines, the combination with the keyboard, of a registering device, a sliding plate to operate said device, means for actuating said plate from the keyboard, and means engaging said plate to lock it against operation by certain keys on the keyboard; and other details of construction, all adapted to produce a new and useful device.

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The Critic Company, Ltd., Box 434, Boise, Idaho. Compilers and Publishers "The Mines and Minerals of Idaho." Five years in preparation; 8 parts; 800 pages; illustrated. "The Manufacturers' Idaho Scout," weekly, $1 per month. Correspondence solicited; prompt attention.

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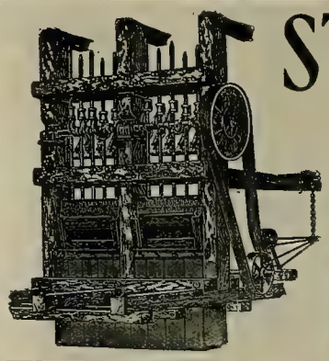

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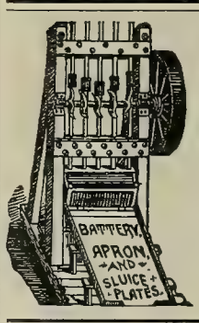

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MINING AND SCIENTIFIC PRESS

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Mining in Arizona.

No region of the West affords a greater variety of mineral resources and conditions than are found in Arizona. The climate is dry and healthful, but the impression, entertained by some, that it is a vast stretch of sandy plain unbroken by mountains and destitute of verdure, is an error. There are high and beautiful mountains in Arizona, forest-clad, and in winter covered with snow. In the lower lands of the southern part of the Territory the sharp serrated ridges of numerous mountain ranges give beauty and even grandeur to the landscape. To see distinctly 150 miles in Arizona is an ordinary matter, and if objects were in view at greater distances there is no doubt that the vision of distant mountains might be extended to 300 miles.

Copper is the principal mineral at present produced in Arizona, the output for the past year being about 246,500,000 pounds, which makes Arizona the second in rank of production of copper in the United States, Montana being first and Michigan third. In addition to copper the output of gold and silver in Arizona is large and increasing. Besides these three

Congress Mills, Yavapai County, Arizona.

The United Verde, Jerome, Arizona.

important metals Arizona also produces lead, zinc, bismuth, antimony and tungsten minerals, molybdenite, structural materials and gem stones. The mineral industry in Arizona is of far greater importance than all others in the Territory, and it is annually increasing in its magnitude. There still remain large undeveloped resources—great copper deposits, gold, silver, zinc and lead ores—to develop when the necessary transportation facilities have been provided. There are three districts in the Territory isolated from the ordinary routes of travel, and as the mountains are rugged and often almost impassable the construction of roads is an expensive undertaking for individuals, and yet a great deal has been accomplished by private enterprise in the way of road building, and even in the construction of railroads. The most important copper mining camps are at Jerome, in Yavapai county, where the United Verde is the principal mine; Globe, where the Old Dominion is a large producer; Bisbee, in Cochise county, is the heaviest producer, however. Here are the mines of the Calumet & Arizona, the Copper Queen, and other large mines. Clifton and Morenci and Metcalf are other large copper camps.

In some of the districts there were found evidences of prehistoric occupation and the primitive working of the mines. It is known that in Yavapai county a preistoric race sunk shafts near the head of the Hassayampa river and excavated the quartz by means of stone hammers, which were used to break down the rock after building fires on the rock faces and then dashing cold water upon the rocks to effect their disintegration. Native copper occurs at a number of places in Arizona, and it was probably this metal that was used by the prehistoric races, as no remnants of their smelting furnaces for ore reduction have ever been found in the Territory.

The first record of copper smelting in Arizona is that at the Longfellow mine, near Clifton. This occurred in 1873 and the operation was perfomed in an adobe furnace.

Arizona has also furnished some remarkable examples of gold and silver deposits. All old timers in that territory remember the mule teams packed with thousands of pounds of native silver, which came from the Stonewall Jackson mine. The rich mines of Tombstone attracted thousands of adventurers nearly thirty years ago, and rich silver mines have been opened in a score of places elsewhere. One of the most noted was the Silver King in Pinal county.

On Rich hill in Yavapai county, lying on the surface of the ground and near the summit of the hill, thousands of dollars in gold nuggets were found strewn about. This gave rise to another stampede to that district. The Congress gold mine is the deepest in the Territory, being down about 3000 feet. A peculiarity of this mine was the honey-combed limonite.

Hauling Mill Machinery in Arizona.

MINING AND SCIENTIFIC PRESS.

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SAN FRANCISCO, DECEMBER 30, 1905.

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Hail and Farewell!

For the first and last time in the history of this journal I obtrude my personality to state that I have transferred my entire holdings therein, but continue to have a warm interest in its enduring prosperity.

During the many years in which it has been my pleasure and my privilege to conduct the MINING AND SCIENTIFIC PRESS, my constant aim has been to make it of paramount value to mining men everywhere, and it is but the grateful statement of what is deemed an accomplished fact to say that such ideal has been largely realized.

None the less satisfactory is my consciousness that in the person of my successor the purpose of this journal in its career of honest and honorable usefulness will be ably continued.

The policy and purpose of such a journal as the MINING AND SCIENTIFIC PRESS is characterized less by what appears therein than by what does not appear, the intent being to serve the general good and hold the confidence and support of those whose good will is worth having. The MINING AND SCIENTIFIC PRESS enjoys the esteem and respect of mining men the world over, and the natural satisfaction occasioned by this fact is enhanced by the belief (I had almost said knowledge), that in the person of T. A. Rickard, my successor, the high standard set will be maintained, and that with increasing prestige the future of this journal will make it of correspondingly greater value to the basic industry of the nation, which it represents.

Mr. Rickard needs neither eulogy nor introduction to the mining men of America. He is well and favorably known and is thoroughly equipped for the work he assumes. In mining, metallurgy and mining engineering the horizon widens, the future grows broader, and as this is the oldest mining journal on the American continent, so, I confidently trust, it will ever be the best. For him who now assumes its guidance and control I have personal and cordial commendation to my readers, and I invoke for him the same meed of good will and support so kindly accorded me, and which I have ever cordially and gratefully appreciated.

To my colleagues and assistants in the editorial, business and mechanical departments I tender hearty acknowledgment of the zeal, fidelity and ability that have characterized their several efforts in making this journal successful.

More need not be said; less could not be said; "the rest is silence." J. F. HALLORAN.

Dec. 28, 1905.

Cost of Power in California.

Undoubtedly there are places where power generated by steam in a boiler, where oil is the fuel employed, would be as cheap as any other available power. It is largely a matter of situation. On the Pacific coast the extensive employment of crude oil as a fuel and the large development of electric power came about at nearly the same time. True, there had been numerous small plants of both kinds erected and in successful operation at various places years prior to the general advent and extensive development of these two competing sources of power, but within the past five years the competition has become active and has resulted in a material lowering of power cost in certain mining districts from about $6 per horse power per month to $4 for the same period, notwithstanding the assertion of a prominent official of one of the electrical distributing companies made about four years ago to the effect that the electrical companies were aware that oil as a fuel was being introduced in a few places, but it was in no sense considered as a competitor by the electrical companies. At that time the horse power rate was $6 per month. The fact that it is now but $4 is significant.

The crude oil of California and some of its products are peculiarly adapted to employment as a fuel, and wherever it has been introduced, and the installation made by an experienced engineer, it has been a success and has reduced the cost of steam making where the cost of oil was not prohibitive.

Ordinarily electric power is sold by meter measurement—a kilowatt—1000 watts being the unit of measurement. A horse power is figured as equivalent to 746 watts. When the amount of power required is known, it is a simple matter to figure its cost.

Wherever crude oil can be obtained in sufficient quantity at a cost not exceeding $1.50 per barrel, this natural fuel at once becomes a strong competitor to most other sources of power. Crude oil may also be employed in several of the numerous types of gas engines now on the market, and power produced in this manner is even cheaper than steam produced by using oil under a boiler. In some instances the cost of this kind of power has been found remarkably low.

Free water power, wherever obtainable, is undoubtedly the most desirable, because the least expensive, of any of those used at mines; but this kind of power is not as easily available as formerly, owing to pre-existing rights in the streams. Still, many places remain where a low head and large volume may be obtained and a moderately large amount of power developed. In some of the mountain streams of California water rights of this kind may be secured repeatedly along the same stream. If large power is required, the expense would naturally involve a much more expensive construction, but where power is required for individual mines it may usually be secured at reasonable cost for dam, flume and wheel equipment. This power may then be employed to run a dynamo and the current carried wherever desired. Numerous mines have availed themselves of these existing conditions to put in power plants of this description and they have been found satisfactory.

In some instances compressed air has been employed in lieu of electricity, of which type the large installation of the North Star Gold Mining Co., near Grass Valley, Cal., is a noted example.

Wood, which was formerly the only fuel used in California mines, has become in some districts so costly that coal brought from neighboring States can be employed to advantage, but the resort to coal at $12 to $15 per ton is only seen occasionally, notwithstanding it has, in some cases, been found preferable to pine wood at $6 to $7 per cord. The loss and cost in handling the wood make the difference between these two classes of fuel greater than is apparent at first glance. The coal may all be used advantageously, and with experienced firemen a ton of good coal is equal to more than two cords of good wood, as it is delivered in the yard.

Gasoline, as well as crude oil and distillate, is also largely employed as a means of power, particularly in the desert regions. The sources and kinds of power are many, and the mine managers in the several sections of the Pacific coast usually work out the problem along the line of existing conditions and of necessity, rather than along those of preference. Occasionally, however, the subject is not given the attention it deserves, and installations are made which are not the least expensive in first cost nor the most economical in operation after installation.

A BILL has recently been introduced in Congress providing for the location, development and operation of mineral lands on Indian reservations. This bill states that on some of the existing Indian reservations there are large and valuable deposits of copper, gold and other ores, and that as the Indians make no use of these mineral resources, and have no disposition to develop them, they should accordingly be thrown open to prospectors who may make locations thereon, etc. However desirable it may be to make available these mineral resources situated on Indian reservations, to attempt to locate and operate these lands for mineral without withdrawing the lands in question from the reservations by the Government and settling for them with the several Indian tribes, respectively, interested, will only result in serious trouble and loss of life to those who first attempt it. If the Government buys the land from the Indians or makes a satisfactory exchange with them, for other lands, the idea may be safely carried out to the advantage of all concerned, but any attempt to wrest these lands from them without just compensation will only meet with armed resistance, unless the nature of the Indian has changed within very recent years. All previous attempts of this kind have resulted in Indian wars and great loss of life, with heavy attendant expense to the Government.

THE ancient river channels in the mountains of California have been successfully worked for the gold they contain by ground sluicing, hydraulicking, and by the drift method of mining, but it is improbable that any dry channel known to-day will pay to work by dredging method, first stripping the heavy over-burden of non-auriferous, or only slightly auriferous, material by dredging, and then washing the pay dirt near bedrock.

THE year 1905 just drawing to a close has been one of the most prosperous for the mining industry that the country has ever seen. There has been a good and increasing demand for metals, and all of the most useful and common kinds are at an unusually high price. The year has also been largely free from the disturbances resulting from the conflict of capital and labor, and the outlook for the year 1906 is at this time certainly propitious.

COPPER maintains itself well in the market, selling in New York at 18.50 to 19 cents, and it is said that no large amount can be contracted for prior to April first next, and it is even suggested that the price may go above 19 cents. This is surely welcome to the producers of copper, but they seem unable as yet to make an over-production of the metal.

THE successful completion of the Simplon tunnel, connecting Italy and Switzerland, is to be celebrated next summer by an industrial exposition in the city of Milan, which is near the Italian portal of this great engineering feat.

CONCENTRATES.

SOLUTIONS of potassuim cyanide attack metallic silver slowly. The solution is required to be much stronger for silver than for gold.

THE most important consideration in stamp-milling gold ore is rather what can be economically saved, not what amount of ore can be crushed.

SALT lands and lands containing saline springs may, if unoccupied, be located as placers, but one person may take or enter no more than one claim.

THE Hornsilver mine at Frisco, Utah, was originally a large lead-silver producer. It now produces rich copper ores, and comparatively little lead.

THE stampede to Alamo diggings, in Lower California, occurred during 1889-90. It was followed later by a stampede to the quartz veins found in that locality.

COAL outcrops are not usually black and glistening, but rather dull and earthy, and brownish in color. In the West some coal croppings, lignite, look like brown shales.

CLOSED electric lamps (incandescent) are not dangerous in gassy or dusty coal mines, but open electric lights are as dangerous as any other open fire, and will cause explosions.

GOLD occurs with some copper ores in the free state. When gold is present in ores of this description, it is not infrequently seen, particularly with chrysocolla, a silicate of copper.

IN 1868 a 20-stamp silver mill erected complete in Nevada cost from $75,000 to $100,000, according to its situation. Transportation of heavy freight was a very important factor in this high cost.

CHROME IRON is found in more than half of the counties of California. It is always associated with serpentine, which is abundant in both the coast range and the foothill ranges of the Sierra Nevada.

GOLD occurs in calcite and in quartzite at Oro Grande, Cal., and in the same district lead-silver ores are found in limestone and copper ore in limestone and diorite. Zinc sulphide also is found in limestone in that district.

THE oldest copper producing district in Arizona is at Clifton, discovered in 1865. Ore from the Longfellow mine was reduced in an adobe furnace there in 1873, the blast being supplied by a leather blacksmith's bellows.

A BUCKET is generally used in sinking in a vertical shaft, and if the shaft have more than one compartment the bucket should be handled in the center one, as this admits of greater facility in loading and handling the bucket below.

ONE of the important features in the employment of locomotives of any type underground is the system of collecting the cars into trains to be hauled to a central point and from there in trains to the shaft. If this matter is systematized much time is saved thereby.

IT is not customary to give the posts of tunnel sets a greater spread than 1 foot in 7 or 8 feet of height, except in heavy, swelling ground, then the base of the set is sometimes 8 or 9 feet while the cap may be but 3 feet clear, and the height from floor to cap 6 feet or less.

OVERTURNED folds are not common, but are seen occasionally. One of the most noted instances is that of the Elk mountains of Colorado, where an entire mountain mass has been lifted and overturned, so that the older formations are seen superimposed upon the younger.

TURQUOISE mining in the United States has of only late years become an important industry. Prior to 1890 little turquoise had been mined. It is now known to exist in southern California, Nevada, Arizona and New Mexico, and many valuable deposits of this mineral have been opened.

THE mines of Randsburg district, Cal., are of several types—fissure veins, impregnations and fissured zones. The ore from the Butte mine is merely a silicification of the country rock along a fissured zone. Some of the richest ore in that mine looks little different from the barren rock of the vein walls.

SILVER chloride (horn silver) occurs in ores in masses, flakes and in dust-like particles, so finely disseminated as to be invisible to the eye. In color it varies through shades of gray to brown, violet, yellow, light green and black. Larger masses look like wax and can be cut like horn with a knife.

A MILLSITE cannot be taken on land known to be mineral, but a mining claim may always be used by the owner as a millsite. A citizen of the United States may take up a millsite on the unoccupied public, non-mineral lands, whether he may own mines or not. A millsite is sometimes required for custom reduction works.

SMALL veins of iron oxide occurring within a few feet of each other in a schistose or massive formation are not proof positive of the existence of large ore deposits below. Small fissures or gashes in the surface strata may be filled by infiltration of iron solutions from the walls, and have neither great depth nor longitudinal continuity.

A CONCENTRATING table is not unfrequently charged with doing inefficient work, when the real cause of the poor work is overload. It is as possible to overload a concentrating machine with water as it is with ore. A system of careful classification should be inaugurated prior to concentration if the best results are to be accomplished.

IN the early days at Leadville, Colo., the only surface equipment at many shafts, particularly those on Fryer hill, where the workings were not deep, consisted of a small hoisting engine, a tripod of stout logs and a trip-rope to handle the bucket at the collar of the shaft. Thousands of tons of ore were hoisted and handled in this manner.

EXTENSION track may be made in the bottom of an incline shaft, when sinking, by reversing T rails, and clamping their upper ends to the rails spiked to the timbers. The bottom of this improvised track may be held in place by a rod of proper length, provided with guides for the rails, so that they cannot spread and derail the skip.

TO THE uninitiated, mica and selenite, the transparent variety of gypsum, look much alike. A thin plate of mica is flexible and very elastic; selenite is somewhat flexible, but inelastic, it is also very soft. A piece of selenite subjected to even moderate heat, such as on top of a hot stove, will quickly turn a chalky white, while the mica remains unaffected by much higher temperatures.

MOST gold mines in California are below 2000 feet altitude, some of them being as low as 400 to 500 feet above the sea; but there are mines in the Sierra as high as 10,000 to 11,000 feet or more above sea level. Altitude bears no relation to the amount of gold or other metal contained in the ore, but it may have a direct bearing on the economic proposition of equipping and working the mine.

NO MINERAL LOCATIONS can be made on Indian reservations. In the past numerous Indian reservations have been thrown open to settlement by the Government and mines subsequently opened thereon. One of the most important is that of the Black Hills, South Dakota, which was originally a portion of the Sioux Indian reservation. It was opened to settlement early in 1876.

AMBER is an oxygenated hydrocarbon, but, strictly speaking, is not a mineral, as it is of organic origin, and is a fossil resin. In mineralogy it is known as succinite. The amber of commerce is mostly obtained from the Baltic sea, where it is mined, and also found strewn along the shores where it has been cast up by the waves. It becomes electrified upon being rubbed, and some varieties are fluorescent.

CASSITERITE occurs in veins of pegmatite, as in the Black Hills of South Dakota; in a fine-grained tourmaline rock, as in southern California, in quartz in feldspar, in greisen, in topaz rock, as at Mount Bischoff, Tasmania; in slates and granite, as on the Seward peninsula, Alaska; in gneiss, mica schist, chlorite and clay schist and in eruptive rocks. The most common minerals accompanying tin stone are feldspar, mica, quartz, tourmaline, wolfram, apatite and some others.

WHERE it is desired to recover water from mill tailings and the quantity is abundant, it is advisable to build a dam provided with a gate at or near the bottom, through which the sands will flow. This will free the water near the surface from the coarse material, and only slimes need be treated to remove the water, which may be done by passing the liquid through a series of boxes or tanks, the clear water being pumped or carried by flume to wherever it may be desired to use it.

THE principal diamond mines of the world are at present in South Africa, Brazil, Dutch Guiana and India. Diamonds are found at many other places, but in only small quantities. In the United States diamonds occur in California, Wisconsin, North Carolina and a few other places of less noted occurrence. The so-called diamond fields of Arizona are a myth, though an attempt was made many years ago to create a stampede to an isolated portion of that territory by the extensive publication of alleged discoveries of diamonds.

METHYL IODIDE, CH_2I_2, is a liquid having a specific gravity of 3.3243 at 16° C. and is insoluble in water. It is a yellow fluid, strongly refracting, miscible with benzole but not with alcohol or water. It does not attack metallic substances. The specific gravity varies with the temperature. This salt was used by R. Brauns for specific gravity determinations. Other solutions having a specific gravity of 3.00 or over—Rohrbach's barium mercuric oxide, Thoulet's potassium mercuric oxide and Klein's cadmium borotungstate — are miscible with water.

A DEPARTMENTAL regulation, No. 19, is to the effect that but one discovery of mineral is required to support a placer location, whether it be of twenty acres by an individual, or of 160 acres or less by an association of persons. The courts do not presume to say how rich a placer must be to make the discovery valid, nor how wide a vein shall be nor how much mineral it shall contain before it may be recognized as a valid and bona fide discovery. Neither size nor richness are material in such matters. A discovery of such indications as would lead the miner to believe that it would lead to a more valuable deposit in depth is sufficient. Pay gravel or pay ore are not absolutely essential to a legitimate discovery.

IT is rarely that large masses of white quartz constitute valuable ore, although outcrops of this kind are characteristic of many mining regions. Not infrequently these large masses of silica are associated with shoots of pay rock, while the pure snowy white quartz is valueless. In some instances only a portion of the mass is barren—the foot wall or hanging wall part being good ore. In other cases the pay zone lies entirely outside of the massive quartz, being separated from it by a layer of clay, gouge, or country rock. The bonanzas of the Comstock Lode, at Virginia City, Nev., occur wholly within large and nearly barren masses of white and bluish white quartz. These bonanzas are later than the large masses of quartz, having been deposited in fissures in the massive silica, which resulted from movements of the vein.

A RED, brown or black gossan does not always indicate payable values below, but such outcrops should be investigated. In the case of abundant manganese oxide in the gossan the indications are usually favorable for silver and lead. Where hematite occurs most abundantly gold is most likely to be the metal found, though where the vein beneath is gold bearing the gossan is usually auriferous also. In the case of limonite copper may be suspected. There are no hard and fast rules concerning this, for hematite may also be abundant in the gossan of a copper deposit, and manganese as well. Limonite deposits should be investigated to ascertain whether they are really the outcrop of a vein or ore deposit beneath or only a superficial deposit, formed by iron springs in the vicinity. In case of the latter it might be good business to investigate the source of the spring deposit. Not infrequently the water from large veins of pyrite and chalcopyrite deposit extensive masses of limonite on the surface.

THE coal land laws of the United States were extended to Alaska by act of Congress approved June 6, 1900. A single individual who must be twenty-one years of age and a citizen of the United States (or have declared his intention to become such) may locate 160 acres of coal land in one tract and no more. He can take but one claim. An association of persons may locate 320 acres in one claim and no more. An individual or association having improved a tract of coal land to the extent of $5000 may locate and enter a tract of 640 acres, including such mining improvements. No person or association of persons is permitted to sell, or bargain to sell, the coal lands he may locate, to another person or association until he shall have paid for the same and received a deed from the Government. It is to avoid this sort of thing, which has been practiced in timber land locations, that the laws are so definite as to the requisite acts to obtain title to coal and forest lands. After having paid for the lands claimed, and having received a patent or deed thereto from the Government, the owner may dispose of the land in any way he sees fit, but he is not permitted to again make a location, having exhausted his right.

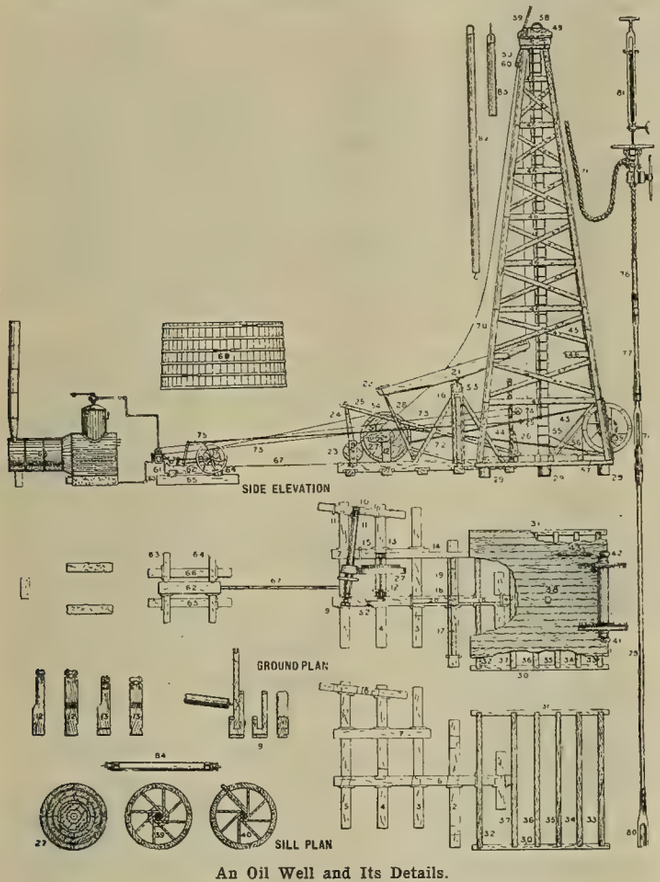
THE Montana law is explicit concerning annual assessment work and simplifies the matter of giving the work publicity when properly performed and thus securing title. It requires the owner of a lode or placer claim who performs, or causes to be performed, the annual work, or makes improvements required by the laws of the United States, in order to prevent the forfeiture of the claim, to file, within 90 days after the annual work, in the office of the county clerk of the county in which such claim is situated, an affidavit of his own, or an affidavit of the person who performed such work, or made the improvements showing: First, the name of the mining claim and where situated; second, the number of day's work done, and the character and value of the improvements placed thereon; third, the date of performing such work and of making the improvements; fourth, at whose instance the work was done or the improvements made; fifth, the actual amount paid for work and improvements, by whom paid, when the same was not done by the owner. The law further provides that such affidavits, or a certified copy thereof are prima facie evidence of the facts therein stated. Claim holders in any State who follow out the requirements of the Montana law are likely to have very little trouble over assessment work, as it leaves nothing undone to secure title as required by the Federal statutes.

The Boring of an Oil Well.—I.

Written for the MINING AND SCIENTIFIC PRESS by J. H. PIERCE.

A great many people have but a limited idea of what an oil well really is, viewed from the mechanical standpoint. They have a vague idea that it is a hole bored deeply into the earth in some manner, and is usually surmounted by a derrick, a tower-like wooden structure of curious design. What part this tower plays in the drilling of an oil well they do not usually know.

The following series of letters from a "green hand" at an oil well to his friend at home throws considerable light on the subject and is an entertaining recitation of the daily events occurring about a new well. The accompanying sketches and engravings give an idea of the paraphernalia about a well and the appearance of the proposition when in operation:



An Oil Well and Its Details.

A TOOLIE'S LETTER.

MY DEAR JOHN:—Replying to your request to write you all about my new "job," I'll just try—that's the best I can do—and if you find anything that I seem to be wobblin' on, you will have to excuse me, because my brain is like a deep-sea drag net. It's simply full of unknown things that I have jammed in there, waiting the day that I can bring them to light and dissect.

We arrived here Sunday and about all the two drillers did was walk about the "rig" and say things about the builder. I will postpone this part until I see you. A "rig" is an oil-country term for about 16,000 feet of lumber put together. I'll send you a photograph for you to study it out for yourself. We have a "bunkhouse" to sleep in, and a cookhouse and a "Chinee" cook. The bunkhouse is just big enough to let in four bunks. I have not measured it, but I think that it is about 14x16 feet. The cookhouse is about 14x20 feet, with a little room for the "Chink."

Monday morning we started to "rig up," and it appears that I am to run the morning "tower" with a big driller by the name of Slade. The other "toolie" is a little, stubby Irishman, and, of course, they call him "Ole" and they have dubbed me "kid." Think of it, 6 feet in my stocking feet, weight 195 pounds, all meat, and have to answer to the name of "kid." I started to call them Mr., and I wish you could have heard the remarks that they addressed to me. That part will have to wait until I see you alone. Now, don't think that I am working with a lot of ruffians, for manlier men I have never known. They remind me of our old Colonel in the fight at Cainte, when I started to salute, present the commanding officer's compliments, etc. He roared: "Cut it out! Tell me what you want. This is no place for formality." I am beginning to realize that a drilling rig is no place for formality, either.

Slade's people intended him for a minister; but he got sick and they sent him out to his brother, who was a contractor in the oil business; he never went back, and I don't think he would disappoint his mother if she could see him now. Ole is just a jolly "mick." The other driller has a name that sounds like Ikenbaugh, but he answers to just "Ike."

Ole and I after the boiler was "hung" proceeded to wall it in with brick. As I was a "greeny," all the really hard and unpleasant part of the work fell to me. I had to mix mud, carry brick and light Ole's cigarettes for him nearly all day Monday and until about 11 o'clock Tuesday. The two drillers in the meantime had built a forge, put the brake on the bullwheels and said more things about the man who had sent the tools out. It appears from their talk that the manager knows nothing about the oil business and has not even left the furnishing to a supply house. Fortunately, the boiler and engine fittings were all there, so we got them connected up Wednesday morning. They don't do things the way I learned at school, and I didn't make more than a couple of suggestions about the way it should be done, either. We got the belt on Wednesday, which, by the way, the drillers said other things about, because it was a "red" belt, when it should be a "rubber" for a drilling well, a "red" belt being all right for a pumping well.

They threw the "bull rope clamps" away and spliced "eyes" to connect it with, because they said clamps were out of date. Then we "lagged the bandwheel." This took us until Thursday morning. We had to cut the new cable, because old rope was not provided, and it took about 200 feet—quite an item, with rope 17 cents a pound. We nailed one end on one side of the bandwheel—8 feet in diameter—and then I turned that big wheel around while the other toolie held the rope tight with the bullwheels, and the drillers nailed it on. After doing this eight hours, I was rather glad when the last nail was driven. This is done to give better friction surface for the friction pulley on the sand reel and to preserve the bandwheel.

Then they sent—me, of course—under the derrick floor to dig the place for a "slump" box. We have to make a tight box to dump the drillings into and let it run away, for it appears to be a serious thing for any to get in the "hole." Why I don't know—I'll tell you later.

I had been wondering how they would tie the rope onto the drills, and it was the easiest thing imaginable. They had a thing that they called a "woodpecker socket." It's a big piece of iron with a hole in the top that runs out at the side and really reminds you of a woodpecker's hole. They put the rope down through this hole and out at the side, and then took some pieces of rope about a foot long and then wove them in the end. I think they took two-thirds of the size of the cable.

Then they put a lot of tallow on the rope and pulled it back in, which was not very far. I was getting pretty well interested by this time.

Thursday night, they said, was their last night in "the hay," for Friday would see them "spudding." I understand that there is some superstition about spudding in on Friday, but these drillers did not seem to care.

I thought that I had worked hard, but Friday morning the way I was jumped around was a caution. They run the rope socket out through the side of the derrick about 30 feet up and then screwed it on to a 24-foot 4¼-inch stem. This stem seemed to please Slade greatly, while the other driller thought he could "dig more ditch" with a longer and heavier stem. If you get tangled up with the terms I write, you'd better go out and get a little air. The only thing that I can liken my brain to is the side of a house against which a lot of kids have been throwing mud balls. The mud balls drop off at odd times, and these names and sentences drop off my brain the same way, even in the middle of the night, and I find myself lying awake trying to get them back in their proper spot.

We took two wrenches—sounds easy, don't it? but those wrenches weigh just 200 pounds each—and tightened the joint, and then they had me pound on the end of one of the wrenches with a 16-pound sledge. I found it was different from the sport of "hammer throwing."

In the meantime the other toolie had been heating a bit, and when we got the stem pulled up in the derrick we dressed it. That is done by pounding it with two 16-pound sledges, and I can almost hear now the constant admonition of Slade to "Get off that corner!" and "Strike to dull it, man; strike to dull it!" As near as I can explain to you, we hammered a head on it the size of the outside of the first casing to put in, making it perfectly round, except that there is a letter U left in each side, called a "water course," to let the mud work up in.

I thought that we had tightened up that rope socket enough to hold anything; but they got a notched track that set on the floor and then another thing that they called a "jack" that runs on this track and works by a 5-foot lever. The power is enormous, and, with two big men working it, I was a little afraid that we would break something, but we didn't.

Then we hitched a jerk line on the wrist pin and run it into the derrick, and put a spudding shoe on the cable where it came off the bullwheel shaft, hooked the jerk line into this shoe and Slade started the engine. Every time the crank went over it lifted the tools and dropped them, and when you realize that the stem, rope socket and bit weighs about a ton, and that ton was hitting on a surface 12 inches across, you may imagine that it made an impression. They had water running down in where the bit was pounding, and the way it mixed mud was a caution. After they got down about 6 or 8 feet the mud began to get very thick; so they pulled the tools out and run a bailer down and bailed it out. A bailer is just a joint of casing with a bail on one end and a valve in the bottom.

Slade and I went home to get up at midnight and relieve the other two. We work from midnight until noon, and it is called the "morning tower." From noon until midnight is called the "afternoon tower."

When Slade and I got back at the well the rope socket was just at the floor; so we "broke" the joint, washed it, scoured it and set it up with the "jack" and I began to realize what I was doing. Besides watching the boiler, keeping up steam, oiling the engine and other points of the rig, I had to put the bullrope on the bullwheels when Slade had run the tools long enough to be ready to bail, guide the bailer into the "slump box" and numerous other things.

By noon on Saturday we were ready to "hitch on;" but as the manager had not provided any rope or pulleys for the temper screw, we intend to go on spudding until he can get them here. A string of tools on a cable is somewhat like the "return ball" that the boys play with. If you would take a rod of iron on a piece of rubber and spring it up and down, you would have the principle of the tools and the cable. The deeper one gets the slower one has to drop the tools, on account of the increased elasticity of the cable.

This being Sunday, we are all resting up, and one needs it after a week at this business.

Will try to write more next Sunday. Yours,

JIM.

The Titration of Molybdenite.

Written for the MINING AND SCIENTIFIC PRESS by J. OHLY.

Many methods have been devised for this purpose, and some pretty good ones, but the following seems to be most reliable in the opinion of the writer.

The first condition of success is to have the ore thoroughly pulverized, because the flakes of the mineral have the unpleasant property of oxidizing themselves superficially if brought into nitric acid and heated, and then to stick to each other tenaciously, so that the mass looks thoroughly decomposed from MoS_2 to MoO_3. On shaking the casserole or flask, in which the operation is made, and touching the white mass with a glass rod, the brilliant unchanged surfaces of the molybdenite appear again, and the operator realizes that he must proceed in a different manner.

The subdividing of the ore, used for analysis, must therefore be brought about in an agate mortar, when the dissolving in nitric acid by heating will offer no further difficulties. Cool the solution, and add 15 c.c. concentrated sulphuric acid, evaporate to white fumes of H_2SO_4—to be sure that all nitric acid is driven off—and cool again. Dilute, filter into a beaker, add three or four pieces c. p. zinc, and let the reduction proceed until the condition of Mo_2O_3 is reached, when the solution assumes a chocolate color—which takes at least half an hour.

Now titrate with permanganate solution, that is usually present in any laboratory, standardized on iron, which answers this purpose very well, but which is standardized besides on a solution of MoO_3 in concentrated sulphuric acid, made by dissolving 0.2 gram MoO_3 in 15 c.c. sulphuric acid and heating, cooling, diluting with water and reducing with zinc.

As iron is always present, the result of the titration will give the amount of iron and molybdic acid together. If copper is present, it should be removed beforehand by sulphuretted hydrogen.

In order to determine the iron a separate solution of the molybdenite is prepared in the same manner as described before, cooled, diluted, and treated with an excess of ammonia, and the ferric hydrate formed filtered off and washed. This precipitate is dissolved in hydrochloric acid, the solution changed at boiling

heat into the sulphate by adding 20 c.c. of concentrated sulphuric acid to it, heated till white fumes of sulphuric anhydride appear, cooled, diluted to a certain volume (always observing the same volume) and titrated.

Subtracting this result from that of the first titration leaves the amount of MoO_3 present, which is calculated for the metal Mo or for MoS_2 if desired.

The whole work can also be reduced to one operation by adding sulphuric acid to the filtrate from the ferric hydrate to neutralization, reducing with zinc to brown color, and titrating with permanganate, until the color becomes permanent, as in iron.

Fine Grinding in Metallurgy.

TO THE EDITOR:—In response to Mr. E. E. Wann's invitation, I send you a contribution to the general fund of information on the preparation of gold bearing ores for the extraction of values therefrom.

In the preparation of ore by present up-to-date methods, sliming is, as far as possible, avoided, because of the damage to the mill and the difficulty of working slimes by the present methods.

A few questions arise here: Do slimes offer resistance to the profitable recovery of gold from its ores? Can a higher percentage of gold be recovered from ores if it be all reduced to slimes? Is there any intermediate treatment of gold ores that will give a different character to the slimes, whereby the recovery of values may be made less difficult and costly, less time taking and more efficient?

When entering on any proposition of this kind, it is advisable to learn all that we can about the material to be treated. My microscope showed me that metallic gold, in its ores, is in various forms and conditions, which may all be classed under two heads, massive and filmous. The minute microscopic particles in the massive forms have length, breadth and thickness, the filmous have length and breadth without perceptible thickness. Some of the massive forms are round like shot and have the extremes of weight in proportion to size, and by virtue of both form and weight are very sensitive to the slightest slope, and will often run ahead of the angular sands in washing. In another form the particle is porous; and, in proportion to its size, may have very little weight, and when round in form I have seen it run over the top of the sands to a lower level. Where the particles are solid and angular, or flattened, there is no trouble about its sinking in washing. The filmous gold is very deceptive in appearance; it is often found in volcanic regions. A few days ago I was invited to examine some ore from Goldfield, Nev., which appeared to be very rich; it was expected to assay into the thousands. I found that it was filmous; the assay returns were $12. A sample of gold ore was brought to me that milled satisfactorily, but gave nothing in the pan. I ground a portion and panned carefully and got nothing. I ground another portion, put it in the pan with water, stirred it well, and poured off two-thirds of the muddy water into another pan, then put on more water, stirred and poured off as before until the water no longer became muddy, then panned the sands, and got no gold. I took the other pan and stirred up the slimes well, then let it stand quiet while I slowly counted ten, then poured off the muddy water into the other pan, and continued this as before, each time counting ten before pouring off. On gently panning the exceedingly fine sand left, I got a good string of gold.

The muddy water was then stirred up and left quiet while I counted sixty, and repeated as before. On panning this, I had another string of gold. I went down a stream from a mine to a reservoir, where the muddy water was caught from sluicing and so given time for partial settling, got some of the settled slime, and found it carried $16 per ton gold. These tests show that some slimes do carry values, and brings the question: Is it advisable to reduce everything to slimes? I say, certainly not, with present machinery and processes. Then, how far can present machinery be utilized for the production of slimes? The present machinery, in all its varied forms, may be regarded as perfection in saving what I have termed massive gold; let it continue its work. Its work can even be lightened by coarse screens and passing the unslimed tailings to a purposely made sliming mill.

Now comes the question of treating the slimes. Shrewd minds are busily occupied with the subject. My idea is, that the final process will be continuous motion of ore from mill to dump; and that idea is based on actual work done, but by means too costly for profitable use on a large scale. I have seen filmous metallic gold dissolved in cyanide in ten minutes, and returned to the metallic form in another ten minutes, twenty minutes covering the whole time of both consecutive operations.

But, all gold is not alike. I have had filmous gold floating on a solution of cyanide for three weeks without being dissolved. Not only the mechanical treatment of slimes to get mercury or cyanide into contact with the contained gold, but the chemical treatment, to insure action on contact, has to be appropriate to each ore to obtain, at a profit, the results desired. I have frequently had gold immersed in mercury, and stirred about in it, that came out of the mercury without a trace of mercury on it.

The ancient miners heated the rocks by fire, and when hot enough threw water on it, thus softening the rock, making it easily broken. May we not take a hint here, and use fire in some economical way, say crushing to a small size, then passing it through some form of roaster, and dropping the hot ore into water, not only make it more easily ground into slime, but obtaining a more quickly settling slime, and producing a favorable chemical change that will enable both cyanide and mercury to act on the gold that without roasting is not taken up by these methods?

The cyaniding of ordinary slimes in a tank is costly, and often unsatisfactory; the roasting gives a more quickly settling property to such ores as I have tested in this way. A continuous process of both cyaniding and amalgamating gold-bearing slimes may be employed by using revolving tubes, the slimes from the plates or concentrator going in at one end of the tube and out at the other, the tube being set at such an angle that the discharge will permit a certain thickness of slime on all the length of the tube, thus causing every particle of ore to travel a very long distance in contact with the cyanide or mercury. Quick separation of solution or amalgam from the slimes is merely a matter of mechanical detail.

In testing the oil process, I found that petroleum oil has a strong affinity for gold. Water was put in a glass vessel, on the water was put a thin film of the oil, on the oil was scattered sand containing fine gold. The sand passed through the oil, the gold remained suspended in the oil; the heavy particles of gold pressed the thin film of oil down into the water like a sack. On agitation the sacks were detached from the film and sunk, and, on being brought together, the sacks with their contained gold formed one mass that kept separate from the sands, and thus showed its usefulness for separating gold from finely ground ores.

Now, a word as to the supposed absolute reliability of ordinary crucible assays, as a guide to what is being done, especially where values are very low. I have found that in some crucibles, after a clean pour, the glaze on the sides of the crucible contains numerous minute, microscopic beads of gold. Some crucibles taken from the dump of the assay office assayed higher than the ore did. This shows that a crucible assay of tailings may be an unsafe guide, no matter how skilled and careful the assayer may be. This indicates the advisability of some kind of quick analysis, or a method of assaying without the use of unglazed clay vessels, for guidance of mill work by values in the tailings. Evidently we don't yet know all there is to be known about gold and its extraction from its ores.

San Francisco, Dec. 23. JOSEPH VOYLE.

An Important Pelton Contract.

As indicating the strides being made in hydro-electric development, a recent order for Pelton water wheels is very significant. The California Gas & Electric Corporation has closed a contract with the Pelton Water Wheel Co. for a 10,500 H. P. water wheel unit, to be located at the Deer creek station, forming a part of their system of electric distribution. This establishes a record, as there has never before been built an impulse wheel of such great capacity. The unit in question is to operate under an effective head of 765 feet, and will be direct connected to a 5500 k. w. 300 r. p. m. generator. The "double overhung" type of construction will be employed, and the unit will consist of two Pelton wheels, one mounted on each overhanging end of a single shaft which carries the rotor of the engine-type generator. Some idea of the magnitude of this unit will be gained by noting that the rotor of the generator will weigh in excess of 45,000 pounds, and will be carried by a hollow nickel steel shaft 20 inches in diameter. The journals and supports are correspondingly heavy. The wheel centers will be of disc construction of open-hearth cast steel, and fitted with steel buckets secured to the rim by means of turned steel bolts hydraulically pressed into reamed holes. All pressure parts, such as gates, nozzles and connections, will be of cast steel. The gate valves will be provided with roller bearings to take the thrust from the nickel steel spindles, and the valves will be normally operated by electric motors, with provision for hand control when necessary. But a few years ago 1000 H. P. was considered as the limit of capacity for an impulse wheel, and the contrast with the present equipment is most striking.

ZINC is a peculiar metal. When cold it is hard and crystalline, but if slightly heated it is very soft and is susceptible to any treatment that brass may receive. In drawing zinc sheet in a press, the difference between the melting point and that of the temperature at which the best drawing takes place is so small that the problem of heating becomes serious if one is not conversant with the fact that zinc may be heated in oil. Attempts are made to heat by other means, but much waste occurs. To heat in this manner a heavy oil with a high flash point should be used, and a thermometer employed to register the temperature. This instrument will obviate any over or under heating, and prevent waste from such means. In addition to acting as a heating agent, the oil has a good effect on the drawing dies.

Stamp Mill Capacity.

TO THE EDITOR:—In regard to stamp milling capacity it has been suggested in reference to the use of primary and secondary crushing that the revolving trommel, or the impact screen, should be used to separate the sands from 20-mesh pulp for recrushing or grinding to 30 or 40 mesh.

I think that it is now generally recognized in concentration practice that the use of the revolving trommel is, as a rule, limited to the separation of sand sizes above 3 mm. (about ⅛ inch) and, more rarely, under the most favorable circumstances, to sizes above 2 mm. (about 1/12 inch). Working below these sizes the capacity of the trommel is small, and the wear and tear is great—so hydraulic classification is usually depended upon to separate finer sand sizes.

The impact screen is the result of the desire to carry the exactness of screen sizing to greater lengths than is practicable with the trommel. I do not know how effectively it accomplishes this on wet material, and I think that milling men generally would be very glad to see published results on this class of work.

Apart from this, however, it is certainly open to several commercial objections that the hydraulic classifier is not. The first cost is probably greater and the bill for repairs and renewals would certainly be greater, owing in some degree to wear of moving parts, but principally to abrasion of the screen by the ore particles. Then there is a necessary loss of head room in both the coarse and the fine pulp streams over the impact screen, whereas in the classifier there is no loss of head in the fine pulp stream passing over it. Again, the impact screen requires a certain amount of force, while the classifier requires none—the pressure of the water supply does it all. On the grounds of ease and cheapness of handling, the classifier easily has the best of it, and it only remains to decide whether in the work mentioned it will effectively accomplish the desired result. Now, of course, no one claims that the upward current classifier will give a uniformly sized product unless, perchance, it is working on a pulp whose constituents have the same specific gravity, for it sorts out the grains of approximately equal weights, and which have the same velocity in an upward current of water. If a 20-mesh pulp were being treated, the classifier could be so regulated as to remove completely all particles that would be retained on the screens of the secondary battery and with these would be a considerable number of smaller grains of whatever heavier minerals there may be in the ore. The return of these smaller grains would not materially affect the capacity of the secondary battery, but, if subsequent table concentration is carried on to receive these heavier minerals, there might result a loss from sliming in the secondary crushing. A little closer regulation of the classifier by cutting down the water might result in these grains being thrown over into the fine-ore stream, and, at the same time, some of the more barren particles of coarse material (lighter because of its barren condition) might also be thrown over, thus effecting an increase in the capacity by decreasing the amount to be recrushed, and saving the cost of crushing such worthless material. So, here, by being capable of better regulation and by being more delicate in its action, the classifier might score a point on the impact screen.

The only other source of trouble that suggests itself to me in using the classifier in this work is the possibility that the addition of the classifier water might render the pulp passing over it too dilute for good amalgamation. The amount entering the stream from a 10-stamp battery, after allowing for the amount drawn off with the coarser sands, should not exceed twenty gallons per minute. It will vary, however, under varying conditions of crushing and of ore constituents, as well as construction of the classifier, and I think that in most cases it can be counted upon to be less than the figure mentioned.

C. M. EYE, E. M.

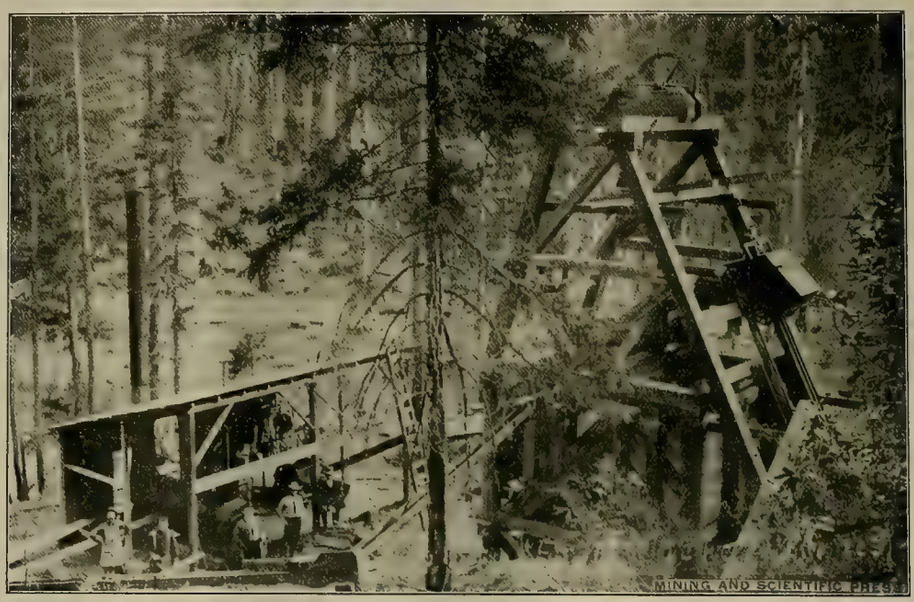
SINCE American occupation, miners and prospectors have often preceded the troops. The American mining bureau at Manila now has reports from almost every one of the very many islands in the archipelago. In many cases samples and specimens have been furnished to the bureau. Through these sources the fact has been established that gold, copper, lead, iron, coal, sulphur, granite, marble, petroleum and other metallic and non-metallic minerals exist in paying quantities. The influence of the miner and prospector is making itself felt, repeating the experiences of the pioneer days of the mineral producing American States of the West. More than that, mining operations in the Philippines, when once they really begin, will have all the present day advantages of the latest devised electrical and other mining apparatus.

Something More of Head Frames.

In a recent issue was illustrated and described a number of types of head frames, built at various places, under varying conditions, and representing several ideas in construction and somewhat of expediency.

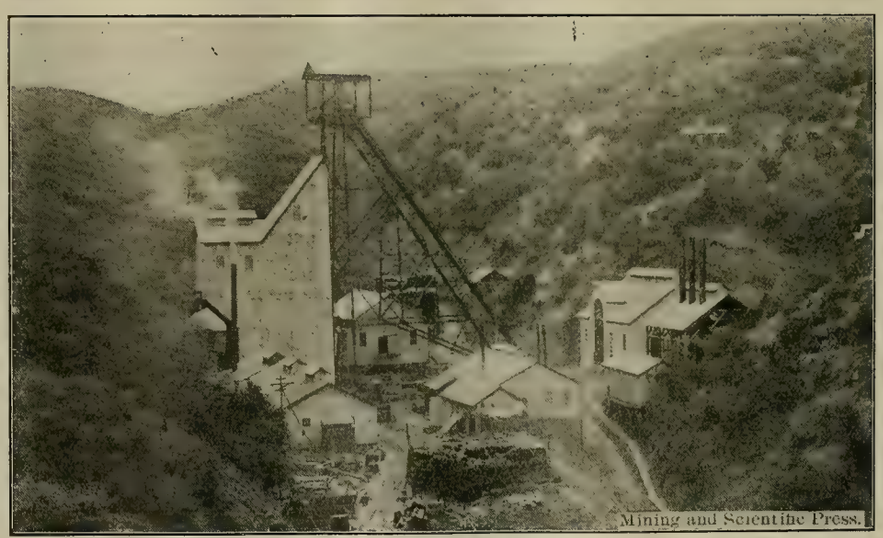
What there appeared is not all that could be said on this interesting and important subject, nor does this addition of the several types here illustrated include all of value in the matter. The conceptions of the practical mine carpenter and those of the mechanical engineer often differ widely. The former builds for solidity and endurance and it is rarely that he builds a structure of this sort which collapses under the strains of the work it was designed to perform. The engineer scientifically designs with a view to assured strength but with the employment of "A" type and, although built of timber, is designed on engineering lines to operate under peculiar conditions. It is a frame which could be copied to advantage at many places where more elaborate and expensive constructions are in use.

Steel Head Frame, Cornish Tin Mine.



A Head Frame in Oregon.

A Two-Post Frame at a Vertical Shaft, in Leadville, Colorado.



Gwin Mine, Calaveras County, California.

the minimum of material, therefore less expense. In the accompanying illustrations are types of head frames which represent simplicity, economy and strength, but without due regard to the engineering features—for instance, the rectangular two-post frames of the Montana type—one at a California mine, the other at Leadville, Colo.

In one of the illustrations we see the steel construction at the collar of a Cornish mine, but, aside from the fact that it is of steel, it offers little, if any, advantage over the four-post wooden frame situated at an inclined shaft in California. This frame is built over a smaller temporary frame, as seen in the illustration. Another type, and a somewhat unusual one, is seen in the peculiar construction at the Oregon mine.

In the steel frame at the Gwin mine, Calaveras county, Cal., is seen a type of modern two-post frame. It is designed to hoist from a depth of 4000 feet, through a vertical shaft, and shows that when material is properly distributed it is not necessary to build as massively as some seem to think.

The frame at the Congress mine in Arizona is of the

Gem Stones of Australia.

Written by JOHN PLUMMER.

For those conversant with the various methods of obtaining diamonds and other gems, this Commonwealth affords an inexhaustible field for the exercise of energy and enterprise. Nearly all the known kinds of gem stones have been found, but the attention of prospectors and miners has hitherto been concentrated on diamonds and noble opal. The former are met with in New South Wales, Queensland, Victoria and South Australia. In the Mother State, until recently, the stones were found mostly by miners engaged in the washing of alluvial for gold. Lately, however, several, including the largest yet obtained in Australia, have been discovered under circumstances wholly different from those characteristic of diamond fields in South Africa, South America and elsewhere, and pointing to the possibility of their being derived from Tertiary deposits. The existence of diamonds in New South Wales was known for years before an attempt was made to work the localities in 1872. In the course of the following year several deposits of diamondiferous wash were discovered at Bingara, in the New England district, and in later years at Boggy Camp, Copeton. The output has never been very considerable, the largest value realized in any year being £15,375. In 1899 the value amounted to £10,350; the output declined in the next two years, but increased to £11,326 in 1902, falling to £9987 in 1903. The total value of the diamonds produced up to the end of 1903 was £86,604; but this amount is believed to be considerably understated. At the diamond mines great care is exercised in the washing of the diamondiferous gravels, the process being somewhat complicated and tedious, but it is so efficient that even the smallest diamonds, no larger than a pin's head, are secured.

Some of the finest opal known is obtained in the Upper Cretaceous formation at White Cliffs, near Wilcannia, New South Wales. During 1895 good stone was found at the depth of 50 feet, and as the lower levels are reached the patches of opal appear to improve in quality and to become more regular and frequent. On one block a patch of stone was found which realized over £3000. It is difficult to state with exactitude the value of the production, but it is believed that stone to the value of £816,600 has been sold up to the end of 1903. In 1901 a special commission was appointed to inquire into matters connected with the opal industry at White Cliffs, and their investigations tended to show that the annual value of production for some years had amounted to £100,000. Despite the fact that operations were hampered in 1902 by lack of water, the production for that year was valued at £140,000. In 1903 the estimated value was £100,000. The number of men engaged in the opal industry was 1115. The opal bearing country embraces an area of several hundred square miles, the great difficulty experienced by miners being the limited rainfall. In Queensland magnificent opal is found in rocks of the desert sandstone formation, sometimes on the surface, but generally at a depth of about 14 feet. The chief fields are at Cunnamulla, Paroo and Opalton, in the far western and northwestern parts of the State, but the scanty water supply has been a great barrier to the progress of the industry. At Station Creek, in the Paroo district, a deposit of opal, valued at £2000, was unearthed during 1903. In that year the production was valued at £7300, and the total up to the end of the year, at £146,145; about 170 men being engaged in the industry.

Sapphires are found in all the States, and at the sapphire fields of Anakie, in Queensland, there is a population of 150 persons. The fields are extensive, but the gems are of a peculiar color, quite distinct

from those of any other country, a characteristic that somewhat detracts from their value, despite their extreme beauty. The value of the gems produced in 1901 was £6000, but owing to the low prices and the lack of sufficient water supply on the field, the returns fell to £5000 in 1902. The season of 1903 was more favorable, the production being valued at £6500. Many of the sapphires found in the Commonwealth are of a blackish color, occasioned by the presence of iron. Could this be removed they would become an intense blue, and extremely valuable. There are extensive emerald deposits in New South Wales, but the hardness of the matrix in which the gems are found forms a source of difficulty, as it is almost impossible to break down the rock without injuring and frequently destroying them.

Among other gems may be mentioned the Oriental topaz and Oriental amethyst, both found in New South Wales. The ruby has been obtained in Queensland and New South Wales; turquoises in Victoria; chrysoberyls in New South Wales; spinel rubies in New South Wales and Victoria; white topaz, in all the States; and yellow topaz in Tasmania. Chalcedony, carnelian, onyx and cat's-eye are found in New South Wales; and it is probable that they are also to be met with in the other States, particularly in Queensland. Zircon, tourmaline, garnet, and other gem stones of little commercial value are found throughout Australasia. Garnets of a rich color and luster are obtained in South Australia, where at first they were mistaken for rubies.

A Two-Post Montana Head Frame at a Vertical Shaft.

An Ordinary Type of California Head Frame at Inclined Shaft.

How Oxygen Assists and Retards the Dissolution of Gold in Cyanide.*

Written by H. Forbes Julian.

A doubt has for some time existed as to the accuracy of the generally accepted idea that free oxygen is primarily essential for the dissolution of gold in cyanide solutions, according to the equation—

$$4KCy + 2Au + O + H_2O = 2KAuCy_2 + 2KOH.$$

Experiments are described which go to show (1) that free oxygen plays no primary part in the reaction, (2) that any assistance given by free oxygen is of a secondary nature, and (3) that free oxygen exerts a retarding influence.

The experiments show that the galvanometer points to the presence of free oxygen as having a retarding influence on the dissolution of the gold, whereas the balance points to it being of material assistance. The cause of the two instruments not agreeing is discussed, and is attributed to the formation of local voltaic circuits. These, in the first instance, deposit hydrogen and oxygen which, it may be assumed, become occluded at their respective electrodes until the systems are in equilibrium. It is pointed out that cyanogen leaves the solution to combine with the gold rather than that gold particles pass into the solution, and it is shown that cyanogen does not leave the solution until the deposited oxygen has been occluded to a certain degree of concentration. The reason for this is that the expenditure of energy necessary to remove oxygen from the solution is less than that necessary to remove cyanogen, but when oxygen is occluded to a certain concentration, the expenditure of energy then necessary to cause the metal to occlude a further amount becomes as great as that necessary to begin to remove cyanogen from the solution. The available energy is obtained from the metal and solution, and it follows that when the solution is very dilute the available energy is too small to remove cyanogen, oxygen being then alone deposited. From this it may be conjectured that no metal actually combines with cyanogen until the solution has a certain minimum strength.

The presence of dissolved oxygen in the solution has a secondary effect in the process of dissolution, by oxidizing the occluded hydrogen, produced through the action in the local votaic circuits. This results in upsetting the equilibrium, and introducing into the circuits concentration gas cells, which soon bring about equilibrium again, but this time with oxygen at both electrodes at different concentrations, instead of hydrogen and oxygen. If, now, excess of dissolved oxygen diffuses to either of the electrodes the equilibrium is again upset, and an E. M. F. is generated by the gas cell in opposition to the E. M. F. generated by the metal couple; the net result being, of course, a current in the direction of the greater E. M. F. As the strength of the solution increases after a certain point, the E. M. F. due to the metal couple increases rapidly, whereas that due to the oxygen concentration cell remains constant or increases only slowly.

The increase in the E. M. F. of the metal couple appears to be largely due to the formation of AuCy —a compound having a high potential which acts as an electrode. This deposits in films, varying in density or thickness to a maximum with the strength of the solution. A couple results of Au—AuCy. After this stage of the process, when AuCy is formed, oxygen ceases to exert an influence. That is to say, the metal passes into solution by the AuCy dissolving in the potassium cyanide solution, as one salt dissolves in the solution of another.

The effect of the gas cell is best observed in highly dilute solutions at ordinary or low temperatures. After a certain strength is attained, dependent on temperature, the effect of the gas cell is entirely masked. At the higher temperatures the E. M. F. of the gas cell diminishes, with a corresponding increase in the E. M. F. of the Au—AuCy couple.

An "A" Frame at Congress Mine, in Arizona.

* Abstract of paper read before the British Association in South Africa.

Notes on Southern Nevada and Inyo County, California.—III.*

Written by H. H. TAFT.

The Jumbo was sampled many times and "turned down." It was bonded and a shaft was sunk, with no results. On the Quartzite a shaft was sunk and trenching done and the property was given up. On November 10, 1902, H. Stimler and W. A. Marsh camped at Rabbit Spring, where Goldfield now gets its water, and soon after made locations in the Sand Storm section. In the spring of 1904 the Sand Storm and Kendall claims were carefully explored, with no results. In the Jumbo gold was found by panning the soft rich country rock close to the reef which was rich; but the vein was found later in the reef, through which it takes a zigzag course.

After the incorporation of the Jumbo Mining Co, leases were let for the last seven months of 1904, according to the custom of the district, in blocks 200 feet long by the width of the claim, royalties being set at 25% of the gross yield. These leases yielded over $1,000,000. The best piece of ground, 200 feet long and 200 feet deep, yielded in round figures 2000 tons of $350 ore and 3000 tons of $50 ore. The Quartzite and the Sand Storm are now among the active shippers. One lot of 14.5 tons from the Kendall claim of the Sand Storm group yielded on the plates of a stamp mill $45,785 and is said to have left tailings valued at $1000 per ton.

The Combination Mines Co. is the only corporation in the district that is carefully preparing for regular future production. Good buildings are under erection, a pipe line has been laid 10 miles to a spring, and a well-built mill has been completed. The principal vein is parallel to that of the Jumbo. Just to the northwest, on a cross vein, is the January, which has a dump of several thousand tons of milling ore awaiting treatment. The Florence mine, one of the best, is on another cross vein east of the Combination. This group of four mines is the most important in the district.

Four miles north of Goldfield town is Diamondfield, about 1 mile north of which occurs another group of promising mines from which some shipments have been made. One of these is the Black Butte, a prominent topographical feature. On this property has been developed ore of probably the lowest grade ($20) mined in the district. A short distance north, on the slope of the butte, is the Quartzite "fraction," one of the most promising properties now shipping ore. Half a mile north is the Vernal, which has also shipped some ore. To the northwest are two very strong quartz reefs, in which very limited prospecting has not yet developed any important ore bodies.

The explorations near the Sand Storm, 3 miles west of Diamondfield and a little farther from Goldfield, have not been specially fortunate, except in the Tonopah Club, which is in the low ground lying between Diamondfield and the Sand Storm.

Northeast of Goldfield town some important discoveries have been made; and ore has been shipped, notably from the St. Ives, a claim covering a very prominent reef near the Jumbo, and from the Cimerone. The latter was found during the summer of 1904, and the finder literally camped on it, putting his tent and bed over the rich place, until he had succeeded in buying the fractional claim from the original locator. Then he made the discovery public, and in a few weeks sold out, it is said, for $60,000 cash.

In March, 1905, the town of Goldfield, lying between the Combination mine and the mesa at the foot of Montezuma mountain, had an estimated population of 10,000, and Columbia, practically an extension 1 mile northwest, had 2000, and Diamondfield about 500. Goldfield and Columbia are supplied with excellent water by two 2-inch pipe lines. The water comes from under the mesa immediately west. The Combination Mines Co. has a pipe line from the Warm Springs. Twenty miles west of Goldfield is the Silver Peak marsh, where there is an open lake.

Both at Bullfrog and Goldfield the situation is somewhat discouraging. In March last scarcely fifty men were working at Bullfrog and about 200 at Goldfield. While actual development was thus neglected, the industry of transferring to new corporations groups of claims, good, bad and indifferent, of selling the stock of such corporations, was active. All American mining districts have passed, and will doubtless hereafter pass, through such a period.

TONOPAH.—The veins in this district are much stronger and more condensed and possess the regularity of silver veins, which they should be deemed to be, since the values are about two-thirds in that metal. The railroad has only been in Tonopah a year and has been overwhelmed by freight for the newer districts. One small mill, owned locally, is operating. The owners of the developed properties do not seem to think that the time is yet ripe for large reduction plants.

About 1500 tons of high-grade ore is shipped weekly to the smelters, and, incidentally, an enormous amount of milling ore is blocked out. It is said that one company has $35,000,000 in "positive ore." In one of the mines 60 feet thickness of $28 ore is reported. The maximum depth reached is 1000 feet. This district has, therefore, long passed its doubtful stage.

The country rock is andesite, so overflowed by more recent volcanoes that very little of it is exposed. The explorations of the past year have gone through this overflow and found ore by drifting in the "mineralized porphyry" below.

The development of milling, always an expensive and interesting problem, will be unusually so in these three districts. Their ores, though different, are all typically milling ores, consisting of quartz with very little base metal. Should smelting be necessary, there are several flux-producing districts, now idle, which could be drawn upon.

BORAX DEPOSITS.—South of the Funeral range, in the region drained by Furnace creek and on the Amargosa side of the mountain, is a large development of recent sedimentaries—shales, clays, sandstones and thin sheets of gypsum. There are a few intrusions of later andesite and a heavy flow of black and brown basaltic lava. In these sedimentaries immense deposits of calcium borate occur, conformable with the strata. The most common mineral is colemanite. As one might expect from an element possessing the peculiar solubilities of borax, there are many combinations of boric acid, lime and soda under various mineralogical names. There is some question as to the origin of the deposits. The Pacific Coast Borax Co. first obtained title under the placer law, but now favors lode locations. That company has the region pretty well "corralled" for borax. The rocks are highly colored. The country is bare of vegetation and water is scarce.

The borax deposits are remarkable in size and purity. In one place there is an outcrop of calcium borate 30 feet thick. At the Lila C. mine, on the Amargosa side of the range, 35 miles from and in sight of Ash Meadows, is a deposit, from 3 to 17 feet thick, dipping about 45° E., and explored on the surface for a mile. The underground workings are in the vein (?) for a quarter of a mile. This is the property that will bring a railroad to this section.

DEATH VALLEY.—Much has been written about this valley and a strange amount of romance is attached to it. The prospector could easily find a more promising field and a less expensive place to work a mine in. It is a long, narrow valley, very deep and surrounded by high mountains. The Panamint and Sentinel peaks reach an extreme elevation of 11,000 feet, while Death valley, hardly 10 miles west, is 200 or 300 feet below sea level. A similar difference of elevation occurs 80 miles northwest, between the summit of Mount Whitney and Owens Lake valley.

Under one general name there are three connecting valleys: Death valley proper, Lost valley and Mesquite valley. The upper end of the latter is only about 30 miles from Goldfield. Instead of being the horrible region usually reported, it is the best of the desert valleys. Lying so low and being shut in by surrounding mountains, it is hot in summer; but the winter climate leaves little to be desired, particularly by those who require a dry atmosphere. It is but a few miles west to an elevation in the Panamints, where in the shade of the pines the traveler can be comfortable and look into the sweltering valley below, while a battery of abandoned charcoal kilns might make him fancy he was summering near Lake Superior.

The name Death valley comes from the loss of an emigrant train in the lower end of Lost valley. The party was on the way from Salt Lake to southern California, and, becoming exhausted, stopped to rest in what appeared to be a meadow. The salt and wiry grass is not nutritious; the water is saline and carries enough sulphates to disarrange promptly the human digestive system. The spot, where it is said about fifty people perished, has been dug over for buried treasure, and last winter many of the pits were in brackish water. Some prospectors, also, have lost their lives in the south end of the valley.

At the mouth of Furnace creek the Pacific Coast Borax Co. maintains a ranch, having 200 acres in alfalfa and wheat. Twice a month a 16-mule team arrives from Dagget, 160 miles away on the Santa Fe Railroad. Three miles from the ranch are the old Coleman Borax Works.

Furnace creek and several streams south, usually dry, bring down borax in solution. For a few miles in width and a length of about 30 miles, the lower part of this valley looks like a mud flat with the tide out. These places are locally called marshes, although they have no vegetation. The borax is here a double borate of lime and soda, commonly called "cottonball."

A peculiar phenomenon, better seen in this than in the other valleys, is the "self-rising ground." The soil carries a large proportion of soluble salts, sodium carbonate, sodium chloride and various sulphates and borates. Evaporation is excessive; the subsoil is moist, being constantly supplied by springs; and capillary attraction brings the salts to the surface. This does not go on evenly, but forms hummocks sometimes 2 or 3 feet high, hard on the surface and soft beneath, making a bad and sometimes dangerous ground to walk across. The same natural laws have caused the surface enrichment of some mineral veins in the desert, particularly veins of copper ore.

The atmosphere in the valley is remarkably clear and possesses the resonance so noticeable above timber line. There is no truth in the story about birds and animals dying in attempting to cross the valley. The Indians and the Borax Co. keep several hundred cattle and some mules and horses about the mouth of Furnace creek, and rabbits, quail and other small game can be found.

PANAMINT RANGE.—This range is unusually high and precipitous, starting at sea level instead of several thousand feet above, as most other high ranges do, and having no foothills. The rock is green slates, mica schist, quartzite and limestone. On the west side is an intrusive granite which has tilted the whole formation, the larger part of it to the east. The green slates carry fine-looking quartz, but so far it has not been found to carry values. On top of the range are large areas of recent conglomerate and basaltic lava.

Panamint City had once 6000 people and is now reduced to a few old-timers, who say it will soon start again and make "the greatest camp on earth." The ores are of silver—refractory and heavy, with a pyritic gangue. The railroad is 90 miles away.

On the west side of the mountain every gulch for 46 miles has some sort of a mining equipment, usually a small stamp mill and owned by some Los Angeles company. The first question asked of strangers is: "Are you from Los Angeles?" It is best to answer: "No."

LEAD MINES.—South of the Amargosa there are some lead ores and two large deposits of iron ore. They are too far from a railroad to have anything but speculative value.

The mountains between the Panamints and the Sierra Nevada were once the scene of great activity in lead-silver mining. Old roads constructed at great expense, smelting plants at the mines and charcoal kilns many miles away in the timbered mountains are mute evidences of this former scene of activity.

Cerro Gordo, Darwin and Modock produced between 1870 and 1880 approximately $25,000,000. The first-named was the heaviest producer, furnishing the largest quantity and lowest grade of ore, while the last produced the smallest tonnage and the highest grade. They are all at or near the contact of granite and limestone. Unlike the deposits at Monarch, Colo., along a similar contact, these ore bodies are from a few feet to 300 feet away from the contact, in cracks and crevices of the limestone.

At Darwin there is an anticlinal about 6 miles long, the west side of which dips about 45° and the east side more steeply. The latter carries some copper, while the former shows none. The oxidized surface ores contain roughly one ounce of silver to 1% of lead and the galena ores two ounces of silver to 1% of lead. From the old books left at some of the works it would appear that the average ore contained from 40% to 60% of lead. The gangue is iron and lime, with some silica. There are four smelting plants near this place, one of which is in good condition, and twenty persons are still living in the town.

The "on dit" of the country is that the ores became too poor to work at a depth of 800 feet. While these mines were working Mojave, Cal., was the nearest railroad point, and wood and charcoal had to be hauled long distances. From the charcoal kilns in the Panamints to Darwin is 50 miles. The altitude of the kilns is 8000 feet, that of Darwin 6000 feet and that of the intervening Panamint valley 1100 feet above tide. The price of fodder must have been high. The nearest farms are now 50 miles away.

Cerro Gordo is 7 miles from and 3500 feet above Keeler, the terminus of the Carson & Colorado Railroad, 334 miles from Reno, and by wagon road 120 miles from Mojave. Here are located the soda works of the Inyo County Development Co. With diminished treatment charges at custom smelters, lower rates of freight and the flood of siliceous ore now going on to the market, it would not be surprising if these lead ores, with their useful fluxing character, should be again mined with profit.

OWENS LAKE VALLEY.—Owens Lake valley, about 75 miles long and 20 miles wide, is drained by Owens river, which flows into the lake of the same name, about 18x12 miles in area. The water of the lake is a nearly saturated solution of sodium carbonate and common salt, with a little sulphates and borax. There is no verdure around the edges.

The river is fed by streams from the west, having their origin in the Sierra Nevada, a very high, narrow and well-timbered range. All the older settlements are on these streams, but the railroad follows the east side of the valley. A large ditch has been carried by an irrigation company down the east side of the valley to within 12 miles of Keeler, and the newcomers are settling along this ditch.

While this valley is fertile and well watered, particularly at the north end, the farmers have not as a rule been prosperous, because the market was too distant. Now a sudden change has come. From Laws station, opposite Bishop, in the upper end of the valley, to Tonopah is 113 miles by rail. It is fortunate both for the farmers and the miners that there should be an agricultural region so near.

All the streams coming from the Sierra Nevada

*Trans. Am. Inst. Min. Engs.

furnish opportunities for developing water power; already a company is preparing to generate and transmit electric power from Bishop creek to Tonopah and Goldfield.

All the grains and fruits of the temperate zone are raised here. The apples, peaches, pears and certain varieties of grapes are better than those raised on the coast side of the Sierra.

SMALLER MINES TRIBUTARY TO OWENS LAKE VALLEY.—In the south end of the Argus range and in the Coso mountains are many veins, usually only a few feet in width, of white quartz in granite, occasionally carrying gold, low in value and in spots rather than in regular ore bodies. Most mining men dislike these conditions. The Congress mine in Arizona is the only large and successful enterprise working this class of quartz.

The Beveridge and Lee districts, northwest of Darwin, have argentiferous ores. At the latter place there was formerly a stamp mill, which, judging from the amount of tailings, did not run long.

The Ubaheba district, lying between the Saline and Butte valleys, is a large, undeveloped region of low-grade copper ores in contact deposits between limestone and some acid eruptive. These valleys are very deep and would be a continuation of the Panamint valley but for an east and west mountain that looks like an enormous dam. The west end is granite; but the larger portion of the mountain is recent conglomerate overflowed by basalt.

In the mountains facing Owens Lake valley on the east side, both in the granite and the chloritic slates, quartzites and limestones, which the intrusive has thrown on edge, there are numerous veins of white quartz, carrying occasional gold values.

Between the stations of Alvord and Citrus, 3 or 4 miles from the railroad at the foot of the mountain, and well located for economic reasons, is a new stamp mill and outbuildings, now idle.

Farther up the valley, at Poleta, there is a plant running.

FROM OWENS VALLEY TO GOLDFIELD.—From Alvord station, 5 miles from Big Pine, 20 miles from Bishop and 54 miles by rail from Keeler, there is a wagon road 61 miles to Lida and 96 miles to Goldfield. This road is now much used by freighters and farmers hauling produce to Lida, Goldfield and Tonopah. Three ranges of mountains and two valleys are crossed. Between Deep Spring and Fish Lake valleys there is a gold-copper exploration near the road. In the mountains east of Fish lake are two old mills.

About Lida and between Lida and Montezuma mountain the formation is light-green slates overlain nonconformably by limestone. In the slates are dikes of porphyry and rhyolite and many quartz veins. At Lida the veins are exposed on the surface and show remarkable persistence in length; but when worked thirty years ago they were found to lose their values at a depth of from 200 to 300 feet. The ore is quartz, with little galena and zincblende. The principal values are in silver.

From Lida east to the Kawich range the rocks are all volcanic, from rhyolite to basalt inclusive, but rarely are there any of the earlier tuffs or andesites.

Gold Center is a small area, similar to Goldfield, but the ores are not particularly high grade or continuous. The soft, aluminous country rock seems to have moved too much after the ore was deposited.

Quartz mountain, 24 miles south, is of rhyolite, with veins similar to those of the Bullfrog district.

It is remarkable that so many mines have been found of late years in the volcanic tuffs, now generally known as andesite. A very large portion of them carry gold. One can not but wonder if there are not more. This is not a formation which prospectors have liked until lately; and as yet it has been but imperfectly studied. The fact that the mineral-bearing tuffs are basic, and are overlain by the acid rhyolite, is perhaps significant. Cripple Creek has a rhyolite mountain in which much money has been spent without satisfactory results. The nature of the veins, too, is new. They may often be called freaks. Mineralizations of country rock are to be expected rather than "text book" veins, such as used to be sought for.

THE use of gold in exchange and adornment, and copper for utensils, was common among the natives of the Philippines upon the first landing of their Spanish conquerors 400 years ago, but the Spaniards never encouraged the systematic mining of metals. Placer washings, and the most primitive methods of mining and working quartz were, and still are, in use by the natives. Revolutions, burdensome laws, and the scarcity of skilled labor discouraged foreign mining enterprise in the long line of Spanish days.

Testing of High Power Gas Engines.

Written by WILLIAM H. SPILLER.

The modern gas engine has to undergo prolonged and severe test in the factory, far more critical than the majority of steam engines ever pass through. The duration of these tests varies from one week to fifteen days, according to the size of the engine, the work it has to perform and the distance it has to be shipped.

It can readily be seen that in a piece of mechanism weighing from twenty-five to fifty tons some of the parts will weigh from one to five tons, and that these various parts must represent a great deal of money expended for making and the high-class labor of finishing, to say nothing of the cost of the splendid grade of material required for this type of power machinery.

As these engines are sold under a positive guarantee covering consumption of fuel per horse power per hour, workmanship, material and general efficiency under actual operative conditions, the reason for the excellent exhaustive testing is at once apparent.

The manufacturer cannot afford to run any risk of a shut-down of a plant from any cause after installation on the customer's foundations.

The expense of shipping, the services of the erecting engineer and his expenses from the factory are considerable; therefore, the manufacturer takes the trouble and expense of assuring himself, as well as protecting his customer, that there will be no flaws, no trouble or vexatious delays, but a perfect working, economical and absolutely reliable up-to-date power, placing the engine in a field distinctively its own, acknowledging no competition, bowing to no other power.

The first tests are made by the chemist when he analyzes the pig iron or steel as received from the mill, and this analysis must tally with the specifications calling for the particular grade required for certain parts of the machine.

Then when a heat is run, a test piece is made and put under test until it is fractured and the ultimate or breaking strength is known, and then the unit stress per square inch, with a proper factor of safety for the material, is determined.

The factors of safety in gas engines are very high, for the strains are exceedingly complex, there sometimes being not only compression and tension strains, but also cross and traverse strains in the various parts.

When a casting has been made in the foundry it is gone all over with powerful blows delivered with a heavy hammer, to ascertain if the casting is perfect; and if any chambers have been cored, this will show if there are any thin or weak spots in the walls.

If any defects are developed the piece is immediately rejected.

After the cylinders have been finished, and before assembling the engine, they are tested under a high water pressure with a special device, and the pressure, number of the cylinder and engine recorded.

The various materials and parts of the engine having passed these preliminary but systematic tests, and then being assembled, forming the completed engine, the cams and gears set correctly for the proper timing and igniting of the gases in the cylinders, the valves in proper position for admitting and exhausting of the gas, the engine is then ready for its initial run.

The indicator, so familiar to steam engineers, is used, and a card is taken from each cylinder on the engine.

It might not be out of place to state here that these large engines are started by means of compressed air, admitted through an automatic starting valve to one cylinder, and the engines operate by this means until gas has been drawn into the other cylinders upon the descent of the pistons, compressed and ignited, and then upon shutting off the compressed air and admitting gas to the first cylinder it immediately assumes its cycle of operations upon gas, giving its power also.

The compressed air is supplied by means of a small 2 or 3 H. P. gas engine, air compressor and air receiving tank, furnished with every plant.

The indicator cards taken from the engine show to the trained testing engineer the exact amount of compression in pounds per square inch of the mixture of gas and air; the pressure of the burning gases after ignition, the pressure of the exhaust, and also whether the intake and exhaust valves are set properly for the highest economy, and whether the igniters are timed accurately for igniting the gas at the proper point of the stroke to gain the greatest power.

The valves on these large engines are operated positively by mechanical means, and as they are provided with a device for adjusting to the one-thousandth part of an inch, it can be understood what an excellent opportunity is presented to the engineer for securing efficiency and economy.

Some manufacturers have been in the habit of cataloguing their engines under the indicated horse power, and we have seen records of test runs having been made of gas engines and the fuel economy per horse power credited as being a great deal higher than that of other engines.

Had these same engines been tested under a brake load and that test been published, it would have been the correct way to list and sell an engine, as the purchaser would know how much power he is going to have actually delivered to the belt after consuming a certain amount of fuel.

As the brake test is the most important test from the purchaser's standpoint, we will now consider it in detail. In making this test of the boiler horse power or delivered horse power, the determination is made by means of a type of dynamometer, known as the "prony" brake. This consists of a large cast iron ring, having both inwardly and outwardly projecting flanges, the inner flanges serving as a trough to hold the water necessary to keep down and absorb the excessive heat developed when the engine is delivering a great amount of power.

A small pipe standing at the proper height allows the water to flow into the ring, maintaining a constant amount of water necessary to supply the loss from rapid evaporation, and the heat is partially dissipated in the form of steam and the excess of water carried away by means of an overflow pipe. The accompanying engraving shows a test being made of a 300 H. P. producer gas engine, operating upon pea coal and consuming less than one pound of brake horse power per hour, in the manufacturing establishment of the Weber Gas Engine Co., Kansas City, Mo.

At the time the picture was taken the engine was delivering about 350 H. P., and the clouds of steam from the brake obscured part of the view.

The outer flange on the ring serves to hold in position the brake strap of steel to which shoes of wood are riveted. This strap is provided with two powerful hand wheels at the back for tightening and increasing the friction on the ring or drum. Lubrication is supplied from pieces of tallow placed between the blocks of wood. The band or strap has a lever rigidly attached and firmly braced to it at different points. The drum is bolted to the fly-wheel and revolves with it; the brake arm resting upon a knife edge on top of the wooden stand on the platform scales prevents the brake from revolving when the strap is tightened, and allowing the downward push to be weighed in pounds and fractions on the scale.

The engine is run at normal speed, and the strap is tightened until the speed of the engine remains constant and carries the proper load in horse power, as indicated by the weight necessary to balance the scale.

The brake horse power is computed by multiplying the pressure upon the scale in pounds by the length of the brake arm in feet, times the revolutions of the drum per minute by the decimal .0001904.

The length of the arm is taken as the distance from the center of the engine shaft to the knife edge on top of wooden stand on the scale.

The weight of brake arm and wooden stand is deducted from the total weight as registered by the scale.

Testing of a Gas Engine.

PYROMORPHITE is a lead phosphate and chloride. It is rarely in sufficient quantity to be of commercial value. Its beautiful crystalline structure, and occurring as it does in a number of colors, makes specimens highly prized and priced. The old Phœnix mines of Phœnixville, Pa., produced some of the world's finest specimens.

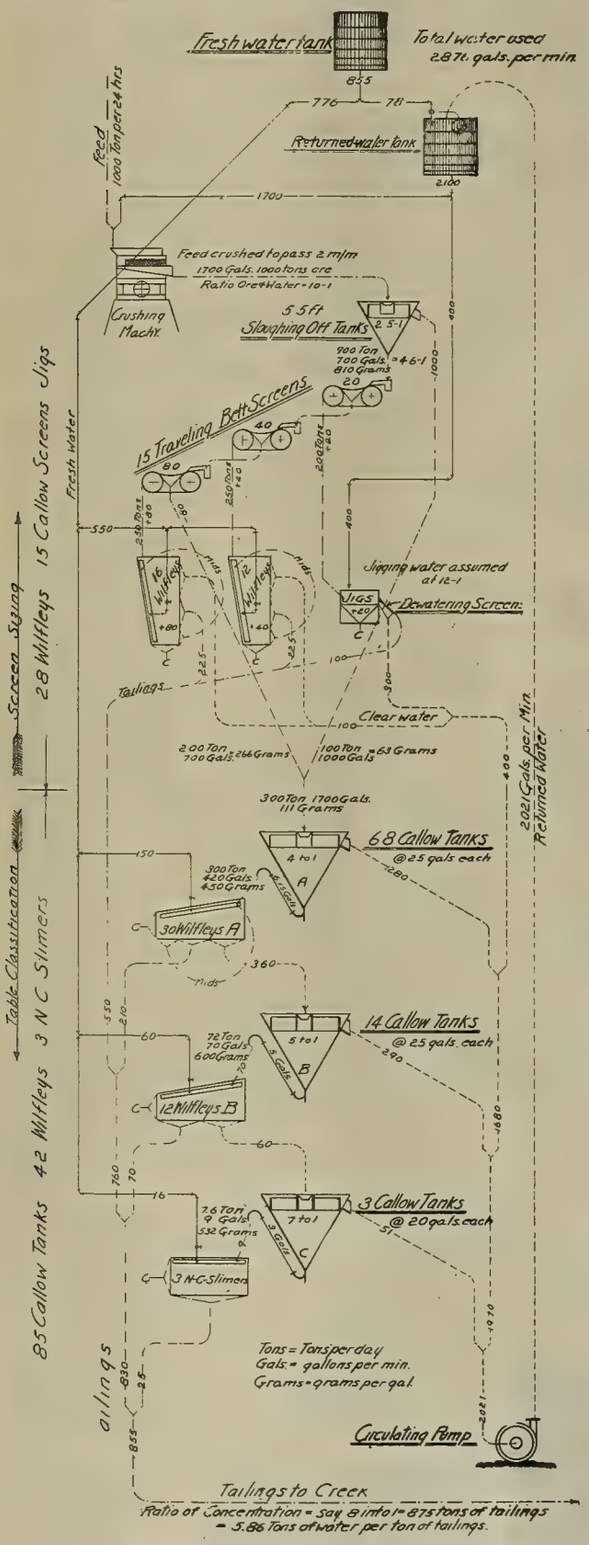
THE Castle Dome district in Yuma county, near the Colorado river, was at one time a noted producer of lead-silver ore. Tiptop is an almost forgotten, but at one time, rich silver camp, in southern Yavapai. The hornsilver and native metal found there were at one time famous.

LARGE masses of moss agate have been found in abundance in the foothill range of the Black Hills, in the Hartville mining district of Wyoming, about 130 miles north of Cheyenne. The material occurs in lenses from 5 to 6 or more inches in thickness, and varying in width from 2 to 3 feet.

Classification as Applied to the Concentration of Finely Crushed Ore.

By J. M. CALLOW.

It will be generally admitted that the greatest problem in ore dressing has been the proper and accurate sizing of finely crushed material. Hitherto the limit of exact sizing—in other words, screen sizing—has been in the neighborhood of 2 mm. The Callow screen has enabled screen sizing to be carried to any mesh, 200 inclusive, but while on a certain grade and character of ore this will be found perfectly practical and feasible, yet on other ore, less complex and of lower grade, it may be considered an unnecessary refinement. But whether 80, 100 or some finer mesh may be determined upon as the practical limit for a particular ore, there is still left in any case a wide range of undersize particles on which it is equally as important and profitable to practice some form of sizing or sorting. Any contrivance calling for additional water for this purpose is inconsistent, since these pulps are already too dilute, and if surface or whole current classifiers are used, the sorting performed by them is so crude and their several products so badly contaminated with slime that they offer no practical advantage over a simple settling scheme. Therefore, for any improvement in this department some fresh element must be sought for. This is found in the percussion table, which both concentrates and classifies, stratifying its feed not only into bands of gangue and mineral and their intermediate products, but also separating the sand from the slime more effectively than any other apparatus, and this without the addition of any water other than that necessary for the regular operation of the machine.


Fresh water tank
Total water used 287t. gals. per min
Returned water tank
Feed 1000 Tons per 24 hrs
Feed crushed to pass 2 m/m
1700 Gals. 1000 tons ore
Ratio Ore+Water = 10-1
Crushing Machy.
5.5 ft Sloughing Off Tanks
2.5-1
900 Ton 700 Gals = 46-1 810 Grams
15 Traveling Belt Screens
Fresh Water
Screen Sizing 15 Callow Screens Jigs
Table Classification 3 N C Slimers 42 Wilfleys 85 Callow Tanks
Jigging water assumed at 12-1
Dewatering Screen
Jigs
Tailings
Clear Water
200 Ton 700 Gals = 266 Grams
100 Ton 1000 Gals = 63 Grams
300 Ton 1700 Gals. 111 Grams
68 Callow Tanks @ 25 gals each
4 to 1
A
300 Ton 420 Gals. 450 Grams
30 Wilfleys A
14 Callow Tanks @ 25 gals each
5 to 1
B
72 Ton 70 Gals. 600 Grams
12 Wilfleys B
3 Callow Tanks @ 20 gals each
7 to 1
C
7.6 Ton 9 Gals. 532 Grams
3 N-C Slimers
Tons = Tons per day
Gals = gallons per min.
Grams = grams per gal.
Circulating Pump
Tailings to Creek
Ratio of Concentration = say 8 into 1 = 875 tons of tailings = 5.86 Tons of water per Ton of Tailings.
202 Gals. per Min. Returned Water

Callow's System of Ore Classification, as Applied to the Concentration of Finely Crushed Materials, and the Recovery of Operating Water.

The practical limit of screen sizing having now been advanced from 2mm. to 80 mesh or finer by the invention of the traveling belt screen and with the Callow settling and pulp thickening tank at hand for settling and thickening the undersize and combining these with table classification, a thoroughly practical and perfect system of sizing is the result, which is fully set forth in the accompanying diagram. It will be noted, moreover, that the recovery of water incident to this arrangement is no less important than the other features characteristic of the system.

The Fight for Le Roi.

Among the noted mines of British Columbia, the copper-gold producer known as Le Roi, at Rossland, is the most prominent. The mine was discovered on the slope of Red mountain, near where the city of Rossland now stands. In its early history it attracted but little attention, but the owners believed in it and spent considerable money in its development. Pay rock was eventually found, and the obscure prospect rapidly developed into a mine and attracted world-wide attention. It was floated in England for a large sum and for a time produced handsomely. In time the large and easily available ore bodies were extracted—faster than new ones were developed—and evil days came upon the property. Expenses were reduced, equipment extended and new ore bodies discovered and developed. The character of the ores in the Rossland district has made a mixing of the ores of the several mines advisable, and even necessary, to obtain suitable smelting mixtures. This led to the proposition to consolidate several mines of the district. To this some stockholders strongly objected, while others favored it. At a meeting held in London on the 8th inst., the difficulties of the company were discussed at length. In his address to the stockholders, H. W. Tyler, chairman of the company, recited the difficulties of the past and, in part, spoke as follows:

"We are met here to-day to consider mainly two things—(1) to discuss the report and balance sheet, which we have laid before you, as to the working of the Le Roi mine during the year 1904–5; and (2) to decide the important question as to whether this company is to be worked in future as a separate company, or whether it shall be included in a new company to be formed by the amalgamation of several existing companies. In reviewing, at our meeting in January last, the history of the Le Roi mine, from the date of the special meeting in May, 1902, at which, contrary to our wishes, Mr. Hill, the former chairman, had resigned, I took the opportunity of reminding you that we had, under the able management of J. H. Mackenzie, recovered from the serious and apparently hopeless financial difficulties which had caused Mr. Hill to call that special meeting and to tender his resignation. And you will remember — (1) that Mr. Mackenzie realized for us for the year ended June, 1903, a profit of £80,242, after writing off £32,015 in respect of development, and £19,148 for depreciation; (2) that by the end of December, 1902, the previous deficiency of net assets, amounting to £40,000, had been converted into a surplus of net assets of £80,000; and (3) that in further working to June, 1903, the position had again improved until the excess of liquid assets reached at that date no less an amount than £92,621. In spite of ill health, Mr. Mackenzie, who had resigned in the Autumn of 1902 to seek the more congenial climate of San Francisco, was good enough, at my special request, to remain at the mine until February, 1903, when S. F. Parrish, who had been strongly recommended to us, succeeded him as general manager.

"Under the management of Mr. Parrish, the working of the mine and smelter showed losses in place of profits for the four months between June, 1903, and December, 1903; but Mr. Parrish cabled in February, 1904, that he had found a large amount of payable ore at the 1350-foot level, that future prospects were excellent, and that he was shipping from the mine 650 to 700 tons daily, with six furnaces in full operation at the smelter. Then began, in February and March, 1904, what I may designate as the Parrish troubles. We heard from the office manager that Mr. Parrish was ill, and might not be able to return to business for some time, and that Mr. Wilson had closed down all the furnaces at the smelter; and Mr. Fraser, the manager of the Rossland branch of the Bank of Montreal, also cabled to us, urging that we should quickly secure the services of Mr. Mackenzie. We at once, on March 31, 1904, cabled to Mr. Mackenzie, and informed the shareholders of the position. Mr. Mackenzie lost no time in acting on our request, and he had reached Rossland on April 3. On April 7 Mr. Mackenzie cabled to us reporting serious differences of assay between the mine and the smelter, suggesting a cleaning up of the furnace bottoms, and recommending a contract with the Trail smelter, but was then powerless in the matter, inasmuch as my colleagues on the board held contrary opinions to mine, which they strongly expressed here last January. Mr. McMillan reached Rossland on May 5, and Messrs. Bradley and Mackenzie acted as consulting engineers until August. Mr. McMillan cabled to us on August 30, 1904, that Messrs. Bradley and Mackenzie had resigned their position, as, according to Mr. McMillan, their views did not harmonize with his, and I heard from Mr. Mackenzie, in a letter dated September 20, that they did not consider it wise to keep the Northport smelter in operation under the then existing conditions. It has since been reported to us, the figures having been worked out by the accountant at Rossland, employed by Mr. McMillan, that we incurred a direct loss of $109,579 in one year, by continuing to use the Northport smelter against the advice of Messrs. Bradley and Mackenzie.

"It is, unfortunately, the fact that the monthly profits have been on a diminished scale. And these considerations have a direct bearing upon the subject, the all-important subject which we to-day have to decide: Can we go on working the Le Roi mine by itself, with a reasonable prospect of finding for ourselves, and providing for you, substantial dividends in the future? Or should we be subject, however good the management, to a continuance of the disappointment which has been experienced in the past? We have every reason to believe that all the best ore that could be collected from the mine was dealt with during the early part of the year, and we are since told by Mr. Mackenzie that development was not properly maintained, while it would appear that the ore reserves, according to Mr. Astley, were a diminishing quantity. Such results as these are by no means encouraging either as record of the past or promises of the future if the mine is to be worked by itself. The accounts before us show a profit of £50,000 in the year 1904–05, as against the serious loss in the previous year, and if a net profit of £50,000 in the year could be fairly earned, and if it could be depended upon for a permanency, it would no doubt be satisfactory.

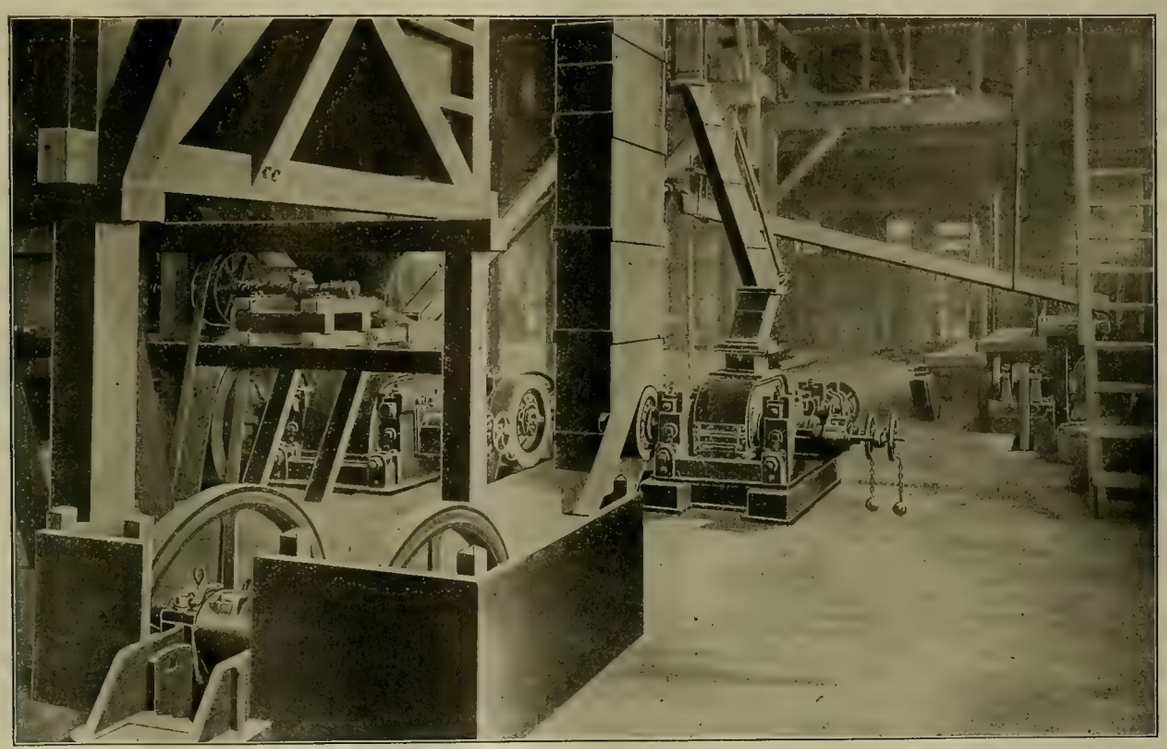
"I now come to the question of amalgamation with the Center Star (including the War Eagle) mines in Rossland, the St. Eugene Con. Mining Co. at Moyie and the Canadian Smelting Works (including the Rossland Power Co.) at Trail, all in British Columbia. Mr. Mackenzie recommends that the Le Roi Mining Co. should join in this consolidation on the terms which he proposes, and that he states emphatically that, in his belief, there is no question of doubt as to the result of such consolidation being beneficial to the shareholders of the Le Roi Co. He states that the manifest advantages of such an amalgamation are: 1. A reduction in the cost of mining and exploration. 2. A substantial saving in administrative and office expenses. 3. Reduction in freight and treatment charges. 4. Reduction in present cost of marketing copper. 5. Competent management and the skillful direction of exploration work under one head. 6. The prestige and advantages of a large and powerful corporation with sufficient capital and an assured future, backed by the support of a great transcontinental railway vitally interested in the upbuilding of a profitable mining and smelting industry in British Columbia. I think that the advantages so set forth must be obvious to the mind of any one who considers them dispassionately, and especially of any one who has been accustomed to consider such questions of working such companies under advantageous circumstances instead of working them separately. Mr. Mackenzie further instances advantages which might accrue from consolidation: 1. The Le Roi shaft, with its excellent equipment, is capable of doing all the necessary hoisting for three mines instead of one. 2. One manager, superintendent and foreman, with one office and stores department, would suffice for the three mines. 3. Smelter reductions, now impossible, could then be made; and, further, the erection of a converter and copper refinery at a cost of, say, £30,000, would be advantageous in saving the profits now made by others, and saving freight in sending the produce of the mines away for refining purposes. Coke and coal are cheaper at

Trail than at Northport, as no duty has to be paid to Trail. Trail procures larger varieties of ore than Northport, making it possible to provide a self-fluxing charge, without using a large percentage of barren flux in the form of limestone as is necessarily done at Northport. In receiving the ore and coke the facilities at Trail for handling material are either by gravity or mechanical, and that there is a mechanical system of charging. The labor at Trail is much more constant in quality, with a much better system of discipline, and there is a greater sense of security among those employed in holding their various positions, as against the constant changing of manager and men at Northport. The Northport furnaces being old in style and years require repairs at heavy cost, which is not the case in the furnaces at Trail. The cost of power at Trail, being electrical and generated by water power, is much less than the steam power used at Northport and transmitted by long line shafts and ropes. Mr. Mackenzie adds that the books of the company show a net profit at Trail of over $200,000 in 1903 and $137,000 for 1904, and he considers that the company will earn a similar amount in 1905. Mr. Mackenzie expresses the opinion that with Mr. Aldridge at the head of affairs of the amalgamated companies we could be assured of sound, safe and economical management. He allots 24% for Le Roi mine, 18% Canadian Smelting Works, 34.7% for the St. Eugene Con. M. Co., 16.9% for the Center Star, and 6.4% for the War Eagle Co. After studying the matter from various points of view, and with all information before us, we cannot but think that these percentages are fair and reasonable, and we recommend them for your acceptance, as they have been accepted by the other companies."

During the meeting Mr. McMillan spoke in his own behalf and that of his constituents. He said: "The main questions they had to consider were, first, the question of the removal of the managing director from the board by the remaining directors without reference to the shareholders; and, second, the question of amalgamation. The directors had said that he was removed because they were dissatisfied with his management and because he was opposed to amalgamation. If his management had been bad, they might have asked him to cease to act as managing director, but would not have been justified in putting him off the board. His alleged bad management was an afterthought, the real reason being that he was opposed to amalgamation. Last year's record spoke for itself, as they made a profit of £50,000 after writing off large sums. With regard to amalgamation, that had been in the air for nearly two years, and he disagreed with the scheme that was brought forward, on the ground that the Le Roi was not receiving a proper portion of its value, and because he was absolutely opposed to taking in the Trail smelter, the Trail concentrator and the undeveloped coal lands. He dealt at length with the various properties with which it was proposed to amalgamate, with a view of showing that their value was overestimated, and also spoke in opposition to the taking in of the Trail smelter. The point for the shareholders was that, on the one hand, they had Mr. Waterlow putting forward this scheme of amalgamation, and, on the other hand, they had the managing director, backed up by all the expert opinion in the service of the company, opposing it. Then Sir Henry Tyler and Mr. Waterlow proceeded to get rid of those who opposed the scheme, and brought in Mr. Mackenzie of San Francisco, who recommended it. It was for the shareholders to decide what was to be done."

J. H. Mackenzie said: "In the latter part of August the firm of Bradley & Mackenzie received a cable from the Le Roi board of directors requesting them to examine and place values on the properties included in the proposed amalgamation scheme. Scarcely had the examination begun before you were told in circulars that it would not be safe to follow our advice, as Mr. McMillan could not do so when in April, 1904, your company was face to face with assessment or liquidation; that I was prejudiced against Mr. McMillan, owing to that gentleman having made a success of the Le Roi when I had predicted failure. As to your not being able to follow my advice, I wish to state that I resigned from the management of your company in February, 1903, and on that date the surplus of assets over liabilities were £80,000. In April, 1904, I was called back by cable to investigate the shutting down of the Northport smelter. There were over 40,000 tons of refractory ore in the yards which, it was claimed, could not be smelted. Your account at the Bank of Montreal showed a deficit of £27,000 over and above liquid assets. From April until September—a period of five months—I was in Rossland the greater part of the time directing the affairs of the company, and when I turned it over to Mr. McMillan the deficit of the bank had been reduced to £3000, the stores were free from debt, the mine was producing 275 tons daily of high-grade ore, the smelter was in operation with two furnaces running, the large stocks of ore in the smelting yards had been treated, and it was found that you possessed 5285 tons of ore in excess of what had been carried on the books of the smelter, and the accounts of last year have had the benefit of this extra tonnage. The property was earning a monthly profit of £3500. Regarding the dismantling of Northport and the injunction suit which was begun, the following are the facts: The Trail smelter requested the loan of a blower until such time as they should receive a new one, which was then en route. My arrangement with Mr. Aldridge was that he should pay all the expenses of removing the blower, afterwards to return it to Northport or pay for it, as the Le Roi Co. might choose. An injunction suit was immediately begun to prevent the dismantling of Northport. As there were several idle blowers at the Northport smelter, I felt that no damage could be done by loaning one of them to a neighbor.

"As many misleading statements have been published regarding the War Eagle and Center Star properties, which are included in the proposed amalgamation scheme, I wish to state that recent discoveries in the War Eagle mine have greatly enhanced its present and prospective value. For instance, on the fifth level a new stope has recently been opened up which contains about 40% of the total estimates of tonnage given that property. In the Center Star mine a winze below the ninth level has been sunk some 200 feet, 160 of which is in ore of a good shipping grade. The bottom of this corresponds with the 1550 level of Le Roi. The width or length of this ore has not been determined, but it promises a large tonnage. I may say also that the bottom of this winze is also on the same horizontal as the 1550 level of Le Roi, and I consider the showing in the bottom of the Center Star equally good as that of the Le Roi. It will be asked why I recommended the Le Roi Co. to accept 24% of the amalgamated company, which will earn the Le Roi shareholders only £37,000 per annum, when the earnings of your company for the last year were £49,000. The explanation is that the monthly profits have been gradually diminishing, and until the development work exposes new ore bodies or new extensions of known stopes, your profits will not reach the figure of £49,000 per annum if you continue to operate the Le Roi as a separate company. For the six months ending December 30, 1904, the Le Roi Co. earned average monthly profits of £3725; for the six months ending June 30, 1905, the average monthly profits were £2370 only; while for the last five months the average monthly profits have fallen to £1550, or at the rate of £18,600 yearly. The average monthly earnings of your company for the last eleven months have been less than at the rate of £30,000 per annum. I am not personally interested in this amalgamation in any way, nor am I urging it upon the shareholders. I was called upon to place a relative value of these properties, and have done so honestly and fairly, and I challenge any one to show where I have sacrificed the interests of the Le Roi shareholders, or have done an injustice to any of the concerns interested in this amalgamation."



Testing Plant of the Colorado Iron Works.

The resolution adopting the report and accounts was carried unanimously, but when a second resolution was put to the meeting to agree to the scheme of amalgamation, it was lost by a large majority.

The chairman thereupon demanded a poll, which he said would be taken by voting papers being sent to shareholders, who would be asked to return them within a fortnight.

The motion to re-elect Mr. Waterlow, a director, was also negatived, and resolutions reappointing Mr. MacMillan and the three gentlemen mentioned by him as directors were carried, the chairman demanding a poll in each case.

A. J. MacMillan, who was re-elected a director as shown above, on the 21st, secured a temporary injunction from the court restraining the directors of the Le Roi M. Co. from making any use of the proxies sent in by the shareholders since the meeting of two weeks ago.

The Testing of Ores.

The value of tests, preliminary to the installation of reduction works, has never been questioned. It is regrettable, however, that many so-called tests are of such an incomplete and uncertain nature as to offer no sound basis upon which to determine the method of treatment, and it is not uncommon that, owing to lack of facilities, or to incompetence upon the part of those conducting the test, the gravest errors have been made in the selection of the process to be used and equipment to be provided.

That these conditions should obtain at the present time is generally due in great measure to the absence

of testing plants equipped on a sufficiently comprehensive scale to treat large quantities of ores by various processes and make direct comparison between different methods. The composition and characteristics of ores vary so widely, and there are so many methods of treatment available, that the most painstaking investigation is required to determine the process which, all things considered, will make the maximum saving of the contained values.

To sufficiently meet the requirements of a complete ore testing plant, there must be a combination of machinery and equipment of large capacity and perfect suitability, and a corps of experienced, practical experts of unqualified ability in the technique of the different processes.

The Colorado Iron Works of Denver has installed a well appointed mill, arranged in such a manner that tests can be carried out by any process without handling the ore during any part of its course through the machinery in the same manner as it would be treated in a mill under actual service conditions. Especial precautions have been taken to guard against the lodgment of ore in the crevices of hoppers, launders, elevator housings, etc., to mix with the ore of a subsequent test and influence the results in any way. Every machine through which ore is passed is made easily accessible for inspection and thorough cleaning out, both before a test is begun and after its completion. The laboratory and assay office are supplied with every detail necessary, and is in charge of a metallurgist of experience in research work on ores of the most varied character.

Preliminary laboratory tests are made to indicate the most promising lines upon which to conduct the mill tests, after which a considerable quantity of ore is run through to determine definitely whether or not the method adopted in that case will prove the best for milling treatment on a working scale.

Not being wedded to any particular process, and having no special ideas which we wish to exploit as against the recognized methods of treatment in their highest state of development, they operate the plant under the direction as to metallurgical methods of any competent engineer representative of the parties for whom the test is conducted.

The tests are conducted by the following methods or by any combination of them:

Crushing by rolls followed by concentration by jigs and tables. Crushing by rolls followed by concentration by tables and slimers. Crushing by rolls and cyaniding direct. Crushing by stamps, amalgamating, followed by concentration. Crushing by stamps in cyanide solution followed by concentration. Crushing by stamps, amalgamating, followed by cyanidation of the tailings. Sliming of the entire ore in pebble mill.

In shipping ores for treatment it is very important that a large quantity be sent. A carload, say fifteen to twenty-five tons, costs but little more to ship than a smaller lot, requires but little more time for treatment and no more cost for assaying, while the results are far more reliable. In all cases where a salable product is obtained from the treatment, credit will be given, thus materially reducing the cost. Great care should be taken at the mine to obtain an average of the ore to be treated. The ore should not be the best nor the poorest, but an exact sample of the regular run, which will be treated at the mine. Should the ore vary much in the mine it will be advisable to ship 50 or even 100 tons.

The cost of treatment cannot well be estimated in advance. It will depend on the nature of the treatment, the amount of assaying required, and many other things which cannot be anticipated. In all cases, however, the charges will be made as low as consistent with good, reliable work, and undoubtedly lower than in custom plants.

Shipments should be consigned, freight prepaid, to the Colorado Iron Works Testing Plant, Denver, Colo. Different lots should be plainly marked.

Books Received.

In contradistinction to the demands of the specialist, the student requires a text embracing a wide scope. Fortified with the fundamental ideas gained from the study of such, he is prepared for latter-day specialization. This fact will necessarily temper the criticism of an "Economic Geology of the United States," by Heinrich Ries. This work is intended to cover the ground gone over in an elementary course. Its most notable difference from similar texts is the mode of arrangement, whereby the non-metallic minerals are discussed first and the metallic minerals last. This logically leads from a discussion of the simpler to the more complex forms of mineral deposits, and also indicates the predominating economic importance of non-metallic minerals. Of these, coal is given the first place. A detail of this chapter will give an idea of the method used in treating other substances. After defining the different kinds, and giving proximate analyses, the author discusses the origin and conditions affecting the transition through various stages. the structural features are indicated, and the geologic distribution in the United States described in a cursory manner. The chapter is concluded with statistics of production and an extended bibliography. The latter is one of the most valuable features of the book, and is maintained at a high standard throughout. The description of petroleum, natural gas and hydrocarbons is supplemented by a number of fine illustrations. This feature is also noteworthy, the pictures indicating structural conditions with remarkable fidelity. Various building materials, stone, clay, lime and calcareous cements are generalized. The parts devoted to explaining the uses to which the materials may be put are evidently the result of considerable personal investigation; salines. gypsum, fertilizers and abrasives conclude the list of major non-metallics. As of minor importance, he describes the varieties, distribution, uses and production of asbestos, barite, fluorspar, fuller's earth, glass sand, graphite, lithographic stone, lithium magnesite, mica. mineral pigments, monazite, precious stones, sulphur and pyrite strontium, and talc and soapstone. Important occurrences only are described, and these in a popular manner. Mineral waters and soils conclude Part I. Numerous references are given for detailed study if the student should so desire, but in the text the mode of occurrence is not described with detail now required by specialized geological instruction. Part II, metallic minerals, is introduced by a brief discussion of the theory of ore deposits, the author apparently favoring a modified view of Van Hise's theory, and thinks "that most metalliferous deposits, aside from ores of iron, have resulted by deposition from ascending waters in regions of igneous intrusions, the waters being, in part at least, of igneous origin." Weed's classification is used, "not because it is considered entirely satisfactory or especially simple, but because it embodies the results of more modern studies of ore deposits and their genetic character." Seven chapters are devoted to the metallic ores—iron, copper, lead and zinc, gold and silver, silver lead, aluminum, manganese and mercury, and minor metals. In each case the author names and briefly describes the various ores of the metal in question, discusses the geographical distribution of each, and gives a generalized statement of the manner of occurrence in the more important districts. This latter is practically a summary of the folios of the United States Geological Survey, and is valuable chiefly for the excellent illustrations accompanying it. The abstracts serve as a guide for intelligent study of any particular ore deposit, and will undoubtedly prevent the hazy ideas that are often the result of indiscriminate reading. The author is to be commended for his care in giving proper credit to other writers where such is due. In this section, as in the preceding one, the reader is impressed with the reason why these minerals are sought, the uses to which they are put, and why they are fitted to such uses. Statistics are brought up to 1903. Unfortunately, there are a few instances where the author has necessarily had to depend upon others, and in the transmission of ideas a few errors have been introduced. Yet these are few and of minor importance. They should not impair the general usefulness of the work. The author has a pleasing style that makes easy reading. The student's mind is not distracted from the subject by the author's mechanism of expression. Characterized in brief, this is a college text, broad and elementary, yet serving as a general introduction to a field where personal observation should confirm or disprove preliminary reading. The geologist should never be hampered with preconceived ideas that bias his own judgment. The MacMillan Co. of New York are the publishers. The book will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $2.60.

Recent development of mines in arid regions has demonstrated the value of the gas engine for power requirements. Nevada's new mines are now reached by the gasoline-propelled automobile and hoisting and pumping is largely done with gasoline engines throughout the arid West. In consequence there has been a demand for an explanation as to the how and why of their construction and operation. This demand seems to be well met in "Gas, Gasoline and Oil Engines," by G. D. Hiscox. The book treats on the theory of gas, gasoline and oil engines as designed and manufactured in the United States. After a brief introduction, largely historical, the author gives a concise exposition and discussion of the theory of gas and gasoline engines, developing the fundamentals for efficient design in accordance with the underlying physical conditions. Next follows a brief account, elaborated in succeeding chapters, of the various materials of power—illuminating gas, natural gas, producer gas, gasoline, kerosene, acetylene and alcohol. A particularly valuable account is given of producer gas and the various processes of production. Each of the essential parts of the engine is illustrated and described in the construction and operation. These include carburetors, cylinders, governors and valve gear ignition devices and the various details of construction. This section includes diagrams of most of the types produced by leading American manufacturers and is eminently practical in its details. The remainder of the volume is occupied mainly with descriptions of the many types of motors on the market, including stationary, marine and automobile motors. A chapter on the management of motors contains some valuable information. Heretofore the English literature on this subject has been behind recent advances of the explosive motor in recent years. This book brings the subject up to date and forms the foundation for an intelligent study of existing models. There are recent developments in crude oil engines which are not noticed. It is evidently not written for the designer and omits some details essential to his work. But, as a comprehensive and practical treatise for the operator, it should be in the hands of every progressive man interested in running gas engines. It is published by N. W. Henley, 132 Nassau St., New York City ,and will be sent postpaid by the MINING AND SCIENTIFIC PRESS for $2.50.

"Register of Mines and Minerals of Yuba County, California," issued by the State Mining Bureau, Ferry Bdg., San Francisco; price 25 cents, postage 8 cents. It contains a topographical and an economic geological map of Yuba county, a map of dredging fields near Marysville, and a list and brief description of mines.

As an extract from "Mineral Resources of the United States," the U. S. Geological Survey has issued "The Production of Precious Stones in 1904," by G. F. Kunz. This is a succinct summary of the condition of this industry throughout the world.

Personal.

W. H. WILEY is at Greenwood, B. C.

WILLIS LAWRENCE is in San Francisco.

W. A. PRICHARD is at Zacatecas, Mexico.

J. F. HALLORAN sailed for Tahiti this week.

LYTTLETON PRICE of Bellevue, Idaho, is at the Palace Hotel.

JOHN B. FARISH is in New York on his return from London.

F. M. DRESCHER is in Denver, Colo., from Prescott, Arizona.

F. W. BAKER sailed for London from New York on December 12.

GEORGE W. EVANS has returned to San Francisco from Denver.

F. J. H. MERRILL of New York is doing geological work in Idaho.

E. J. WILSON is building a smelter at Val Verde, near Prescott, Arizona.

R. C. TURNER has returned to San Francisco from Chihuahua, Mexico.

W. H. DALY is manager Durango M. Co., near Velardena, Durango, Mexico.

ALBERT V. JOHNSTON of New York is visiting San Francisco and Los Angeles.

FRANK H. PROBERT has returned to Los Angeles from Hanover, New Mexico.

H. VINCENT WALLACE of Nogales, Arizona, is visiting San Francisco and Bakersfield.

R. F. PEARCE is at Denver from the mines of the Andes Tin Co., near Oruro, Bolivia.

GEO. S. BINCKLEY has returned to San Francisco from a professional trip to Shasta county.

LEE GLOCKNER returned from Western Australia on the "Ventura," which arrived this week.

L. S. AUSTIN, professor of metallurgy Michigan College of Mines, is visiting Anaconda, Montana.

W. E. WADE has resigned as manager Globe M. Co. at Lead, S. D., and F. Icker has succeeded him.

R. H. CHANNING, general manager Utah Con. M. Co., has returned to Salt Lake City from a trip East.

R. S. BAVERSTOCK of Los Angeles is in Kern county getting ready for shipping a carload of scheelite.

STANLY A. EASTON, manager of the Bunker Hill & Sullivan mine at Wardner, Idaho, is visiting San Francisco.

JOHN C. MONTGOMERY, Denver, Colo., has been appointed resident manager of the Venture Corporation, London.

W. H. WEED has returned to Washington, having concluded a geological investigation of mines at Butte, Montana.

D. C. TOBIN of Leadville, manager Continental gold mines of Vulcan, Colo., has returned from a business trip East.

DUNCAN MACVICHIE, general manager Bingham Con. M. Co., of Salt Lake City, is spending the holidays in Los Angeles.

GEO. HALL has been made superintendent Mount Masonic mine at Park City, Utah, succeeding J. C. Hasson, resigned.

JAMES HOOPER has been appointed superintendent Veta Grande mine at Altar, Sonora, Mexico, vice Arthur Houle, resigned.

ARTHUR HOULE has been appointed superintendent Calumet and Arizona smelter at Douglas, Ariz., succeeding James Wood, resigned.

ROBERT L. TOZIER has been appointed district sales manager of the Power & Mining Machinery Co.'s gas machinery department, with headquarters at 52 William street, New York.

O. O. MCREYNOLDS, who has charge of the construction work of the Gold Prince mill at Animas Forks, Colo., has returned to Denver for the winter, as he claims they are unable to deliver material.

ROBERT T. HILL, mining geologist, has purchased the entire capital stock of the Hill-Cunningham Company, 25 Broad street, New York. The corporation will be put into liquidation and Mr. Hill will hereafter continue business under his own name at the Trinity Building, 111 Broadway, New York.

Trade Treatises.

Bulletin 1202 of the Allis-Chalmers Co. of Milwaukee, Wis., shows their Reliance friction clutch.

The Trump Mfg. Co. of Springfield, O., send a nicely illustrated catrlogue of their boilers and self-contained side crank steam engines. The design and construction are well shown.

The Chicago Pneumatic Tool Co. of Chicago, Ill., sends Catalogue No. 17, a comprehensive compilation, picturing and describing the various air-driven tools handled by them. In addition it contains interesting cost comparisons.

MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

The supply of silver from all available sources in 1904 was 176,840,014 ounces, as against 173,222,088 in 1903. This was an increase of 3,617,926 ounces, or a gain of 2.1%. Mexico was, as usual, the heaviest contributor, with an output of 60,808,879 ounces, although this shows a decrease of over 7,000,000 ounces from the output in 1903. The United States was second with a total of 57,786,100 ounces, as against 54,300,000 a year earlier, a gain of 3,486,100 ounces, which is almost equal to the entire world's gain for the year. Australia was third, with a record of 14,558,892 ounces, against 11,909,040 ounces in 1903, drawn principally from the great mines of Broken Hill and Barrier Range. Germany claims a production of 12,532,938 ounces, against 5,830,000 ounces the previous year, which would entitle the Teutons to third place; but as no discrimination is made between silver extracted from foreign ores and that obtained by native mining, proper credit can not be assigned. Bolivia comes next, with 6,083,333 ounces, against 6,614,957 ounces in 1903, a decrease of 531,624 ounces, and is closely followed by Spain and Peru, with respective totals of 4,876,076 and 4,667,047 ounces, as against outputs in 1903 of 4,090,000 and 5,491,349 ounces respectively, which indicate a gain of almost 800,000 ounces for Spain and a loss of more than that amount for Peru. With the single exception of Argentina, which showed a slight gain of 16,153 ounces, all the other countries showed losses on a comparison with their output in 1903. Bolivia receded from 6,614,957 ounces in 1903 to 6,083,333; Chile, from 1,650,000 to 868,067; Columbia, from 2,000,000 to 946,066; Peru from 5,491,349, as above, to 4,667,047; Ecuador's figures are not available. Uruguay was practically stationary with 1093 against 1000 in 1903. In Europe increases were noted in five countries and decreases in seven. Those in which increases were noted, with their figures, respectively, are: Hungary, 643,000 ounces, against 619,877 in 1903; Germany (subject to the above explanation), 12,432,938 ounces, against 5,830,000 in 1903; Norway, 257,200 ounces, against 240,298 in 1903; Spain, 4,876,076 ounces, against 4,090,000 in 1903; Turkey, 564,685 ounces, against 486,297 in 1903. In the following decreases were recorded: Austria, 1,254,888 ounces, against 1,279,972 in 1903; Greece, 895,172 ounces, against 1,090,367 in 1903; Italy, 757,777 ounces, against 784,084 in 1903; Russia, 172,912 ounces, against 260,776 in 1903; Sweden, 20,923 ounces, against 32,298 in 1903. The United Kingdom remained almost stationary with 174,517 ounces, against 174,896 in 1903. Canada showed a marked increase, with an output of 3,718,668 ounces, against 3,198,581 in 1903, and just takes eighth place from Japan, whose production was 3,208,620 ounces, against 1,770,152 in 1903, a far greater increase. The Dutch East Indies showed a gain of about 50,000 ounces, Africa 36,000 ounces and other countries 2000 ounces. In 1875 the total output of silver in the world was 63,317,014 fine troy ounces, a figure almost reached by the Mexicans in 1904 and exceeded in 1903. In 1885 it increased to 96,250,831 ounces, a gain of 60%. In 1890 it was 134,404,104 ounces, or more than double the yield of 1875. Five years later the world's record was attained in the figures 182,220,228 ounces—almost three times the output of 1875.

The United States supplied more than one-half of the petroleum produced in the world in 1904. A statement of the world's production of petroleum, prepared by the British Board of Trade, which has reached the Bureau of Statistics of the Department of Commerce and Labor, puts the petroleum production of the world in 1904 at 9,303,000,000 gallons, of which 4,916,000,000 gallons were produced in the United States, 3,650,000 gallons in Russia, 202,500,000 gallons in Austria, 206,500,000 gallons in Java and Sumatra, 135,000,000 gallons in Roumania, 105,500,000 gallons in British India (principally Burma), 49,000,000 gallons in Japan, 20,000,000 gallons in Canada, and 18,500,000 gallons in Germany. In 1903, which made the highest record of any year prior to 1904, the total was but 8,504,000,000; in 1902 it was 7,588,000,000. This increase in 1903 and 1904 occurs chiefly in the United States. The figures of production in the United States show an increase of about 697,000,000 gallons in 1904 over the figures of 1903, while those of Russia, our chief competitor in oil production, show an increase of but 103,000,000 gallons over 1903, and the increase in the United States in 1903 is also much larger than that of Russia. In the four years 1898, 1899, 1900 and 1901, Russian production of crude petroleum exceeded that of the United States, but in all other years for which the record is shown by the publication in question, extending from 1883 to 1904, the production of the United States exceeds that of Russia, and by far exceeds that of any other country. Indeed, it may be said that the United States and Russia produce practically nine-tenths of the petroleum of the world, the total production in 1904, as above shown, being 9,303,000,00C gallons, of which 8,566,000,000 was produced in the United States and Russia combined. Exportation of illuminating oil, or kerosene as it is familiarly called, is also much greater from the United States than from Russia, especially as American crude oil gives a much larger per cent of illuminating oil than does that of Russia. The total quantity of refined illuminating oil exported from Russia in 1904 was 455,000,000 gallons, and from the United States 761,000,000 gallons.

ARIZONA.

Cochise County.

It is reported that the Black Prince Copper Co. intends to put a hoist on its double compartment shaft, near Johnson. The shaft is down 50 feet.

Gila County.

The Globe & Pinto Co. at Globe are sinking their shaft from the 50-foot to the 100-foot level.

Graham County.

The Rex Cobre M. Co. is preparing to resume operations on its claims in the Lone Star district, near Clifton.——The Shannon Copper Co., at Clifton, in its annual report shows a production for the past year of 11,295,586 pounds of fine copper with a by-product of 592 ounces gold and 17,127 ounces silver. The average price of the copper was 14.24 cents per pound. During the year there was charged to the construction account $52,320.06, which, deducted from the total expenses of the year, left $1,368,020.04 as the total cost of the copper, or 12.11 cents per pound, a profit of 2.13 cents per pound. The net profit for the year was $271,153.65, or a little over 90 cents per share.

Mohave County.

The Elkhart mine at Chloride has been taken over by Douglas & Reeves and N. G. Douglas is at the mines. The new owners intend to put the mill in commission and work over the tailings and low-grade ore.——The Benedictine Co. of Cedar is preparing to start work after the first of the year. A tank wagon has been received at Yucca for hauling oil to the mine for fuel purposes.——A pumping plant will have to be put on the J. F. T. mines at Stockton hill, near Kingman. J. E. Carney is superintendent.

Pima County.

In the Tucson mountains, 15 miles from Tucson, there are five mining camps in operation. The Gould M. Co. has the main working shaft 300 feet deep. The Martin Ware mines are being operated by a good force.——The New State M. Co. has repaired its road from Tucson to their mines.——G. A. Hoff is developing his copper mines.——F. J. Sibley has men developing his mines on the northwest side of the mountains.——The Arizona Copper M. Co. is drifting to crosscut the main ledge from the 100-foot level.

Santa Cruz County.

T. F. Kelly has resumed work on his placers near Oro Blanco.——High-grade ore carrying values in copper, lead, gold and silver, is said to have been struck by F. Powers in the lowest level of the World's Fair mine, near Harshaw.

Yavapai County.

The Pine Mountain M. Co.'s 10-stamp mill on Lynx creek, near Prescott, has been started. Joseph Carmichael is superintendent.

G. W. Middleton of Prescott says that the Metals Milling Co., of which he is general manager, is to put in a 250-ton plant, consisting of crushers, rolls and concentrators. Work on the enterprise will be started at once.

CALIFORNIA.

In a recent report of the United States Geological Survey, C. G. Yale gives a succinct account of the centers of gold and silver production. In Alpine county there is practically but one producing section, which is at Loope. In Amador county the mines around Jackson exceed all others in yield, and include the Kennedy, the Argonaut, the Oneida and the Zeila mining companies. The largest producers in the county aside from these are the Keystone at Amador City and the Fremont at Drytown. The surface mines of the county are unimportant. The Kennedy is the deepest gold mine in the State; the vertical depth of its new shaft is 2863 feet (August, 1905), and sinking is progressing at the rate of 60 feet per month. If the vein maintains its present dip, it is expected to be cut in the new shaft at a depth between 3400 and 3500 feet. The hoisting works are built to supply a 150-stamp mill from a depth of 4000 feet. A 100-stamp mill is now in operation, and 3-ton loads are raised from the stopes on the 2700 level. The collar of the shaft is at an elevation of 1500 feet, so the bottom of the shaft is now 1363 feet below sea level. These notes are made concerning this particular mine because of the great depth of its workings and of its equipment for still greater depth—4000 feet. The original old shaft of the mine was down 2300 feet when work on it stopped, and the new shaft was put into use for hoisting, etc.

In Butte county the center of the producing properties is at Oroville, where some thirty dredgers are now at work and others are building. In Calaveras the largest producing mines are at Angels, including the Lightner and the Utica companies. The largest single producer in the county, however, is the Gwin at Gwinmine, and the Melones, at Melones, is also among those with a heavy output. The biggest producers in gravel are the Calaveras Dredging Co. at Jenny Lind and the Calaveritas Hydraulic Co. at San Andreas. In Del Norte all the mining work is done in the vicinity of Crescent City. El Dorado county has no special mining center, unless Placerville may be so considered. The most prominent quartz mines are at El Dorado and Placerville. Fresno county has few operating mines, but what there are are at Auberry, Pollasky, Tollhouse and Trimmers. Orleans is the only place in Humboldt county where any output of importance is obtained. More gold is coming out of Ballarat than from any other place in Inyo county. Randsburg is the most productive camp in Kern county, the Yellow Aster being the leading property and one of the large mines of the State. At Mohave, also, there are three large producers. Lassen county has only one mine of consequence, and that is at Hayden Hill. Los Angeles county also has only one district—that at Shoemaker. The only place in Madera county making any output of note is at Coarse Gold. Mariposa has but one large producer, at Bullion. In Monterey county what little mining is being done is at Jolon. Bodie is the center of the mining industry of Mono county, a very large proportion of the output coming from one mine alone in that camp. In Nevada county Grass Valley is the central point of production, and here is situated the mine having the largest gold output of any in the State—the North Star. The Empire is a good second, and there are other large producers; and Nevada City, close by, has also two producers of prominence. These mines are all quartz, the largest yield from gravel coming from the North Bloomfield region. In Placer county the largest output of quartz is from the vicinity of Auburn, but the principal yield of gold is derived from the drift mines of the Forest Hill divide at Michigan Bluff and Bullion. The most prominent quartz mine in Plumas county is at Johnsville, but there can not be said to be any special gravel mining center, mines of this character being scattered all over the county in great numbers. There are no mines of importance in Riverside county at present in operation. The dredgers near Folsom and Fairoaks represent the principal output of Sacramento county. San Bernardino has only one very large producer, the Bagdad-Chase property at Stedman, which yielded by far the largest proportion of the total output. In San Diego county the Golden Cross of the Free Gold Mining Co. at Hedges produced most of the yield of the county; the mines at Julian and Banner had no notable output. San Luis Obispo has only a few unimportant placers at La Panza. In Shasta county the Gladstone, owned by the Hazel Mining Co., at French Gulch, is the largest producer, followed close by the Midas mine at Knob or Harrison Gulch. The largest quantity of gold and silver from any one point came from the smelters of the Mountain Copper Co. at Keswick, where they purchase siliceous ores to form flux in copper smelting operations. Sierra county has one important quartz producer, which is at Sierra City; the principal gravel mines now producing are around Downieville. Siskiyou has a few prominent quartz mines at Gazelle, Gilta and Nolton; but there are many producing gravel mines scattered throughout the county. The few mines in Stanislaus county are at Knights Ferry. The largest quartz yield in Trinity is from a mine at Minersville, and the largest hydraulic mine yield is from near Weaverville; there are many good-sized gravel properties having yields in different parts of the county. The few mines of Tulare county are at Aukland and White River. Tuolumne is distinctively a quartz-mining county, with quartz mines at many points, the largest single producer being at Chinese Camp; but there are heavy producers at Big Oak Flat, Carters, Confidence, Groveland, Quartz, Rawhide, Sonora, Soulsbyville and Stent. The mines in Ventura county are at Lebec. In Yuba county the quartz interests are at present nominal; the main yield comes from placers, and especially from those worked by dredgers between Marysville and Smartsville.

Amador County.

The Wildman-Mahoney mine, at Sutter Creek, has been closed down pending adjustment of financial difficulties.——The Valparaiso pocket mine south of Jackson has been sold to D. Bora, G. Badaracco, E. Garibaldi and Demartini.

Ed. Lynch has brought suit in the Superior Court against the Keystone Con. M. Co. and M. Jasper McDonald for $20,000, for services rendered as an attorney and otherwise, and also for his monthly stipend. The company owns mines at Amador City. In March, 1901, McDonald, as president of the company, agreed that Lynch should be paid $20,000 for services rendered up to that time and $150 per month afterward. The $20,000 was to come out of the net profits of the mine. Lynch alleges that the accounts have been kept in a fraudulent manner for the purpose of concealing the net profits. In last July the company notified Lynch that he was discharged from its service, but he claims that he is entitled to pay for two months, as he received no allowance for June and July.

Inyo County.

The Coso Reduction Co. is building a mill near Darwin to treat ore from neighboring mines. R. B. Todd is superintendent.

Kern County.

In the Kern River fields the Grace Oil Co. has been sinking a deep well for the purpose of securing lighter oil which it was believed existed, beneath the heavy oil. Early in the week at a depth of 3148 feet a large quantity of salt water had been struck, which flowed up over the top of the casing. The water was struck in a stratum of sandstone which is believed to be several hundred feet thick. After the water had been reached the drill was sent down 18 feet farther, but as the water increased in quantity and as there was not the slightest evidence of oil the effort to bring in a well of light oil was abandoned, the casing was pulled, and the well shot at a depth of 2000 feet, at which depth it will deliver from 200 to 300 barrels of heavy oil a day.

Nevada County.

Work has been started at the Alta gravel mine, west of Grass Valley, by the Prospectors' Co. It is the intention of the Prospectors' Co. to continue the tunnel which has been run 600 feet and put through a raise. A. Hall is superintendent.

Sacramento County.

The Natoma vineyard of 2000 acres, below Folsom, is under bond for mining purposes by the Folsom Development Co., of which R. G. Hanford is manager.

Shasta County.

The Detroit M. Co.'s rich gravel lands in the Horsetown district, 12 miles southwest of Redding, has been acquired by the Shasta Dredging Co. It is proposed to put in a new bucket dredger. W. H. Dunn is in charge.

Trinity County.

It is reported that a 10-stamp mill is to be bought for the Point Lookout mine at Indian Creek. D. B. Fields is owner.——A new hoist has been put in at the Pœth mine on Coffee creek, near Trinity Center. Sinking from the tunnel will be continued through the winter.——The Minear tunnel on the Willey mine, near Deadwood, is being retimbered and is to be extended 200 feet to open up the Shafter mine, which is being leased by R. A. Skinner and R. E. Hanley.

Yuba County.

The Mining Bureau has issued a map and register of the mines and minerals of Yuba county. It has an area of 625 square miles, extending from the Feather river on the west to Sierra county. It is bounded on the north by Butte county and on the south by Placer county. It

had a population in 1900 of 8620, and for 1904 the assessed valuation was $5,995,537. About 50% of the county is valley land bordering on the Yuba and Feather rivers. The topography is diversified and elevations range from 60 feet on the Feather river to 4800 feet above sea level in the extreme northeast corner of the county, with corresponding climatic conditions. Marysville, the county seat, is a town of 3500 inhabitants, at the confluence of the Feather and Yuba rivers and at the head of shoal water navigation. Pocket mining is carried on to some extent and the river bars are worked in the summer, while placer claims afford employment to the miner during the winter months. A large area of auriferous gravel on the Yuba river near Marysville is being worked by dredgers. Two large dredgers are now at work and eight more are under construction and nearing completion. All of these dredgers are expected to be in operation by January 1, 1906. The dredgers are supplied with electric power and lighted by the Bay Counties Power Co. Bauxite and a pottery clay are found in the county; the bauxite is undeveloped. Occasional shipments of the pottery clay are made from Wheatland to Lincoln. Copper deposits and ledges of marble and granite exist in the county, but are undeveloped.

COLORADO.

(Special Correspondence).—It is given out at the United States Mint that $25,000,000 in bullion is now on deposit in that institution in this city awaiting coinage, which is expected to start the first of the year.——A new State road is under consideration between Canon City and Cripple Creek. The State has appropriated $10,000 for the building of the road. Owing to the toll road along the survey, work has been delayed until this obstacle was removed. Teller and Fremont counties have agreed to divide the expense in buying the franchise from the toll road company. The toll road has not been in use for some time past, although the company still holds the franchise.——The Big Five M. Co., doing business in different parts of Colorado, particularly at Idaho Springs, is again in the courts. G. A. Suffa of Boston, a stockholder in the company, has asked for a receiver for the company, on the grounds that the business of the concern is not being properly handled.

Denver, Dec. 25.

Boulder County.

As a result of successful tests on ore from the Wano mine at Jamestown, in the Dorcas mill at Florence, a 50-ton cyanide mill is being built at the mine. The ore is to be roasted before cyaniding, 98% extraction having been obtained in the test.

The Arapahoe Co. at Copper Rock, near Sunset, has leased and bonded its group to a Boulder syndicate. The deal also includes the Jordan tunnel, now in 1050 feet. An air compressor will be put in and the tunnel driven to cut the Cashier-Golddust, Maud S. and Medicine Man group.——The Kirk tunnel, below Sunset, is being overhauled, debris removed, track relayed and portal retimbered. It is the intention of McGown, Kirk & Smith to drive the main drift ahead.——The Lee S. Co. will resume operations near Sunshine after the holidays.

Clear Creek County.

The report of the Chamberlain-Dillingham ore purchasing agency at Georgetown for the year 1905 shows the purchase of 4204 tons of ore, the gross value of which was $385,195. The average value was $68.04 per ton. The value of the copper and zinc was $5000. As the zinc product of the various mills that have been in operation during the year was shipped directly to the smelters, it is estimated that the value was $50,000, and the value of the silver-lead ores sent direct to the smelter is placed at the same amount. The Silver Standard states that the average value of the ore handled is not as high as it has been in former years, but this is accounted for by the fact that the higher price of silver and lower treatment charges of the smelters has induced a larger tonnage of low grade ore and does not indicate a falling off in the value of the high grade ore from the prominent shippers. The largest producers were the East and West Griffith, Colorado Central, Sunburst, Rogers, Santiago, Dives-Pelican and Seven-Thirty, Stevens and Mendota mill.

A rich strike has been made in the Magnet mine, on Griffith mountain, near Georgetown, in the fourth level of the old workings 600 feet from the portal. This property was bonded and leased a few weeks ago to Thomas Rodda of Idaho Springs, since which time it has been sold to the X-Ray M. Co., which is cleaning out and retimbering the old workings, and early the coming year an extensive campaign of development will be inaugurated. Since Mr. Rodda secured the bond and lease he has the privilege of working through both the Doric and Eclipse tunnels. The heading of the Doric is now in Magnet ground.

Gilpin County.

The Pozo mine, in Nevada gulch, near Central City, is producing zinc and iron-lead ores. The ore is first shipped to Denver for magnetic treatment. The zinc product is sent to Iola, Kansas. A new shaft house and hoist are contemplated. A. W. Rucker is superintendent.——The Modoc mine on Quartz hill, near Central City, is taking out mill ore to be treated at the stamp mills in Black Hawk. John Lying is superintendent. The same company is sinking on the Gold Retort vein on the same hill and will put in a whim.

Sinking has been started at the Mackey mine of the Imperial M. & M. Co. of Apex at a depth of 250 feet.—— Operations are to be resumed at the Boston-Occidental Co.'s mine on Colorado hill before Jan. 1. The mill will start with a daily capacity of twenty-five tons. Boston capital is interested in this company and is figuring on a large reduction plant in Mammoth gulch next year, as well as a new road down Mammoth gulch for making future shipments over the Moffat road.

The Perigo mill in Gambell gulch, near Central City, has been started on ore being taken from the Perigo mine by leasers.

Gunnison County.

The new 100-ton cyanide plant being constructed by the Raymond Consolidated M. Co., at Ohio City, is nearing completion. The former difficulty experienced in operating the Raymond shaft was with water, which made development very expensive. The tunnel has eliminated this difficulty and the company will also operate at this point. A 2200-foot tramway has been completed which will convey all the ores to the new mill. E. M. Lamont is general manager of the big enterprise.

Near Tin Cup the West Gold Hill mill, with its ore-drying machinery, is running full capacity, handling seventy-five tons per day and cyaniding the output. On Cross mountain Charles Wahl is sinking on the Gold Bug.——The Jimmy Mack dump, near the Tin Cup, is being treated at the Brunswick concentrator.——The Gold Cup tunnel is being operated from Middle Willow creek and is pushed as rapidly as possible to intersect a number of lodes at great depth.

A 7-foot vein has been opened in the Ben Franklin mine in the Mineral Form basin, 6 miles northeast of Pitkin. A few weeks ago A. B. Clark of Butte, Mont., secured a lease and bond on the property from the Ben Franklin Co. and started operations.——The Double O lode, owned and operated by a company of the same name, under the direction of C. T. Snedakor, has a shaft down 100 feet.

Lake County.

The Rock Hill Mines Co. has a lease on the Nil Desperandum and other claims, near Leadville. The shaft is 750 feet deep and within 12 feet of the bottom of the lime, as shown by the drill holes—which makes it, geologically, the deepest shaft on Rock hill. There are only thirty gallons of water per minute. The drift to the southeast is in 130 feet and has an iron contact carrying silver and lead values. The north drift is in 90 feet and has contact with a streak of lead sand.——On Rock hill lessees have reopened the La Plata mine.—— Two sets of lessees are taking out ore on the Crown Point mine.——The Dome Rock lessees are sinking the shaft through hard, heavily iron-stained lime and will have the necessary depth in a couple of weeks to connect with known ore channels.

Ouray County.

A two years' lease has been granted on the Newsboy mine, near Ouray, to F. Herzinger, who now has men cleaning out the old workings and catching up some caved ground.

The Gold Lion Mines Co. will begin a long tunnel on its property in the Red Mountain district, near Ouray. The tunnel will be extended 1½ mile and will explore several large veins. Starting on the Alice vein, the company will drive 1500 feet, to strike the Mountain Lion vein at a depth of 2000 feet.

Park County.

In the Lower Tarryall district the Hayman M. & M. Co., of which Frank Clancy of Colorado Springs is manager, has sunk the main shaft during the last few months from the 200 to the 360-foot point, and will be continued to 400 feet.——The Apex Copper Co.'s shaft at Hayman is to be continued 200 feet from the 160-foot level. J. K. Vanatta is manager.——On the Sterrett group at Hayman a compressor and machine drills are to be put in. The shaft, which has a depth of 170 feet, will be continued to the 270 foot point.

San Miguel County.

High grade ore is reported on the Black Bear group, in Ingram basin, 5 miles southeast of Telluride, owned by the Black Bear M. Co. An air compressor, machine drills and an electric hoist are to be put in at the mine in the spring. It is the intention, also, to construct a mill during summer. L. Kaanta is president.——The Smuggler-Union 80-stamp mill at Pandora, 2 miles from Telluride, is being enlarged by the addition of 6 feet on the west end to make room for more ore bins to accommodate leasers on the Smuggler-Union mines, who must keep their concentrates separate, and also for eight new Frue vanners, now being set in place, for handling the Pandora lease product after it leaves the crushers and amalgamating tables. This mill is not running full capacity, but will be as soon as the Telluride Power Co. completes preparations for supplying increased power.

The Gold Run placer, near Telluride, has been leased to J. E. Wrightman and Lee Fillius of Denver. The placer is covered with tailings from the Smuggler-Union, Tomboy, Japan, Cimarron, Liberty Bell and other mills from a depth of a few inches to as high as 40 feet. A large portion of them accumulated before the milling and treatment of ores had been developed and improved into the perfection of recent years; before cyanide plants, rag and canvas plants were constructed in this district for the treatment of tailings, consequently it is known that this portion of the deposit, at least, carries sufficient values in gold, silver and lead to enable retreatment at a good profit.——About two years ago the Keystone Hydraulic M. Co., owner and operator of the Keystone placer, on the San Miguel river, 5 miles below Telluride, notified the companies operating the quartz mines and mills that unless measures were taken to prevent the tailings from washing down the river, injunctions would be sued out and lawsuits for damages instituted, for the sand and tailings in the water rapidly cut out the pipe lines, entailing heavy expenses. The Smuggler-Union, Tomboy and Liberty Bell companies then pooled together and purchased the placer, and Jacob Fillius of Denver and E. C. Howe of Telluride were appointed trustees. Above the eastern limits of Telluride a long dam of logs and stone was constructed across the river and valley, and the waters of the river impounded, permitting the sand and the heavier sediment to settle. Before the placer passed into the hands of the mining company, the tailings were being worked on a small scale by the Peck cyanide plant, but the sale suspended operations and this plant has been dismantled. The lessees will put up a large plant.

Summit County.

(Special Correspondence).—The Wellington, Morning Star, Gold Dust, Lucky and Carbonate mines, at Breckenridge, are shipping high-grade smelting ore.——The Washington-Joliet mill is temporarily closed down, but work in the mine is progressing.——The Pacific mine on North Star mountain, formerly owned by Mr. Benirose, has been purchased by a new company which is shipping ore to Alma.——The old Gould mine on Rock creek, 15 miles below Dillon, is being opened up by J. Gould.——The Senator mine, in the upper Blue, may be shipping soon. M. M. Howe of Breckenridge is general manager.

Breckenridge, Dec. 23.

The Carbonate and Little Tommie mines on Mount Baldy, near Breckenridge, have been consolidated and purchased by the Beaver Creek G. M. & M. Co., of which G. E. Moon of Breckenridge is superintendent. The Carbonate is developed by two tunnels, which are connected by a winze from the upper tunnel, which is in 500 feet. The lower tunnel is in 600 feet.

Teller County.

The Maud S. Gold Mining & Development Co. has resumed operations on the Red Bird claim of the National Co., south of Cripple Creek, on the west slope of Gold hill. A. P. Taber is superintendent.

The screens at the Montrose mine of Ironclad hill are being altered by Van Fleet & Co., lessees, after which ore will be moved at a greater speed. The shoot has been followed by drift on the 350-foot level for 40 feet. ——Ore has been broken in the W. P. H. property of the United Gold Mines Co. on Ironclad hill.——A depth of 100 feet has been made by Rollestone & Co., lessees, in a new shaft started recently on a block of the Arapahoe claim of the Jerry Johnson Co. A steam hoist is to be installed.

Chandler & Dean of Cripple Creek have a lease on the Cardinal claim of the Little Valeria Co. on Gold hill. They will drive a crosscut from the bottom of the 250-foot shaft.——J. S. Murphy and associates have put in a 4-drill compressor on the Magnet Rock claims on Beacon hill.——The Dillon shaft on Battle mountain is down 350 feet toward the 1000-foot level.

IDAHO.

Boise County.

E. E. Rodgers, president of the Black Pearl M. Co., at Pearl, says the mill, which was started November 17, has passed through the experimental stages, and is running twenty-four hours a day, giving satisfaction. The saving effected is said to be 98.5% of the total value. A small residue of chloride of silver is lost in the tailings. The plant consists of two mills having a daily capacity of 150 tons. The slime separating cones, invented by J. B. Eldridge of Boise, are giving satisfaction. A peculiar accident was met recently in driving the crosscut for the Leviathan vein. When the bore was in 1350 feet and supposedly approaching the lead sought, sulphuretted hydrogen gas burst forth with considerable violence, driving the men out and tearing out the ventilation pipes. As the gas will not support combustion, efforts to again reach the face and resume work have so far proved futile. A candle will not burn, it is stated, within 400 feet of the face. Hoods have been ordered. In addition to Black Pearl, the company is developing the Lucky Ridge.

Idaho County.

A rich strike has been made in the Hogan mine, at Oro Grande. One of the blasts in the glory hole shot back into a ledge of high grade free milling ore. The gold is coarse. Amalgamation plates are being put in below the sand tanks in the cyanide plant to catch the coarse gold. The Hogan mill has been running steadily since it started up and the company is treating 250 tons daily. The lower tunnel will be driven ahead to tap the new ledge and a stope opened up.

Shoshone County.

In the Bald Mountain claim, 3 miles west of the Monitor mine, Manager E. W. Conrad has run a tunnel in over 1200 feet, cutting through 9 feet of sulphides, and the face of the tunnel is still in ore.——The Monitor is getting out timbers to enlarge its shaft. The present shaft is small, and, as the managers plan to sink about 600 feet, they have to enlarge the opening.——An option running two years has been taken by New York people on the property of the Hunch M. & M. Co. and the old Wild Rose property, 4 miles east of Pierce.——The Ozark is working seven men and the stamp mill is running steadily. The company intends to put in a large mill in the spring.

The electric hoist and other machinery has been put in at the Sister mine, near Wallace, and work has been resumed.

Washington County.

The tunnel on the Flat Rock placer mine on Goose creek, 4 miles from Meadows, is to be driven 400 feet farther by April 1, giving a total length of 600 feet. An upraise will be made to the creek bed at the end of the tunnel. Lee Bunch is manager.

MICHIGAN.

Houghton County.

Another furnace is to be built during the coming year at the plant of the Michigan Smelting Co. at Houghton. This will make a total of six furnaces there. It will be larger than any of the furnaces already constructed, the plants calling for dimensions of 18x40 feet. The smelter now contains two 16x35-foot furnaces, two 14x23-foot furnaces and one 15x18-foot furnace. The new furnace will have a capacity of 100 tons daily. It will be assigned to use upon the mineral of the Stanton mines, while one of the Stanton furnaces will be turned over to the Copper Range Con. group. This will give to each group three furnaces.

MONTANA.

Granite County.

Jas. Patton is shipping ore from the Poorman mine, near Philipsburg, to the Butte and Helena smelters.

Madison County.

J. H. Panky is developing the Easton mine, near Virginia City, with forty men, and intends to open up the

Pacific. These are both silver producers. The 20-stamp mill is running.——It is reported that A. C. Burrage and associates of Boston will resume work on the properties of the Montana Milling Co. and the Jeanette G. M. Co. at Pony.——The Grant mine, near Virginia City, is to be prospected with a diamond drill.

Silver Bow County.

(Special Correspondence).—Two new producing companies were added to the list in November—the East Butte and Pittsburg & Montana—and the total copper production for the Butte district for the month was 29,881,650 pounds against 28,517,520 pounds in October. The November production was apportioned among the various Butte companies as follows:

	Pounds.	Tons of Ore.
Boston & Montana	7,102,080	98,640
Anaconda	8,156 100	130,550
Butte & Boston	1,023,750	15,750
Trenton	1,168,080	18,840
Washoe	865,200	12,360
Parrot	783 840	11 040
North Buttte	2,520,000	18,000
United Copper	3,264,000	48,000
Clark's Original	2,628,000	36,000
Pittsburg	390,000	4,650
East Butte	1,200,000	6,000
Miscellaneous	780,000	12,000
Totals	29,881,650	412,830

Butte, Dec. 23.

NEVADA.

Humboldt County.

President Bean, of the American Antimony Co., which has taken over the Sutherland antimony property near Lovelock, is making arrangements for a 50-ton smelter. The small test smelter which has been in operation at the mine for several weeks has proven a success.——The American Nickel Co., which owns the nickel mines at Cottonwood Canyon, near Lovelock, is putting in new pumping machinery and a new hoist, preparatory to deep mining.

Lincoln County.

The Nevada-Wyoming G. M. Co. is sinking on Calico hill, 1½ mile from Crescent. A gasoline hoist is to be put in. Geo. Zimpleman is superintendent.——Good ore is said to have been struck at a depth of 65 feet in the Gypsy shaft of the Colton M. Co., at Searchlight.——A hoist and Cornish pump are to be put in at the Sazarac mine at Dupont camp, 14 miles northeast of Searchlight. F. D. Howell is superintendent.

Nye County.

The Revenue M. Co. has bought the Wildcat claims, 1½ mile southeast of Beatty, and will develop them under the superintendence of R. I. Johnson.

Storey County.

During the past year work at the Comstock mines has showed that pay ores exist in the lower levels of the Ophir. The drift from the Seg. Belcher through to the Belcher has been completed and connected with the east crosscut from the Belcher incline 1400 level. This gives air and makes it possible to work in the Belcher. The Ward shaft is down 2320 feet. The Union shaft has been cleaned to below the tunnel level.

Washoe County.

The Southern Pacific Railroad has filed a land patent covering 3000 acres of mineral land in this county. This is the first grant made by the Government since 1873 that has not excluded the railroad from mineral lands. Strong indignation is expressed by prospectors throughout the State who as a rule have not patented their claims. They are all shut out of these lands now, and there will be no more individual development of this section on account of the monopoly possessed by the railroad. Four claims have recently been filed on this land in Peavine district, and notices of location filed. As the patents filed to-day by the railroad are dated November 23, it is doubtful if the locations are valid. Complications and suits are prophesied.

John Short and C. T. Short, of Reno, have consolidated the sale of their three claims in Olinghouse Canyon to a New Bedford, Mass., syndicate, represented by A. D. Kenyon.

NEW MEXICO.

Grant County.

The Hermosa Copper Co. is developing a number of mines near Central. The Wildcat shaft is down 400 feet and sixty men are at work blocking out low-grade copper ore. The Humboldt shaft, down 120 feet, is to be continued to the 500-foot level. The Treasure Vault shaft is down 325 feet and will be sunk to a depth of 1000 feet, a new hoist having been put in. The Ivanhoe shaft is to be continued to the same depth. The Empire mill has been bought and is being remodeled by the Hermosa Co.

Luna County.

The Luna Lead Co. has blown in the Deming smelter.

Sierra County.

The Union-Esperanza M. Co. is working the the Union placer at Shandon, Pittsburg district. A well has been sunk upon the bank of the Rio Grande from which water is being raised by five pumps and transported through 11,000 feet of 8-inch pipe. A giant has been put in and the capacity of the plant is placed at about 10,000 cubic yards per day. The work is in charge of W. L. Long, general manager, and Alexander Grace, superintendent.

Socorro County.

The Graphic Co. at Magdalena, in order to reduce the cost of mining, has commenced a 1600-foot tunnel to cut the ore, already blocked out, 200 feet below the sixth level. This tunnel has already been driven 700 feet and has cut two bodies of sulphide ore of better grade than the ore in the old workings of the mine. The tunnel has cut a stream of water furnishing 500 gallons per minute. The company is also putting in a large compressor at the mouth of the tunnel and will put in machine drills.——At Magdalena the Kelly mine put in a new hoist and has completed a shaft and power house. The shaft is being continued deeper to open up new ground.

OREGON.

Baker County.

The Buckeye crosscut tunnel, near Bourne, has cut the vein at a depth of 250 feet after being driven 300 feet.——The Colorado group at Cable Cove are to be reopened by C. F. Chatton.

Grant County.

The Thornburg placers on the north fork of the John Day, near Granite, are to be worked next spring. J. F. Lucas of Corning, New York, has charge. These placers comprise 3 miles of the middle fork canyon, the bars being mainly of the bench type, situated from 10 to 150 feet above the present level of the stream, and have been successfully worked with hydraulic elevator.

Five stamps of the Magnolia mill, near Granite, are crushing ore from the Snow Bird mine. The other ten will be started when more water is available.

Work has been resumed at the Fourth of July mine, near Granite, by Superintendent J. N. Ditmars.

Lane County.

The Bohemia Nugget gives the following summary of Bohemia mines during 1905: The Oregon Securities Co., in October and November, turned out 202 troy pounds of gold—the first large shipment this year. The Vesuvius mill has run a part of the summer, but the main part of the work has been in development and preparation for future work. The Oregon-Colorado Co. has been doing much work. The Crystal mill ran for a time this summer. The Hiawatha Co. has been developing, drifting and improving. They constructed a mile of trail and cleared for a wagon road to the main road during the summer. They also purchased three claims, the Woodman, Stump Tree and U. S. A., and located a new claim, The Merrill. The Riverside Co. has been pushing its development work. Considerable work has been done on the North Fairview.

SOUTH DAKOTA.

Lawrence County.

It is reported that the Clover Leaf M. Co. will begin to unwater the Uncle Sam mine, near Roubaix. A short time ago the underground workings were drowned out by water and a pumping plant is to be put in. The company has a 60-stamp mill. Pierre Wiebaux of Miles City, Mont., the president of the company, is in Deadwood.——J. W. N. Dorr is drawing the plans for remodeling the Kildonan mill at Pluma for the Horseshoe Co.

Excavation for the Homestake slime plant will be completed by the first of the year and construction will be started. The mill will have a capacity of 1750 tons of slime per day. The values in gold and silver reach 90 cents per ton.——The Globe shaft at Lead is being unwatered with skip and gasoline hoist. The station pump at the 500-foot level will be started when the shaft has been unwatered. Frank E. Ickes is manager.

Pennington County.

The Cumberland mine, near Hill City, is being developed by F. C. Crocker, who has sixteen men at work.——The American Tungsten Co. at Hill City will put in a new hoist. R. J. Truax is manager.

UTAH.

Beaver County.

A station has been cut at the 450-foot level of the Frisco Contact M. Co. at Frisco and a crosscut is to be driven to the Horn Silver lode.

Box Elder County.

Ground is being prepared for building the smelter of the newly formed Utah Smelting Co., 7½ miles north of Ogden. It will have an initial capacity of 400 tons per day with two furnaces. Bela Kadish of Baker City, Or., is manager and David Eccles is president.

Juab County.

Jesse Knight of Provo has secured control of the Black Dragon mine at Eureka.——Development work on the 800-foot level of the Star Con. at Eureka is reported to be satisfactory.

The Farragut M. & M. Co. has been formed to work claims north of Eureka. D. C. Harrington is president.——H. Gustaldi has charge of opening up the Balhinch mine north of Eureka. The tunnel is in 350 feet and the shaft has been sunk 200 feet.

Salt Lake County.

It is reported that work is to be resumed at the Last Chance mine at Bingham.

The annual report of the Boston Con. M. Co. to September 30, 1905, states that the company delivered to the Bingham Con. smelter 43,717 tons of ore from which a net profit was realized of over $4 per ton, and that before the termination of the contract 44,000 tons of ore remained to be delivered. The company has entered into a contract with the American S. & R. Co. for the delivery, beginning July 1, of 500 tons a day of the sulphide ore, and that the amount will be increased to 750 tons a day soon. The concentrator plant will be finished in the autumn of 1906. The report of President Newhouse says that during the year the workings have been extended 2719 feet. Work has been started in the hanging wall of the lode. Concerning the porphyry mine he states that there is at least 25,000,000 tons of 2% porphyry in sight. The plan adopted for the mining of the porphyry ore is one which is now in successful operation in the iron mines of the Mesaba Range in Minnesota, viz., open pit with terraced sides, from which the ore would be handled with steam shovels.

Summit County.

The Daly-Judge mill at Park City has been started by Foreman Kescel, after a month's shutdown for repairs.——It is reported that Jas. McGregor is to begin work on the June Bug mine, near Park City.

Tooele County.

Coal shortage has caused the New Stockton G. M. Co. at Stockton to shut down the mine and mill temporarily. A new compressor and hoist is being put in.

WASHINGTON.

According to a recent report of the U. S. Geological Survey, Washington, in 1904, had a yield of $314,463 in gold, $89,831 in silver, $69,937 in lead, $43,788 in copper, and $9 in platinum, a total of $518,028. The returns received indicate a decrease in gold production from that of 1903 of $193,422, occasioned by the idleness of several large mines in Chelan, Ferry, Okanogan, and Snohomish counties, Ferry county showing a decrease of over $162,000, Chelan of over $60,000, Okanogan of over $15,000 and Snohomish of over $43,000. King county shows a small increase, and Whatcom county production increased from $36,388 to $115,000. The silver product shows a decrease of $111,958, Ferry county showing a decrease of over $61,000, Okanogan of $14,000, Snohomish of $22,000, and Stevens of $14,775. The total decrease for the year of combined gold and silver was $305,380. The gold and silver come almost entirely from quartz mines, the total placer gold recovered only amounting to $9,823 from Asotin, Clark, Kittitas and Whatcom counties, the placers in Okanogan county being idle in 1904. As in 1903, Ferry county was the largest gold producer from deep mines, Whatcom county a close second in 1904. Stevens county was the largest silver producer. In gold production the rank of the counties is as follows: Ferry, Whatcom, Snohomish, Chelan, Okanogan, Stevens, King, Kittitas, Clark, Asotin. The rank in silver production is Stevens, Ferry, Whatcom, Snohomish, Okanogan. Stevens county produced the most copper and lead, and Clark county reports $9 in platinum.

Lack of transportation and the fact that nearly all ore requires smelting account for the relatively few producing mines; a very large proportion of the known properties in the State are in the development stage and many are held by annual assessment only.

Stevens County.

The Jay Gould silver-lead mine at Chewelah has been bonded and leased to G. C. Robbins, who will continue shaft sinking from the 100-foot level.

WYOMING.

The production of gold and silver in Wyoming in 1904, as reported to the United States Geological Survey by the owners and different companies, was: gold, $17,305, and silver, $2661, a total of $19,966. The value of silver is computed from the American R. & S. Co.'s average for the year 1904, which is $0.5725 per ounce. Copper was produced to the value of $440,876, computed at the average price per pound of $0.125. Wyoming increased in production in all three of the metals mentioned, especially in copper, the output of which very nearly equaled that of the banner year for copper, which 1900. This increase was caused largely by the production at the Ferris-Haggerty mine, at Encampment.

FOREIGN.

CANADA.

BRITISH COLUMBIA.

Lillooet District.

Mining in Lillooet district has been quiet this last season. The dredger of the Iowa and Lillooet Gold Mining Co., on the bed of the Fraser river, has proved a success. The occasional breakage of some part of the machinery and the difficulty of repairing or replacing it quickly has occasioned some delay in the working. On Cayoosh creek a company financed by Americans have staked and recorded the old Vancouver Enterprise location, their object being to mine the bed of the creek. To do this they have deflected the course of Cayoosh creek, and constructed a dam to carry the whole body of water in the creek. On Alexander creek, a tributary to Bridge river, a hydraulic plant is being put in. On the North Fork of Bridge river, Mr. Burkholder, representing Eastern capital, is doing the same. On the South Fork of Bridge river and Cadwallader creek, placer mining has been conducted the whole year with good returns.

Slocan District.

It is estimated that during 1905, the eighteen shipping mines tributary to the Kaslo and Slocan railway, including Sandon and Slocan lake, will have shipped 11,580 tons, valued at $273,700. The average zinc content was 42.6%. Work has commenced on the lease of the Whitewater and Whitewater Deep mines, at Whitewater on Kaslo creek, which has been taken for two years by S. S. Fowler and W. R. Koch of Nelson and John L. Retallack of Kaslo. The lowest level of the Whitewater is to be driven ahead and a contract will be let to drive the main tunnel of the "Deep" mine. There are two or three sets of subleasers in the old workings.

GREECE.

Secretary Wilson, of Athens, reports a movement in Greece to exploit that Kingdom's mineral resources. He says: Greece might easily become an important mineral-producing country, for it contains considerable mineral wealth in silver-bearing lead, zinc, copper, manganese, iron, emery, sulphur, and lignite, besides marble of many varieties. From 1861 to 1875 the Greek Government granted about 400 mining concessions, comprising an area of 190,000 hectares. Thirty stock companies were started to develop these concessions, but by 1896 only four of them still existed, viz., the French Laurium Co., the Greek Laurium Co., and the companies of Dardeza and Seriphos. By 1904 four more companies were started—the Greek M. Co. and the companies of Locrida, Atlanti, and Capsalo. The Greek Co. obtains silver-bearing lead from the scoriæ or refuse from the mines worked by the ancient Greeks. This material contains only about 3.50% of silver-bearing lead, but the production amounts to 7000 tons annually, valued at 3,500,000 francs. This lead is sent directly to Marseille, where it is smelted and the metals separated. The French Laurium Co. works the mines directly, and in 1903 produced 213,788 tons of metal, divided as follows: Lead, 72,594 tons; manganese iron ore, 60,071 tons; sulphur products, 42,380 tons; zinc, 28,292 tons; and various metals, 10,451 tons. All these minerals are treated at Laurium and are then exported for further treatment,

MADAGASCAR.

The decree making further regulations with regard to the gold mines in Madagascar has been published. It lays stress upon the essential differences between a prospecting permit and a mining permit, but reduces the area from a radius of 2 to 1 kilometres, and imposes a charge of 25 francs instead of 100 francs. So far as mining permits are concerned, the decree divides the mines into alluvial mines and reef mines. These two categories will be taxed as follows: The 5% ad volorem tax on the output is retained. In the case of alluvial mines, a surface tax of 2 francs per hectare will be imposed, and in the case of reef mines, a tax of 100 francs per hectare. The decree further provides for the retention by the Government of 5% of the net annual profit above 250,000 francs. On the other hand, the 5% tax on the output will be reduced or altogether suspended in the case of those reef mines where the expenditure during the earlier stages of working absorbs the whole of the profit. Finally, the interests of holders of the prospecting and mining permits have been safeguarded by temporary measures which provide for the progressive application of the financial regulations imposed by the new decree. The decree of June 27, 1905, which was admittedly a temorary measure to deal with a special state of affairs, is entirely superseded by the new decree.

MEXICO.

The President of the republic has signed a decree providing against the peril of contraction of the currency due to the higher market price of silver and the consequent exportation of silver pesos, which may go above a legal parity. The preamble to the decree states that the portion of silver pesos shipped abroad have been replaced by gold money imported from New York and London, but as gold cannot be immediately recoined and placed in circulation, the President authorizes the Exchange and Currency Commissioner to issue gold certificates for gold bars. The gold certificates will be backed by gold coin or bars.

Chihuahua.

The Monterde M. Co. has purchased mines at Monterde near Guazaperes. H. S. Gaine of Santa Barbara, Cal., is president.

It is reported that work is to be started on the Chihuahua smelter of the A. S. & R. Co. in January.—— The Isis Mining Co., J. D. Knotts general manager, is operating 30 miles west of San Julian on the trail to Guadalupe y Calvo in the district of Mina. The company is building a 5-stamp mill and cyanide plant.

Oaxaca.

The Resurreccion mine in the Tlacolula district has been purchased by the Associacion Compradora y Beneficiadora de Minerales of Tlacolula. The association owns several mines besides the Resurreccion, and these are now being developed. It is operating a 5-foot Bryan mill, with plate amalgamation, concentration and cyaniding. Another mill is to be put in. G. P. Mena is manager and A. L. Charlot director. The mill is in charge of E. S. Burrowes.——At the Placers mine in the Tlacolula district, of which J. Walsh is general manager, a 30-ton mill and cyanide plant is being put in.

Commercial Paragraphs.

THE Chicago Pneumatic Tool Co. of Chicago report that they have been awarded the gold medal at Liege for pneumatic tools and appliances and the silver medal for Franklin air compressors.

IT is reported that the efficiency of the new 100-stamp mill and cyanide plant recently installed by El Oro M. & Ry. Co., Ltd., at El Oro, Mexico, has so far exceeded the original estimates that the cyanide plant of their old 100-stamp mill has been put out of commission, and the new plant is handling the entire mine output of about 15,000 tons per month. The new mill is equipped with the Blaisdell system for automatically handling ore, sand and tailings.

THE Vulcan Iron Works Co. of Toledo, Ohio, reports the largest year's business in the history of the company. In the works many improved machines and high speed tools have been installed, and thereby the capacity of the works practically doubled. During the time that the improvements were in course of development the company ceased building the old type of steam shovel and orders were very much delayed. Old shipments are now practically all made, and, with the ability to build new model Vulcan steam shovels at the rate of almost one a day, they report receiving a volume of new business.

THE Pelton Water Wheel Co. report a contract with the Vancouver Power Co. for an additional 3000 H. P. Pelton unit of the "double overhung type;" to the same company 1050 feet of pipe line, varying from 42 to 48 inches. The Columbus Con. M. Co. of Utah has duplicated its order for a 750 H. P. Pelton wheel, the original of which was installed two years ago, while the United Light & Power Co. of Georgetown, Colo., is installing another 1000 H. P. Pelton unit, this being the second order received from the above company within the last three years. The Fremont Power Co. of Washington has ordered two Pelton wheels for direct connection to 400 K. W. generators. A recent contract with the Northwest Light & Power Co. of North Yakima, Wash., covers a Pelton unit for driving a 350 K.W. generator.

Obituary.

WM. LIDDELL, a pioneer mining man of the Pacific coast and superintendent of the Rawhide mine in Tuolumne county, Cal., was killed by a falling rock in the mine, December 27, aged 59.

Latest Market Reports.

SAN FRANCISCO, December 29, 1905.

METALS.

SILVER.—Per oz., Troy: London, 30 1/16d (standard ounce, 925 fine); New York, bar silver, 65½c, refined (1000 fine); San Francisco, 65½c; Mexican dollars, 53c, San Francisco; 50c, New York.

COPPER.—New York: Lake and Electrolytic, $18.50 @19.00; Casting, $18.12½@18.62½; San Francisco: $18.75; Mill copper plates, $21.00; bars, 21@24c. London: £79 7s 6d spot per ton.

Copper remains practically unchanged, though New York advices state that deliveries before April are nearly impossible to secure, and a higher price is predicted.

LEAD.—New York, $5.60; St. Louis, $5.95; San Francisco, $5.00, carload lots; 5¼c 1000 to 4000 lbs.; pipe 7½c, sheet 8, bar 6¾c. London: £17 6s 3d ℔ long ton.

SPELTER.—New York, $6.60; St. Louis, $6.65; London, £28 15s 0d ℔ ton; San Francisco, ton lots, 7c; 100-lb lots, 7¾c.

TIN.—New York, pig, $35.87½@36.00; San Francisco, ton lots, 37c; 500 lbs., 38c; 200 lbs., 40c; less, 41½c; bar tin, ℔ lb., 42c. London, £162 12s 6d.

PLATINUM.—San Francisco, crude, $18.50 ℔ oz.; New York, ingot, $20.50 ℔ Troy oz. Platinum ware, 75@$1.00 ℔ gram.

QUICKSILVER.—New York, $40.00@$40.50, large lots; London, £7 5s 0d; San Francisco, local, $38.00@39.00 ℔ flask of 75 lbs.

BABBITT METAL.—San Francisco, No. 1, 10½c; No. 2, 8c; No. 3, 7½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 23.50c; San Francisco, Plumbers', 100-lb. lots 19.75c.

NICKEL.—New York, 55@60c ℔ lb.; ton lots, 40@47c.

ZINC.—Metallic, chemically pure, ℔ lb., 50c; dust, ℔ lb., 10c; sulphate, ℔ lb, .04c.

ALUMINUM.—No. 1, 99%, small lots, 37c ℔ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No, 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, $18.35@18.85; gray forge, $14.60; San Francisco, bar, 3½c ℔ lb., 3¾c in small quantities.

STEEL.—Bessemer billets, Pittsburg, $26.00@$27.00; open hearth billets, $27.00@$28.00; San Francisco, bar, 7c to 13c ℔ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7¾c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, ¼c ℔ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ¼c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 7¼c; do. in kegs, 8c.

LIME.—Santa Cruz, $1.35 country, $1.25 city ℔ bbl.

CEMENT.—Imported, $3.00@4.00 ℔ bbl.; California, carload lots, $1.80 f. o. b. at works; small lots, $2.10 ℔ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

LUMBER.—(Retail): Pine, ordinary sizes, $24.00@ 25.00; extra sizes higher; redwood, $28.00@30.00; lath, 4 feet, $4.50@5.00; pickets, $21.00;shingles, $2.50 for No. 1, and $2.25 for No. 2; shakes, $13.50 for split and $15.00 for sawed; rustic, $28.00@35.00.

NAILS.—This week the basic prices are: Wire, $2.77; Cut, $3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, $3.35; Cut, $3.55; 10d to 16d, Wire, $3.45; Cut, $3.35; 8d, Wire, $3.50; Cut, $3.50; 6d and 7d, Wire, $3.60; Cut, $3.60; 4d and 5d, Wire, $3.70; Cut, $3.70; 3d, Wire, $3.85; Cut, $3.85; 2d, Wire, $4.10; Cut, $4.10. Special rates for carload lots.

GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 11¼c; Hallett's, 12½c; San Francisco, 1000-lb. lots, 14c; 300@500-lbs. 12c; 100-lb. lots, 13c.

BONE ASH.—Extra No. 1, 5@6c ℔ lb; No. 1, 4@5c.

BORAX.—Concentrated, 7@8c ℔ lb; powdered, 9@10c; fused, 25@30c; crystal, 7c.

CANDLES.—Spear Brand, 16 oz. adamantine, 40s., 11c ℔ set; 14 oz. adamantine, 40s., 10c; 12 oz. adamantine, 40s, 9c; 10 oz. adamantine, 40s, 8c; 16 oz. stearic, 40s, 12¾c ℔ set; 14 oz. stearic, 40s, 11½; 12 oz. stearic, 40s, 10¼c; 10 oz. stearic, 40s, 9¼c. 100-case lots and over, ½c less. Not less than 50-case lots, ¼c less. Boxes of 20s, price ½c advance.

CAPS.—3x, $5.50@6 per 1000; 4x, $6.50@7; 5x, $8@8.50; Lion, $9@9.50, in lots not less than 1000.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23@24c ℔ lb.; carloads, 23@23½c; in tins, 30c; soda ash, $2.00 ℔ 100 lbs.; hyposulphite of soda, 3@3½c ℔ lb.; caustic soda, in drums, 3@3¾c ℔ lb.; Cal. s. soda, bbls., $1.10@1.20 ℔ 100 lbs.; sks., 90c@$1.00: chlorate of potash, 12@13c; nitrate of potash, 6¾@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2½c; flour sulphur, French, 2¾@—c; alum, $2.00@2.25; California refined, 1¾@2c; sulphide of iron, 8c ℔ lb.; copper sulphate, 5¼@5¾c; chloride of lime, spot, $2.50@2.75; sulphuric acid, in carboys, 66° B, 1¾@2c ℔ lb.; nitric acid, carboys, 8c ℔ lb.

OILS.—Linseed, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 57c; Lucol oil, boiled, bbl., 48c; cs., 53c; raw-bbl., 46c; cs., 51c. Kerosene—Pearl, per gal., 17½c; Astral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Bleached, do., 68@73c; Whale Oil, cs., 52@67c.

BISMUTH.—Subnitrate, ℔ lb., $2.10.

CHROMIUM.—90% and over, ℔ lb., 80c.

FIRE BRICK.—Domestic, carloads ℔ 1000, f. o. b., factory square, $25.00; soap and split, $22.50; arch and wedge, $27.50; skewback, $30.00; circle, $32.00.

FIRE CLAY.—Domestic, ℔ ton 2000 lbs. in 125-lb. bags double, and dry ground, f. o. b., factory, $8.50.

FUSE.—Triple tape, $4.00 per 1000 feet; double tape, $3.55; single tape, $3.10; Hemp, $2.85; Cement No. 2, $3.10; Cement No. 1, $2.75, in lots of 3000 and up.

COAL.—San Francisco, coast, yard prices: Wellington, $8.00; Seattle, $6.50; Coos Bay, $5.50; Southfield, $8.00. Cargo lot, Eastern and foreign: Wallsend, $7.50; Brymbo, $7.50; Pennsylvania, hd., $14.00; Scotch, $8.00; Cumberland, $13.00; Cannel, $8.50; Welsh Anthracite, $13.00; Rock Springs, $8.50, long ton; Colorado Anthracite, $14.00. Coke, $11.50 per ton in bulk, $13.00 in sacks; Sunnyside, $8.50, long ton.

LITHARGE.—Pure, in 25-lb. bags, 9½@10½c ℔ lb.

MAGNESIUM.—Pure, N. Y., $1.60.

MANGANESE.—Black oxide, ℔ lb., 2¾@4c.

MERCURY.—Bichloride, ℔ lb., 77c.

MOLYBDENUM.—Best, $2.75 ℔ lb.

PHOSPHORUS.—American, ℔ lb., 70c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1**, 50%, carload lots, 11¾c; less than one ton, 13¾c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2**, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, $1.50 per keg; less car lots, $2.00 per keg.

RED LEAD.—500 lbs. and over at one purchase, ℔ lb. 7½c; less than 500 lbs., 7¾c.

SILVER.—Chloride, ℔ oz., 90c@$1.00; nitrate, 54c

SODIUM.—Metal, ℔ lb., $1.

TUNGSTEN.—Best, ℔ lb., $1.20.

URANIUM.—Oxide, ℔ lb., $3.40.

New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR WEEK ENDING DECEMBER 12, 1905.

807,150.—FOOTWEAR—H. C. Boice, Hanford, Cal.
806,770.—EXCAVATOR—A. A. Booth, Spokane, Wash.
806,774.—TREATING ORES—H. F. Brown, Oakland, Cal.
807,018.—ACCORDION—R. Carbonari, San Francisco.
807,109.—HOISTING DEVICE—W. H. Corbett, Portland, Or.
806,957.—VEHICLE BRAKE—J. Curry, Vancouver, Wash.
806,783.—MOLD—A. Dayton, Tacoma, Wash.
807,362.—ELEVATOR—E. S. DeLong, Upland, Cal.
806,878.—FLUE CUTTER—J. W. Doyle, Seattle, Wash.
806,962.—RASP—R. J. Ellis, San Francisco.
807,021.—BAND SAW—E. Falk, Eureka, Cal.
806,880.—SUSPENDERS—F. Ferguson, Santa Rosa, Cal.
807,022.—TYPEWRITER—R. R. Fowler, Madera, Cal.
807,023.—GOLD WASHER—C. W. Gardner, Oroville, Cal.
807,371.—WASH BOILER—S. J. Gibson, The Dalles, Or.
807,074.—VALVE—H. L. Harbaugh, Seattle, Wash.
807,025.—NOZZLE—G. J. Henry, Jr., San Francisco.
807,382.—COMBINATION TOOL—E. Hogan, Portland, Or.
803,974.—LOOSE LEAF BINDER—J. W. Husing, San Francisco.
807,285.—FAUCET—A. J. Ketelsen, Seattle, Wash.
807,184.—HOSE SUPPORT—J. E. Mainburg, San Francisco.
807,039.—CANE AND STOOL—J. H. Martin, Riverside, Cal.
807,040.—FLY PAPER—O. Mausert, San Francisco.
806,901.—IRRIGATING SYSTEM—S. P. Mendenhall, Whittier, Cal.
806,904.—VALVE—R. J. Mullin, Seattle, Wash.
807,043.—DOOR OPENER—K. Nishimoto, Fresno, Cal.
807,127.—HAIR COMB—E. R. Powers, Los Angeles, Cal.
807,130.—BUTTER CUTTER—W. H. Roussel, San Francisco.
806,934.—TURBINE—D. W. Starrett, San Francisco.
806,852.—DERRICK—C. S. Smith, Clay Station, Cal.
806,940.—HARVESTER—G. N. Todd, Los Angeles, Cal.
806,941.—COTTON PICKER—G. N. Todd, Los Angeles, Cal.
807,221.—GUN—I. A. Tonnashi, Guadaloupe, Cal.
806,858.—HOSE COUPLING—J. C. Westrose, Winnemucca, Nev.
807,007.—WASHING MACHINE—M. L. Winegarden, Alameda, Cal.
807,100.—EXERCISING BAG—W. C. Wood, San Francisco.
37,720.—DESIGN—H. W. Tucker, San Francisco.

Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

CAN EXHAUSTER AND COOKER.—No. 808,044. December 19, 1905. M. W. Groom, San Jose, Cal. This invention relates to apparatus for use in canneries and especially in fruit and vegetable canneries. The invention pertains to the exhausting and cooking periods; and its object is to provide an apparatus which will be simple, practical and economical and of large capacity, which may be used for either exhaust or cooking purposes, which will enable cans to be exhausted or cooked for any length of time within certain limits without changing the speed of travel of the cans and without losing time in making the change, and conversely, which will permit the speed of the cans to be changed without changing the time of exhausting or cooking and which will prevent the open cans filling with the drip from the condensed steam during exhaust and so diluting the syrup or causing the cans to overflow and foul the outside of the cans and the apparatus with syrup to the inconvenience of the solderer. It comprises various details of construction adapted to bring about the desired result.

INKING PAD AND HOLDER THEREFOR.—No. 807,988. December 19, 1905. John F. Ames, Portland, Oregon. This invention relates to a form-inking roller and removable pad therefor for use in cylinder presses. The object of the invention is to provide a removable inking pad and suitable holder therefor, the same holder to be used continuously in the press, while various pads may be substituted having inking surfaces of any desired shape or size. The invention is of particular value in multicolor printing, since by associating two or more of these printing rollers with the form cylinder each roller can be provided with a printing pad having an ink-distributing surface of different shape or size, each applying to different areas on the impression cylinder a different colored ink. It comprises the necessary details of construction adapted to bring about the desired result.

ANIMAL TRAP.—No. 807,969. December 19, 1905. S. H. Shelley, San Jose, Cal. This invention consists in a gopher trap comprising a box-like structure having a closed top, sides and one end, and adapted when placed in position in the animal's burrow to inclose a darkened chamber, said structure having its opposite end open, and having also a limited light aperture near its closed end, a mirror in the chamber of the box and supported relative to said aperture and arranged to reflect light into the darkened chamber, and suitable entrapping means between the open end of the box and the mirror.

GRAIN SEPARATOR.—No. 807,978. December 19, 1905. J. S. Walch, Roselawn, Cal. This invention comprises in an apparatus for cleaning grain, a semi-circular screen having a closed upper portion and a screen bottom, a second screen located below the first named screen, rocker arms upon the upper ends of which the upper screen is suspended and from the lower ends of which the lower screen is suspended, means connected with said arms by which they are oscillated, fans with discharge passages delivering air respectively through the front and rear ends of the screens, spouts into which the inclined chutes discharge and a transmitting auger revoluble in said spouts.

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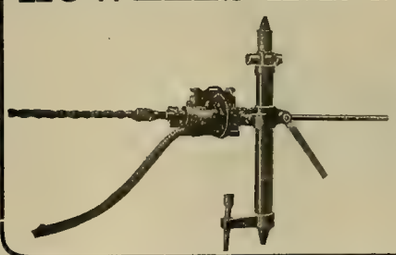

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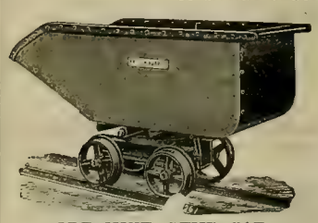

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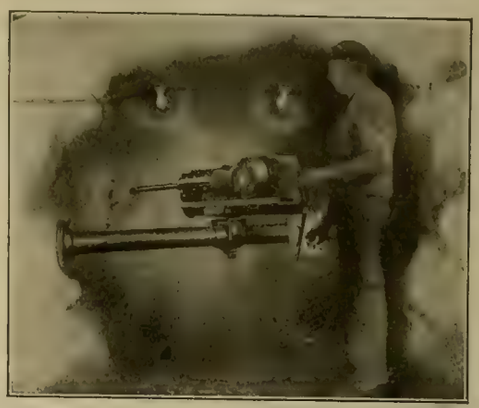

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